Students' Academic Board
IIT Guwahati

Research Conclave'19

An amalgamation of Academia, Industry & Startups

14th - 17th March, 2019

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भारतीय प्रौद्योगिकी संस्थान गुवाहाटी
Indian Institute of Technology Guwahati

Prof. Gautam Biswas
FNA, FASc, FNAE, FNASc, F-ASME, FIE
Director and J. C. Bose National Fellow

गुवाहाटी–781 039, भारत
Guwahati–781 039, India

MESSAGE FROM THE DIRECTOR

It gives me immense pleasure to know that the fifth Research Conclave of the Institute will take place from March 14 to March 17, 2019. With the view of promoting research in IITG and developing it into a hub for exchanging innovative novel ideas, the Research Conclave was started 5 years ago. Since its inception, the event has observed significant growth. Celebrated by the undergraduate and graduate students of the institute, it has become a prestigious platform for promising yourng researchers to present their research ideas. As IIT Guwahati completes its 25 glorious years, I am looking forward to the spectacular ideas that the Research Conclave has to offer this time.

In the Research Conclave, students showcase their research work through posters and presentations in front of their peers, invited guests and fellow attendees from other institutes. It builds confidence and improves communication skills which are very important for their research
pursuit. The event forms the basis for collaboration, networking and wider visibility. Events like Redstart present unique and useful ideas for the industries, while several workshops by distinguished scholars from academia as well as industries help students learn the nuances of practical implentation of various technological concepts and tools.

The responsibility for completing a PhD within a reasonable period of time is very important to sustain the number of students at any given time at the Institute. At the same time the quality of PhD is adjudicated by the number of cutting edge publications in the top-tier journals in the field. Handling this seemingly bivalent requirements is a great accomplishment. This has to be shouldered by both the students, and their advisors. This applies not only to the PhD students, but also to the undergraduate and graduate students. Enthusiasm and craving for cognizance are the key to success. These, along with sincere effort and hard work can lead to publications in the top-tier journals.

IIT Guwahati is a home to diverse people, ranging from different states of India to abroad. Amidst all our differences, we are united in our passion for scientific thoughts and research. We feel delighted and privileged to be a part of the great tradition of education and research at this Institute. As quality manpower is the only means to achieve excellence in "Knowledge Economy", IIT Guwahati has to step up and excel in what it is doing already, i.e. cutting edge research. Research Conclave is one such effort of the institute towards that goal. Again, I congratulate all the members of the organizing team and all the participants for making th is event a great success.

Gautam Biswas

Gautam Biswas, FNA
JC Bose National Fellow and Director
Indian Institute of Technology Guwahati

भारतीय प्रौद्योगिकी संस्थान गुवाहाटी
Indian Institute of Technology Guwahati

Students' Academic Board
IIT Guwahati

MESSAGE FROM
DEAN OF ACADEMIC AFFAIRS

Solving real life problems or developing ground breaking technologies often requires teams of researchers from different disciplines to work together. Expertise from different areas or different disciplines can be combined to address complex problems that can make a significant impact on society. Meetings, interactions and collaborations across disciplines and organizations are simple steps in this direction. With this ethos, Research Conclave (RC) 2019 is an event for young researchers from various disciplines to meet and interact. It also gives an opportunity to interact with experts from academic institutions, R&D organizations, and industries.

On behalf of the Institute, I welcome all speakers, delegates and participants of Research Conclave 2019 to the beautiful campus of IIT Guwahati. I wish all participants, especially young researchers, a fruitful research interaction during this event paving way to innovations and great inventions.

Finally I thank each member of organizing team of Research Conclave 2019 and wish all of you great success.

Prof. M. Guru Prem Prasad
Dean of Academic Affairs
Professor, Department of Mathematics
IIT Guwahati, Assam 781039

भारतीय प्रौद्योगिकी संस्थान गुवाहाटी
INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI

Dr. Padma Kumar Padmanabhan
Professor of Physics
Chairperson, Students' Academic Board, and
Associate Dean of Academic Affairs
Indian Institute of Technology Guwahati
Guwahati 781 039, India.

Monday, March 11, 2019

MESSAGE FROM
ASSOCIATE DEAN OF ACADEMIC AFFAIRS & SAB CHAIRMAN

It is my pleasure and a privilege to extend a warm welcome to all our distinguished speakers, eminent resource persons, student participants, to the fifth edition of the Research Conclave, 14th to 17th, March 2019 (RC'19). This grand event is designed to nurture students and young scholars towards cutting-edge research, innovative technology development and entrepreneurship. It offers a wonderful opportunity for the budding researchers to interact and share ideas with pioneers from academia and industry. In an era where the scientific approaches tend to be more and more super specialized, young researchers often find themselves confined to their area of expertise failing to realize the wholistic picture or the true motive of the scientific efforts. To overcome these hurdles in addressing various concerns and challenges before the humanity more effectively, it demands us to work together, in the form of cross-disciplinary interactions, and industry-academia collaborations. To this cause, RC'19 includes various sub-events such as, workshops, lab visits, panel discussions, debates, presentations in the form of poster/oral/model and on start-up ideas, etc., in addition to interactive sessions with eminent personalities from different walks of life. While congratulating the volunteers of RC'19 for their seamless efforts to organize this event, I wish that the participants a rewarding and exciting days on our campus.

Prof. P. K. Padmanabhan
Professor, Department of Mathematics
IIT Guwahati, Assam 781039

MESSAGE FROM
ORGANIZING COMMITTEE

As IIT Guwahati completes its 25 glorious years, it's indeed a pleasure to welcome everyone to institute's fifth annual academia-industrial fest, Research Conclave, organized by Students' Academic Board, Indian Institute of Technology (IITG), Assam, India.

Since its inception in 2015, Research Conclave has been an efficacious platform to showcase new research ideas and exchange ideas with fellow researchers, industrialists and scientists. The conclave emphasises on presenting seemingly esoteric research ideas in a lucid manner, in order to implement its application in real life. The unique collaboration between academia and industry helps in realizing this goal. Invention is a denouement of imagination and innovation. This forum harness innovative mind to level-up the economic strata of current society from research to industries. Research Conclave works as a catalyst for building leaders through holistic, transformable and innovative ideas.

In Research Conclave 2019, we have tried to reach out to budding researchers and undergraduate students to inculcate research culture among them. The inauguration ceremony of this fifth edition of Research Conclave will be attended by our chief guest, Prof. Partha Pratim Majumder (President, Indian Academy of Science & Founder Director, National Institute of Biomedical Genomics) and other dignitaries from different institutes. Apart from that, IIT Guwahati will be hosting Institute Open Day on March 15, 2019, where around 600 school students will get a chance to visit various laboratories of IIT Guwahati and listen to the lectures, to be delivered by eminent personalities. It's an honour to host inspiring talks by several distinguished speakers, which includes Shanti Swarup Bhatnagar Prize Awardees in different science areas - Dr. Ganesh Nagaraju (IISc Bangalore), Prof. Swadhin K. Mandal (IISER Kolkata), Prof. Amit Agarwal (IIT Bombay), and leading industrialists such as Dr. Raksh Vir Jasra (Senior VP, Reliance Industries Ltd.). We are glad to have venerable speakers like Prof. Prof. Mathukumalli Vidyasagar (Control Theorist & Distinguished Professor at IIT Hyderabad), Dr. Vishal Rao U. S. (Fellow TATA Memorial Hospital,Head & Neck Surgeon Global Cancer Centre, Bangalore), Prof. Amaresh Chakrabarti (Professor & Chairman, Centre for Product Design & Manufacturing ,IISC Bangalore), and Prof. Sudip K. Das (Professor & Head, Dept. of Chemical Engineering, University of Calcutta). The conclave will be organizing workshops on current burning topics such as Machine learning, Data Science, Intellectual Property rights, etc. The event will be conducted by resource person from India and abroad - Dr. Shakuntala Choudhury (William Paterson University, USA), Mr. Raja Nagaraju (Kaleidofin Pvt. Ltd.), Mr. Chirag Tanna (INK IDÉE), etc. There is an overwhelming contribution from the IIT Guwahati faculty fraternity in this edition - 12 speakers from IIT Guwahati will be interacting in the talks on various topics. We do hope that all the participants will be highly benefited by these events. Apart from all these events, RedStart - The start-up challenge, has witnessed an overwhelming participation this year. We are expecting a plethora of out-of-the-box research and industrial ideas. The oral and poster presentation and model exhibition will motivate the students to understand and practice high quality research. Also, it will help students in improving their communication skills and extend their labyrinth of connection by meeting leading industrialists and fellow researchers.

भारतीय प्रौद्योगिकी संस्थान गुवाहाटी
Indian Institute of Technology Guwahati

Students' Academic Board
IIT Guwahati

MESSAGE FROM
ORGANIZING COMMITTEE

We have witnessed over more than 1000 registrations in several events of Research Conclave 2019. We'd like to thank everyone in showing interest in the fest and for the constant support. We'd like to acknowledge the incessant efforts of IIT Guwahati community and other participating institutes, who made this event possible. We thank and congratulate all the participants for their contribution. We also thank the sponsors for their enormous support to this event. Last but not the least, we extend our wishes to the future team who shall take Research Conclave to a newer heights.

We wish everyone a memorable, enjoyable and eventful stay here at scenic IIT Guwahati.

Dr. Akshai Kumar A.S.
Faculty Convener
Research Conclave 2019
IIT Guwahati, Assam 781039

Dr. Nelson Muthu
Faculty Co-Convener
Research Conclave 2019
IIT Guwahati, Assam 781039

Diwanshu Jain
Student Co-Convener
Research Conclave 2019
IIT Guwahati, Assam 781039

Rupak Bhowmik
Student Convener
Research Conclave 2019
IIT Guwahati, Assam 781039

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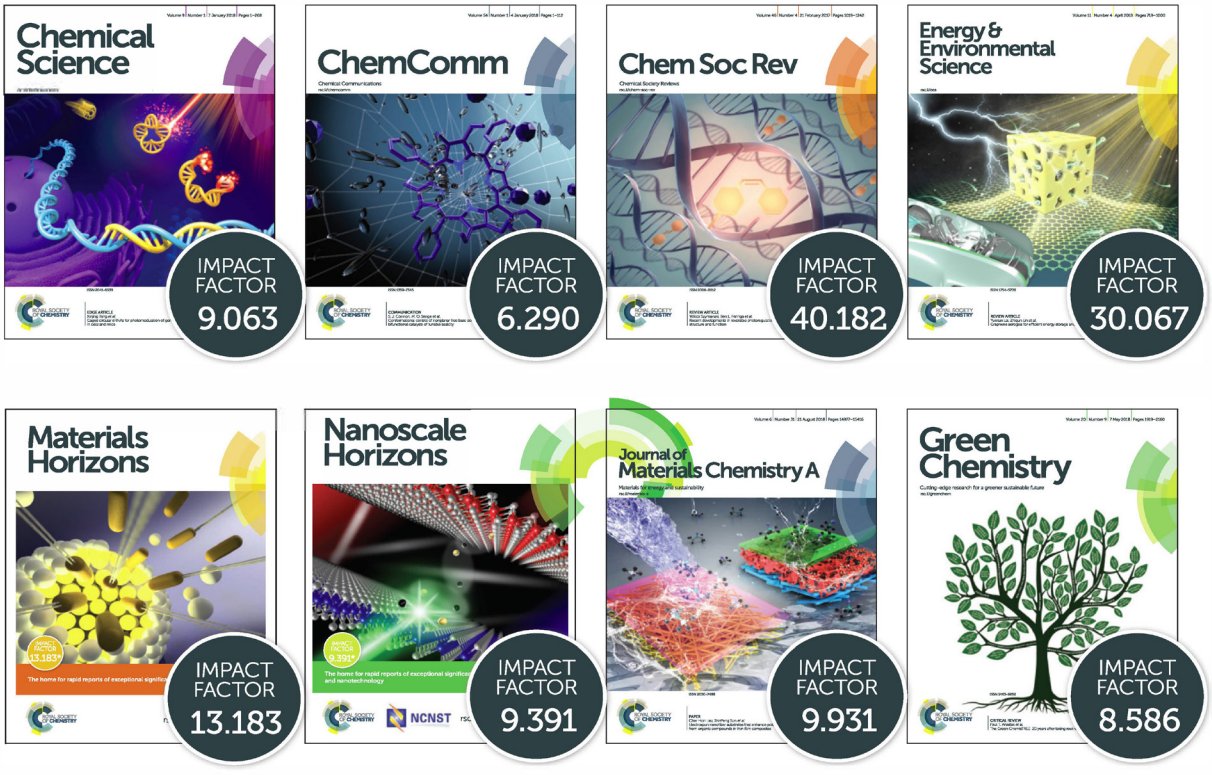

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india-lsca_marketing@agilent.com

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SCHEDULE FOR THE EVENT

March 14 - Day 0

01:00 PM - 03.00 PM
Registrations of Internal Participants & Display of Poster
Venue: New Class Room Complex Foyer

3:00pm Onwards
Inauguration
Inaugural Lecture by the Chief Guest: Prof. Partha Pratim Majumder (4:20 PM -5:20 PM)
Venue: Dr. Bhupen Hazarika Auditorium

March 15 - Day 1

SESSION 1
08:00 AM - 01:00 PM

08:00 AM - 10.00 AM
Registrations of External Participants & Display of Poster in New Class Room Complex Premises
Venue: New Class Room Complex Foyer

09:00 AM - 01.00 PM
Oral Presentations & Invited Talk

Department of Chemistry
(Venue: Room No: 5001, New Class Room Complex)
Invited Talk 1 : Prof. Swadhin Mandal (10:15 AM - 11:00 AM)
Invited Talk 2 : Prof. Bhisma K. Patel (11:30 AM - 12:00 PM)
Department of Bio Science & Bio Engineering
(Venue: Room No: 5002, New Class Room Complex)
Invited Talk 3 : Dr. Biman B Mandal (10:00 AM - 10:30 AM)
Invited Talk 4 : Dr.Ganesh Nagaraju (11:00 AM-11:45 AM)
Invited Talk 5 : Dr. Sachin Kumar (12:00 PM-12:30 PM)
Centre for Environment
(Venue: Room No: 5003, New Class Room Complex)
Invited Talk 6 : Prof. Sudip Kr. Das (10 AM - 10:45 AM)
Department of Computer Science & Engineering
(Venue: Room No: 5004, New Class Room Complex)
Department of Humanities & Social Science
(Venue: Room No: 5005, New Class Room Complex)

09:00 AM - 01.00 PM
Institute Open Day
Exhibition & Lab Visit

10:00 AM - 01.00 PM
Workshop 1: Machine Learning
Resource Person : Dr. Shakuntala Choudhury
Venue: Room No 5006, New Class Room Complex

SESSION 2
02:00 PM - 06:00 PM

02:00 PM - 06.00 PM
Institute Open Day
Invited Talk 7: Dr. Uttam Manna (2:00 PM -2:45 PM)
Wow Math Show - Mr. Dinesh Lahoti (2:45 PM-4:00 PM)
Venue: Dr. Bhupen Hazarika Auditorium

2:00 PM - 05.00 PM
Poster Evaluation
Design, Electrical & Electronics, Energy, Mechanical, & Nanotechnology
Venue: New Class Room Complex

02:00 PM - 05.00 PM
3 Minutes' Thesis Presentations
Venue:
Group 1 (List) - Room No 5101,New Class Room Complex
Group 2 (List) - Room No 5102,New Class Room Complex

02:00 PM - 05.00 PM
Workshop 2: Particle Image Velocimetry (PIV)
Resource Person : Dr. Ivan Zadrazil
Venue: Room No 5006, New Class Room Complex

March 16 - Day 2

SESSION 1
08:00 AM - 01:00 PM

09:00 AM - 1.00 PM
Redstart: The Startup Challenge
Venue: Room No 5101, New Class Room Complex

09:00 AM - 01.00 PM
Oral Presentations & Invited Talk

Department of Mechanical Engineering
(Venue: Room No: 5001, New Class Room Complex)
Invited Talk 8 : Prof. Amit Agrawal (10:15 AM - 11:00 AM)
Invited Talk 9 : Prof. Prof. Uday Shankar Dixit (11:30 AM -12:00 PM)
Department of Design
(Venue: Room No: 5002, New Class Room Complex)
Invited Talk 10 : Prof. Pradeep Gururaj Yammiyavar (10:30 AM -11:00 AM)

SCHEDULE FOR THE EVENT

Centre for Energy
(Venue: Room No: 5003, New Class Room Complex)
Invited Talk 11 : Prof. Kaustubha Mohanty (10:15 AM - 11:00 AM)
Department of Electrical & Electronics Engineering
(Venue: Room No: 5004, New Class Room Complex)
Centre for Nanotechnology
(Venue: Room No: 5005, New Class Room Complex)

11:30 AM - 12.30 PM
Institute Lecture 1: Dr. Vishal Rao U. S.
Venue: Gallery, New Class Room Complex

10:00 AM - 01.00 PM
Poster Evaluation
Chemical, Civil, Mathematics, Physics, & Rural Technology
Venue: New Class Room Complex

10:00 AM - 01.00 PM
Workshop 2: Data Science in FinTechs
Resource Person : Mr. Raja ,Head, Data Science, Kaleidofin Pvt. Limited
Venue: Room No 5006, New Class Room Complex

SESSION 2
02:00 PM - 06:00 PM

02:00 PM - 6.00 PM
Redstart: The Startup Challenge
Venue: Room No 5101, New Class Room Complex

02:00 PM - 03:00 PM
Institute Lecture 3: Prof. Dhirendra Nath Buragohain
Venue: Gallery, New Class Room Complex

03:00 PM - 06.00 PM
Poster Evaluation
Chemistry, Bio Science & Bio Engineering, Environment, Computer Science & Engineering, & Humanities and Social Science
Venue: New Class Room Complex

March 17 - Day 3

09:00 AM - 01.00 PM
Oral Presentations & Invited Talk

Department of Chemical Engineering
(Venue: Room No: 5001, New Class Room Complex)
Invited Talk 12 : Dr. Raksh Vir Jasra (10:00 AM - 10:45 AM)
Invited Talk 13 : Prof. Dipankar Bandhopadhay (11:15 AM -11:45 AM)
Invited Talk 14 : Dr. Anki Reddy (12:00 PM - 12:30 PM)
Department of Civil (Venue: Room No: 5002, New Class Room Complex)
Department of Physics (Venue: Room No: 5003, New Class Room Complex)
Department of Mathematics (Venue: Room No: 5004, New Class Room Complex)
Invited Talk 15 : Prof. Anupam Saikia (10:00 AM -10:30 AM)
Invited Talk 16 : Prof. Amaresh Chakrabarti (11:00 AM -11:45 AM)
Centre for Rural Technology (Venue: Room No: 5005, New Class Room Complex)

10:00 AM - 11.00 AM
Institute Lecture 2: Prof. M. Vidyasagar
Venue: Gallery, New Class Room Complex

11:00 AM - 01.00 PM
Quiz
Venue: Room No:5101, New Class Room Complex

10:00 AM - 01.00 PM
Model Exhibition
Venue: New Class Room Complex

SESSION 2
02:00 PM - 06:00 PM

01:00 PM - 04.00 PM
Workshop 3: Intellectual Property Rights & Patent Writing
Venue: Room No:5006, New Class Room Complex

04:00 PM - 5.00 PM
Institute Talk 17: Prof. Arun Chattopadhay
Venue: Dr. Bhupen Hazarika Auditorium

05:30 PM ONWARD
Valedictory Session
Venue: Dr. Bhupen Hazarika Auditorium


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Citizen 3
Citizen 15
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INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI

Indian Institute of Technology Guwahati, the sixth member of the IIT fraternity, was established in 1994. The academic programme of IIT Guwahati commenced in 1995. At present the Institute has eleven departments and three inter-disciplinary academic centres covering all the major engineering, science and humanities disciplines, offering BTech, BDes, MA, MDes, MTech, MSc and PhD programmes. Within a short period of time, IIT Guwahati has been able to build up world class infrastructure for carrying out advanced research and has been equipped with state-of-the-art scientific and engineering instruments. Indian Institute of Technology Guwahati's campus is on a sprawling 285 hectares plot of land on the north bank of the river Brahmaputra around 20 kms. from the heart of the city. With the majestic Brahmaputra on one side, and with hills and vast open spaces on others, the campus provides an ideal setting for learning.

Indian Institute of Technology Guwahati, the sixth member of the IIT fraternity, was established in 1994. IIT Guwahati was established in 1994 by an act of parliament and its academic programme commenced in 1995. Indian Institute of Technology Guwahati's campus is on a sprawling 285 hectares plot of land on the north bank of the river Brahmaputra. With the majestic Brahmaputra on one side, and with hills and vast open spaces on others, the campus provides an ideal setting for learning.
IIT Guwahati has been symbolised as one of most effervescent Institutes across the world by several major ranking associations. The hardship of students, devotion of quality research, contributions of renowned alumni, dedication and untold effort of the teachers and staff (teaching and non-teaching), and the vision of the administration was influential in these achievements. Worldwide, the ranking of IIT Guwahati was 451–460 in the QS World University Ranking of 2015 and 89 in the QS Asian University Rankings of 2012. In India, among engineering academies, it was ranked 10 by India Today in 2012, 8 by Outlook India in 2012 and 7 by Dataquest in 2011. In the Mint Government Colleges survey of 2009 it was ranked 6. In 2014, IIT Guwahati has been ranked 87 in 100 Top Global Universities under 50 Years by the Times Higher Education World University Rankings, bringing India into the list for the very first time. In 2015, IIT Guwahati has been ranked 50 by BRICS ranking. In 2016, IIT-Guwahati ranked 14th among 20 institutions classed as the World's Best Small Universities in the latest Times Higher Education (THE) rankings of 2016.

According to recent statistics, IIT Guwahati has around 6000 students, 425 staff and 375 faculty. IIT Guwahati is now 17 Convocations old, has over 7000 alumni, and has graduated over 475 Ph.D. students. Over the years, more than 250 companies/organisations have participated in the student placements.

ABOUT STUDENTS' ACADEMIC BOARD

Students' Academic Board (SAB)
IIT Guwahati

The SAB is intended as a student forum which strives to redress the academic problems and concerns of the entire student community of IIT Guwahati. It is a bridge between the students and the academic administration and is responsible to redirect the academic issues of the students to the appropriate administrative authority.

Together we strive to achieve the following:
To make you cognizant of the Academic protocols and procedures. For any system to function efficaciously there is a set of rules and ordinances which needs to be followed to achieve maximum organization. Often the students are unaware regarding these and end up wasting a lot of their time.

SAB, through its workings, organizes various Departmental and Inter-Departmental Activities through-out the semester. Such a synergistic system is often necessary to inculcate the spirit of Academic Excellence and innovation.
Last but not the least, the SAB conducts periodic sessions to interact with the Student Community and undertake timely dissemination of important information.

Issues such as Internships, Exchange Programs, Fellowship/Scholarship Schemes etc. remains the underlying topics on which we try to bolster the student community so as to achieve positive results in a methodical way and thus succeed in bringing laurels to our Alma mater.

SAB Ph.D. Council includes the Ph.D. student members of the DPPC of all the department in IIT Guwahati along with the elected Ph.D. representatives of different centres (Centre for Energy, Nanotechnology, and Environment) within the Institute.Apart from such activities the Ph.D. council conducts Research Conclave

ABOUT RESEARCH CONCLAVE

Research Conclave'19

An amalgamation of Academia, Industry & Startups

Research Conclave is an event organised by the Students' Academic Board (SAB) of Indian Institute of Technology Guwahati (IITG). It started in 2015 with great rhythm and passion; and this year with the same enthusiasm, we are conducting this event in a broader spectrum.

Research Conclave is a staunch platform to nurture the young minds towards research, innovation and entrepreneurship which intends to bring the integrity of the students towards both industries and academia to redress the academic research challenges, concerns of the entire student community and upcoming entrepreneurs around the globe. It is a forum to harness innovative minds of current society by taking innovations made in research to their real/actual implementation in the industries. Research Conclave works as a catalyst for building leaders through holistic, transformable and innovative ideas.

OBJECTIVES

- Showcase the ongoing research activities of different institutes / universities / colleges across the country.
- Model exhibition by research groups from premier institutes and universities across the country.
- Industry-academia interaction with industrial delegates highlighting their technological requirement, expectations from research institutes.
- Interactive sessions with entrepreneurs across the globe to identify the avenues through local firms, businesses and other intermediaries through innovation and research.
- Providing a prestigious platform for start-ups to exhibit their products and ideas to industries and academia.
- Providing a platform for industries to identify highly intellectual, motivated and enthusiastic students for their firms and furnishing technological implementation towards sustainable development and encouragement to student community for pursuing higher studies.

RESEARCH CONCLAVE FEATURES

'CONNAISSANCE'
(Lecture series: Academicians & Industrialists)

'SCIENTIFIQUE'
(Oral, Poster, Model presentation and Laboratories visit)

'ACAD-INDUSTRIE SYNERGY'
(Interaction with Industry delegates, Startups & Aacademicians)

'DISCUTIR'
(Panel discussion & Quiz)

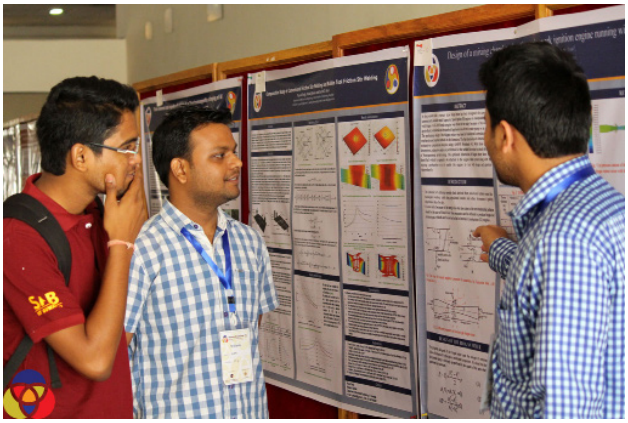
'INNOVATEUR PLATE-FORME'
(Startup)

'ATELIER'
(Workshops & Photography)

REMINISCENCE: A GLIMPSE

A Glimpse

- Showcased various research activities undergoing in different departments within IIT Guwahati through posters, lectures, presentations and lab visits.
- Active participation from institutes all across North-East India.
- Overwhelming response and positive feedback from academic community and industries.



About Us

Merck is a leading science and technology company globally. Curiosity has been our driving force since 1668. Hence, our anniversary year in 2018, marking completion of 350 years, revolves not only around our past, but also centers on the future. Our research mission is simple - innovations that improve the quality of life of people everywhere. Around 51,000 employees globally work to make a positive difference to millions of people's lives every day by creating more joyful and sustainable ways to live.

In 2017, we completed 50 years in India, starting out as a pharmaceutical company and growing to become a science and technology business spanning all the sectors of Healthcare, Life Science and Performance Materials.

Our Life Science business is dedicated to solving the toughest problems in life science by collaborating with the global scientific community. To that end, we offer high-quality products and solutions both for research and the manufacturing of chemical and biological drugs. We also provide products and solutions for diagnostics, environmental testing and industrial customers. We help scientists and engineers to solve problems at every stage of their work. Our lab materials, technologies and services help make research, pharmaceutical and biotech production simpler, faster and safer. They enable scientific discovery by helping customers better understand biological function and disease.

In a nutshell, we operate in three distinct business units:

- Research: Serving academics, government research labs and pharmaceutical and biotechnology companies
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- Process Solutions: Serving pharmaceutical and biopharmaceutical manufacturers

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With the 2015 combination of Merck Millipore and Sigma-Aldrich, we now have a broad portfolio of 300,000 products and an expanded global footprint. Our e-procurement solutions are all about business intelligence and the empowerment of automated workflow that will lead to increased productivity in your organization.

EMINENT SPEAKERS FOR RESEARCH CONCLAVE '19

Prof. Partha P. Majumdar
Chief Guest, Founder Director NIBMG
3:20 p.m. at Main Auditorium

Prof. Swadhin K. Mandal
Professor, IISER Kolkata
10:15 a.m. at Room 5001

Prof. Bhisma K. Patel
Professor, IIT Guwahati
11:30 a.m. at Room 5001

Prof. Biman B. Mandal
Associate Prof., IIT Guwahati
10:00 a.m. at Room 5002

Dr. Ganesh Nagaraju
Assoc. Prof., IISc Bangalore
11:00 a.m. at Room 5002

Dr. Sachin Kumar
Associate Prof., IIT Guwahati
12:00 p.m. at Room 5002

Prof. Sudip K. Das
Professor & HoD Chem. Engg., Univ. of Calcutta
10:00 a.m. at Room 5003

Dr. Uttam Manna
Assistant Professor, IIT Guwahati
2:00 p.m. at Main Auditorium

Prof. Amit Agarwal
Professor, IIT Bombay
10:15 a.m. at Room 5001

Prof. Uday S. Dixit
Professor, IIT Guwahati
11:30 a.m. at Room 5001

Prof. Pradeep G. Yammiyavar
Professor, IIT Guwahati
10:30 a.m. at Room 5002

Prof. Kaustubha Mohanty
Professor, IIT Guwahati
10:15 a.m. at Room 5003

Dr. Vishal Rao U. S.
MBBS, MS-ENT, Global Cancer Centre, Bangalore
11:30 a.m. at Gallery, Core 5

Prof. Dhirendra Nath Buragohain
Emeritus Professor and Founder Director, IIT Guwahati
02:00 p.m. at Gallery, Core 5

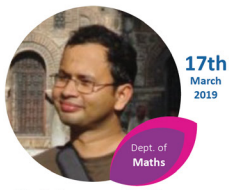
Prof. M. Vidyasagar
Control Theorist & Prof. at IIT Hyderabad
10:00 a.m. at Gallery, Core 5

Dr. Raksh Vir Jasra
Senior VP,Reliance Industries Ltd.
10:00 a.m. at Room 5001

Prof. Amaresh Chakrabarti
Professor and Chairman, CPDM, IISc Bangalore
11:00 a.m. at Room 5004

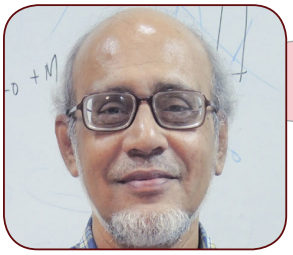
Prof. Dipankar Bandyopadhyay
Professor, IIT Guwahati
11:15 a.m. at Room 5001

Dr. Anki Reddy Katha
Associate Professor, IIT Guwahati
12:00 p.m. at Room 5001



Prof. Anupam Saikia
Professor, IIT Guwahati
10:00 a.m. at Room 5004

Prof. Arun Chattopadhyay
Professor, IIT Guwahati
04:00 p.m. at Main Auditorium



Day 0 :
14 MARCH, 2019

Prof. Partha Pratim Majumder
Chief Guest
President, IAS, Bangalore

Time: 4:20 PM -5:20 PM
Venue: Main Auditorium

About the Speaker

Dr. Partha Pratim Majumder is the Director of the National Institute of Biomedical Genomics, Kalyani (near Kolkata). He is also a Professor at the Indian Statistical Institute and the Indian Institute of Science Education & Research, Kolkata. He is an elected Fellow of all the three science academies of India. He has served on the Board of Directors of the International Genetic Epidemiology Society (IGES), and was the founding Chair of the ELSI Committee of IGES. He is a Member of the Human Genome Organisation. He is a recipient of many awards and medals, including the TWAS (The Academy of Sciences for the Developing World) Biology Prize – 2009, G.D. Birla Award for Scientific Research – 2002, Ranbaxy Research Award in Applied Medical Sciences – 2000, and the New Millennium Science Medal, Government of India, 2000.

"Enabling precision medicine for cancer treatment"

Cancer is a disease of the genome. For any type of cancer – lung cancer, oral cancer, cervical cancer, etc. – only rarely does one encounter families in which multiple family members are affected with cancer. In other words, familial cancers are rare. Cancer is mostly sporadic. The hallmark of cancer is uncontrolled growth of cells. One of more DNA alterations in a normal cell leads to a growth advantage of the cell, which then grows uncontrollably and abnormally to form a set of cells, called a clone, which forms a tumour. These DNA alterations occur mostly after an individual is born, and are called somatic alterations. Many DNA alterations that are present at birth, called germline alterations, can also predispose an individual to cancer. Precision medicine is a phrase that is often used to describe how genetic information about a person's disease is being used to diagnose or treat their disease. Understanding the genetic changes that are in cancer cells is leading to more effective treatment strategies that are tailored to the genetic profile of each patient's cancer. In this talk, I shall provide some examples of how genomic information has already helped to shape the development and use of some of the newest cancer treatments. I shall also explain how recent research, including our own, is poised to foster development of more precise treatment strategies for cancer. Finally, I shall present some snippets from the history of cancer research and a peek into the future of precision medicine in relation to cancer.

Day 01:
15 MARCH, 2019

Prof. Swadhin K. Mandal
IISER-Kolkata
Shanti Swarup Bhatnagar Prize in Chemical Sciences-2018

Time: 10:15 AM -11:00 AM
Room No: 5001, New Class Room Complex

"Mimicking Transition Metals during Catalysis"

One of the major concerns for today's World has been the development of processes, which are sustainable without destroying our limited resources and environment. In this regard, the development of environmentally benign and cost-effective catalysts is ideal. Transition metals are often used in catalysis for their excellent redox switching behaviour during catalytic cycles. However, there is an urge to develop transition metal free catalysis due to various factors, which seeverly compromises the sustainability of whole process such as expenses, low-abundance and associated toxicity of heavy metals. The present work conceptulizes on the fundamental understanding of organometallic chemistry how typically a metal works during catalysis. The concept is capitalized based on an organic molecule (named as phenalenyl based molecule) which can accept electrons, store and delivers the way a typical transition metal such as palladium functions in a coupling reaction. This concept is described as " Transition Metal Mimicking Catalysis".

Day 01:
15 MARCH, 2019

Prof. Bhisma K. Patel
IIT Guwahati
Fellow of the Indian Academy of Sciences (FASc) and the National Academy of Sciences (NASI)

Time: 4:20 PM -5:20 PM
Room No: 5001, New Class Room Complex

"Access to Multifunctional AIEEgens via Annulations"

Ruthenium(II) catalyzed oxidative C-H / O-H and C-H / S-H annulations have been demonstrated by us using different directing arenes viz. 2-arylquinolinone, 2-arylbenzoxazinone, quinoline-4(1H)-thiones and quinoxaline with internal alkynes. Regiospecific annulations have been observed for directing arenes via the assistance of weaker carbonyl or thio carbonyl groups in the presence of a stronger nitrogen-directing site. Multifaceted application potential of AIEEgens in bio-imaging, theranostic, chemo/bio sensors, mechanochromic, solar cells and organic photoelectronic opens up a new research paradigm to develop and design more such compounds. Herein, quinoxaline N-directed Ru(II)-catalyzed oxidative annulation of 2-arylquinoxalines with internal alkynes leads to the formation of highly luminescent annulated quaternary ammonium salts in the presence of Cu(OAc)2.H2O oxidant. While the synthesized compounds exhibit emissions in green to yellow region with large Stoke shifts and reasonable quantum yields, their DFT calculation display 3D twisted conformation bearing donor-p-acceptor (D-p-A) configuration, where the two phenyl moieties could serve as donors and the extended quinoxaline core as the acceptor. Single crystal analysis of the quaternary salt, depicts the presence of multiple intermolecular non-covalent and weak π-π interactions that are possibly responsible for the luminescent behavior in crystalline as well as solid state. Advent of AIEE in quinoxalinium salt in DMF/water is due to the presence of intramolecular motion (RIM) and their restriction in aggregated state. AIEEgen unveils mechanochromism on changing from crystalline to amorphous state upon grinding, where a few of such compounds are utilized for development of latent fingerprints on an adhesive tape. Furthermore, a representative group of synthesized luminescent quinoxalinium salts portray dose dependent cell growth inhibition of HeLa cells with concomitant cell arrest in G1 phases. Hence, these AIEE luminogens are not only attractive as luminescent "light-up" probes for cell imaging, but also important as anticancer agents.

Day 01:
15 MARCH, 2019

Dr. Biman B Mandal
IIT Guwahati
NASI-SCOPUS YOUNG
SCIENTIST AWARD in Medicine

Time: 10:00 AM - 10:30 AM
Room No: 5002, New Class Room Complex

"LAB GROWN HUMAN TISSUES: THE WAY FORWARD"

Every year, millions of patients suffer loss or failure of an organ or tissue as a result of accidents or disease. Tissue or organ transplantation is a commonly accepted norm under these circumstances. However, constant shortage of donor tissue and organ transplants coupled with high morbidity and mortality has spurred great interest for lab grown tissues/organs as promising substitute. Recent scientific advancement in biomaterials, stem cells in combination with biomimetic environments have made this possible through tissue engineering. In a tissue engineering approach, fabricated or bioprinted polymeric 3D scaffold imitates the native tissue/organ it is replacing, while also providing a temporary functional support for the residing cells. In comparison to synthetic, biologically derived polymeric scaffolds being natural, biodegradable and biocompatible offer resident cells a wide variety of biofunctional motifs that help to regulate cell adhesion, proliferation, phenotype, matrix production and enzyme activity. In our laboratory at IIT Guwahati, we utilize silk as a natural model biopolymer to fabricate various tissue forms to study and understand the mechanisms related to cell-surface interactions, stem cell differentiation towards functionality. In my presentation, I would discuss our recent findings to reconstruct native tissues/organs including smart human skin, cornea, intervertebral disc, engineered bone, cartilage, blood vessel, bioartificial pancreas, injectable hydrogels for drug delivery etc. I will also briefly share our latest outcomes using 3D bioprinting technology. Findings from these studies have very important implications in relation to development of artificial tissues and grafts towards future in vivo human transplantation.

Day 01:
15 MARCH, 2019

Dr. Sachin Kumar
IIT Guwahati
NASI SCOPUS Young Scientist Award (2016)
& Young Scientist Research Award (2012)

Time: 12:00 PM-12:30 PM
Room No: 5002, New Class Room Complex

"Avian paramyxovirus: friend or foe?"

Animal viruses are tiny packages of protein and nucleic acid. Avian paramyxovirus type 1 (APMV-1) causes Newcastle disease (ND) in chicken.ND is one of the highly pathogenic viral diseases of avian species. ND is economically significant because of mortality and morbidity associated with it. APMV-1 belongs to the family Paramyxoviridae and the genus Avulavirus.Recent advances in recombinant DNA techniques have brought forward to an era of new vaccine technology in modern medicine. One attractive strategy is the application of reverse genetics to make recombinant APMV (rAPMV). rAPMVcan deliver protective antigens of pathogens in host and evoke a protective immune response. The rAPMV vaccine offers a pertinent choice for the construction of live attenuated vaccine due to its minimum recombination frequency, modular nature of transcription and lack of DNA phase during its replication. APMV is also explored widely in the field of cancer biology due to its property of replicating selectively in tumor cells. In the recent years, the reverse genetics technology allowed to generate rAPMV having high tumor suppressor property. By understanding APMV molecular biology, it is feasible to develop gene-modified recombinant vaccines possessing better safety and immunity for both animals and humans.

Day 01:
15 MARCH, 2019

Dr.Ganesh Nagaraju
Associate Professor, IISc Bangalore
National Bioscience award for Career Development, 2015,
Shanti Swarup Bhatnagar prize for Science and Technology, 2018

Time: 11:00 AM-11:45 AM
Room No: 5002, New Class Room Complex

"RAD51 paralogs: unraveling the new roles in genome stability and tumor suppression"

RAD51 recombinase plays a central role in homologous recombination (HR) mediated repair of DNA double-strand breaks (DSBs). Mammalian cells encode five RAD51 paralogs: RAD51B, RAD51C, RAD51D, XRCC2 and XRCC3. These paralogs have been implicated in repair of DSBs by HR and DNA damage signaling. Mouse knockout of any one paralogs leads to embryonic lethality, implying the essential functions of RAD51 paralogs in genome maintenance. In addition, RAD51, RAD51C and XRCC3 have been shown to localize to mitochondria and contribute to stability of the mitochondrial genome (mtDNA) during oxidative stress. Recent studies show that germline mutations in RAD51 paralogs cause breast and ovarian cancers as well as Fanconi anemia (FA)-like disorder. Using pathological RAD51C mutants our lab showed that RAD51C distinctly regulates DNA damage signaling and repair. We showed that RAD51C binding partner XRCC3 S225 undergoes phosphorylation in an ATM/ATR dependent manner and this phosphorylation is crucial for the execution of intra-S-phase checkpoint and DSB repair by HR. In an effort to understand the essential roles of RAD51 paralogs, our investigations revealed that RAD51 paralogs in distinct complexes regulate replication fork stability and its restart. We also showed that RAD51C and XRCC3 facilitates mitochondrial DNA replication and maintains the stability of mitochondrial genome. Our recent work shows that XRCC2 restrains pathological fork progression during dNTP alterations and safeguards the genome integrity. The fork restraining function is dependent on XRCC2 S247 phosphorylation by ATR kinase. Together,

Day 01:
15 MARCH, 2019

Prof. Sudip Kr. Das
Professor and Head,
Department of Chemical Engineering,
University of Calcutta

Time: 10 AM - 10:45 AM
Room No: 5003, New Class Room Complex

Multiphase non-Newtonian pseudoplastic liquid systems

Non-Newtonian pseudoplastic liquid is the commonly encountered time independent fluid. This fluid is characterized by an viscosity which decreases with the increasing shear rate. This liquids often used in industries like polymer processing, petrochemical and refinery, mineral recovery, food processing, biomedical engineering, biochemical engineering, waste water treatment. Introduction of another phase in the pseudoplastic liquid the viscosity of the system can change. The change of viscosity should utilize in different unit operations. This lecture will describe the advantages of this properties in gas-liquid, solid-liquid systems like pipe flow, bubble column, taper bubble column, fluidization and inverse fluidization etc.

Day 01:
15 MARCH, 2019

Dr. Uttam Manna
IIT Guwahati
NASI-Young Scientist Platinum Jubilee Award (2018)
in the field of Chemical Sciences

Time: 2:00 PM -2:45 PM
Room No: 5003, New Class Room Complex

"Biomimicked Liquid Wettability and Its Potential Applications

Nature remained inspiration for human beings to rationally think, and overcome the existing challenges through strategic exploitation of new possibilities, and that eventually improve the quality of life. Many problems in everyday life is resolved following the blissful path of science. Over the centuries, many relevant discoveries ("flying machine" to the fastest bullet train) were initiated and eventually materialized by careful observation of naturally occurred phenomena. In this relevance, I will discuss on biomimicked liquids wettability; how nature has developed various liquids repellent interfaces? And how this interfaces can be artificially synthesized for various prospective uses in the present scenarios?

Day 02:
16 MARCH, 2019

Prof. Amit Agarwal
IIT Bombay
Shanti Swarup Bhatnagar Prize
in Engineering Sciences-2018

Time: 10:15 AM - 11:00 AM
Room No: 5001, New Class Room Complex

"Development of Innovative Point-of-Care Microdevices"

In this talk, He will present his ongoing effort in developing microfluidics based point-of-care microdevices. This includes blood plasma separation microdevice, constant wall temperature microdevice, and three-dimensional hydrodynamic focusing microdevice. Separating plasma from cellular elements of blood is imperative in disease diagnostics. Conventionally, blood plasma is separated in a centrifuge. However, this process of separation is difficult to replicate at the microscale, requires large sample volume, and is laborious and time-consuming. In this context, they have developed a blood plasma separation microdevice. The results obtained are extremely encouraging in terms of separation efficiency. Separation efficiency of almost 100% has been achieved with whole (undiluted) blood. Their microdevice avoids clogging of microchannels as the dimensions of the microchannels were kept comparatively large. The developed microdevice has been extensively tested. Demonstration of very high separation efficiency at extremely low cost with extremely high reliability are the primary highlights of our developed microdevice. The constant wall temperature microdevice is targeted towards the requirement of achieving isothermal condition in various lab-on-chip devices employed for chemical and biological processes. They propose the idea of employing diverging microchannel in conjunction with wall conduction for this purpose. Isothermal wall condition for a supplied constant heat flux condition is demonstrated experimentally. Subsequently, it was studied in detail using three dimensional numerical simulations to explore the idea over wider parameter range. For the set of optimal parameters, diverging microchannel would yield a temperature gradient less than 0.05 °C/mm. The three-dimensional hydrodynamic focusing microdevice is useful for making cells move in a single file; thereby allowing their properties to be probed unambiguously at a sensing station. Such technology is at the heart of flow cytometry and other medical devices. The design has evolved through systematic experiments and simulations, and has been comprehensively proved with blood cells, particles and dye. The talk will cover the various aspects of the design of the microdevices, their detailed characterization, and efforts in commercializing them.

Day 02:
16 MARCH, 2019

Prof. Kaustubha Mohanty
IIT Guwahati
Fellow of Royal Society of Chemistry

Time: 10:15 AM - 11:00 AM
Room No: 5003, New Class Room Complex

"Microalgae based Biofuels and Biorefinery"

Rapid urbanization and rise in population lead to increased energy demand. It has been predicted to increase at least 50% by 2030. The natural petroleum is unable to meet the current consumption rate, as the rate of consumption is faster than the formation. Moreover, fossil fuel is a non-renewable energy resource which is destroyingour environment through greenhouse gas emissions and consequent global warming. Therefore, in order to end the use of hazardous non-renewable resources, the hunt for clean and sustainable energy resources has become the most challenging topic. Currently, several renewable resources are being explored and implemented. Biofuels, derived from living organisms, came to limelight as they are sustainable and eco-friendly. Unfortunately, the present biofuel projections are based on feed-stocks that are also food commodities and resources suitable for conventional agriculture. One possibility to overcome the problem is the cultivation of microalgae and switching to third generation biofuels, which seem to be a promising source since algae are able to efficiently convert sunlight, water, and CO2 into a variety of products suitable for renewable energy applications. The carbohydrates present in microalgae are considered an appropriate feedstock for microbial growth and for the production of various fermentation products. The high lipid content in algal biomass makes it promising for biodiesel production, while the related long-chain fatty acids, pigments and proteins have their own nutraceuticals and pharmaceutical applications. Therefore, microalgal biorefinery processes deserve further investigations and if the biorefinery can be coupled with enhanced CO2 sequestration then it can be a win win situation for everybody.

Day 02:
16 MARCH, 2019

Dr. Vishal Rao U. S.
MBBS, MS-ENT,
Fellow Tata Memorial Hospital
Head and Neck Surgeon Global Cancer Centre, Bangalore

Time: 11:30 AM - 12.30 PM
Gallery, New Class Room Complex

About the Speaker

Dr. Vishal Rao U. S is a Head Neck Surgical oncologist and robotic surgeon with an experience of over 13 years in Healthcare. He is widely renowned for his invention – Aum Voice Box, a one dollar device which helps patients of throat cancer in getting back their voice. He is also a Fellow at Tata Memorial Hospital, Visiting Scholar at the Department of Otolaryngology in the University of Pittsburgh School of Medicine, USA, a Consultant at the Institute of Public Health and a Director of the Cancer Prevention and Tobacco Control Project with W.H.O Tobacco Free Initiaves partners. For his fight against Tobacco use, Dr. Vishal was awarded the Judy Wilkenfield Award in 2017.

Day 02:
16 MARCH, 2019

Prof. Uday S Dixit
IIT Guwahati
Honorary Fellow,
Indian Welding Society

Time: 11:30 AM -12:00 PM
Room No: 5001, New Class Room Complex

"Evolution of Mechanical Engineering"

Mechanical Engineering deals with the design, construction, maintenance and efficient operation of machines and devices aimed at reducing human physical effort. Starting from the dawn of the civilization, humans have been using tools to augment their muscle powers. In that sense, Mechanical Engineering can be termed as the oldest discipline of engineering. Considering the available records, Archimedes (287 BC - 212 BC) appears to be the first significant contributor to Mechanical Engineering. Since his period and till 17th century, dominate sources of power have been wind and water. Although the concept of steam engine was provided in the first century, steam engines came into existence only at the end of the 17th century and played a major role to enhance the industrial productivity in the 18th century. It also provided impetus to develop thermodynamics as an important field of science and engineering. Sadi Carnot (1796-1832), who can be called as the father of thermodynamics, developed the theory with an urge to improve the efficiency of steam engines. The 19th century saw the development of internal combustion engines and electrical motors. Gradually steam engines became obsolete but steam turbines are still in vogue. Internal combustion engines and electrical motors are continuing their role of power providers to machines. One peculiar feature of Mechanical Engineering is that it is a very dynamic branch, new technologies replacing the older one at unprecedented rate. It is quick to capture the developments in Civil, Electrical, Electronics and Computer Engineering and collaborate with these branches. The 21st century is witnessing the close cooperation between Mechanical Engineering and Biotechnology. Amalgamation of Management and Mechanical Engineering led to development of engineering branches like Industrial Engineering and Production Engineering. The salient current dreams of Mechanical Engineering discipline are providing artificial intelligence to machines, developing self-replicating machines, producing all products through 3D printing and steering sustainable development.

Day 02:
16 MARCH, 2019

Prof. Pradeep Gururaj Yammiyavar
IIT Guwahati
Fellow of Design Research Society
(DRS), UK

Time: 10:30 AM -11:00 AM
Room No: 5002, New Class Room Complex

"Trends in Human Computer Interaction Design Research - envisioning leadership roles for creative Design Researchers"

This Keynote address will trace ongoing Design Research trends by highlighting research examples from the Usability Engineering – HCI Laboratory at the Department of Design – IIT Guwahati. Starting with a brief introductory background to understand 'Design' in its new emerging avatar, the presentation will focus on the urgent need for Designers to redefine boundaries and methods of their research practices so as to remain in the forefront of Innovation through engineering real world User Experience into virtual world ubiquitous AI and IOT User systems. The presentation will argue for a revolutionary upheaval in curriculum structure aimed at building a foundation for Design Sciences.

Day 03:
17 MARCH, 2019

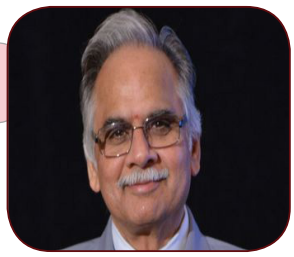
Prof. Dipankar Bandyopadhyay
IIT Guwahati
Gandhian Young Technology
Innovation Award, 2016

Time: 11:15 AM -11:45 AM
Room No: 5001, New Class Room Complex

"A Short Story on Some Strange Queries and Unexpected Solutions"

We started our journey of interrogations when our senses were born. Some claim that they were with us perhaps eternally! Yet, with time (?), we managed to answer some of them while most of them remain unanswered. With the ever increasing hullaballoos of life involving relatives-friends-foes, conferences-rallies, classes-exams-jobs-responsibilities-liabilities, successes-failures-deadlines, or ecstasies-disappointments, these queries became dormant if not shelved forever. One very interesting question can be the role of research in reincarnating them. In this talk, you may come-across some absurd examples, which may incinerate your inherent scientific-intuitive urges before harnessing the knowledge-information extracted from the same to address some of the burning issues of modern life. We shall start with a birds-eye view before delving into magnified details to connect the ends. In the joyride, we shall come across some silly details of mesoscale science and technology. Hope you will enjoy!

Day 02:
16 MARCH, 2019



Prof. Mathukumalli Vidyasagar,FRS
Control Theorist & Distinguished Professor
IIT Hyderabad.
Fellow of the Royal Society

Time: 10:00 AM - 11.00 AM
Gallery, New Class Room Complex

"Machine Learning Methods in Computational Cancer Biology"

Can a team of engineers who do not themselves carry out experiments or treat cancer patients contribute anything useful to the development of "personalised" medicine for cancer (or as it is now called, "precision therapy" for cancer)? In this talk he will show that the answer is definitely YES! At present there is sufficient amount of public domain data in cancer that interested researchers can develop their own algorithms on the data and cross-validate it on independent data. However, working with clinicians (who actually treat patients) would enhance the impact of the research. The biggest challenge in applying machine learning methods to cancer biology data is that the data is noisy, non-repeatable, and full of errors. Thus "off the shelf" algorithms developed for "clean" engineering data do not work on biology data. He will point out some common sources of error, and how algorithms can be developed that are specifically tailored for such scenarios.

Day 03:
17 MARCH, 2019

Dr. Anki Reddy Katha
Associate Professor,
IIT Guwahati

Time: 12:00 PM - 12:30 PM
Room No: 5001, New Class Room Complex

"Granular silo flow: Clogging and its reduction"

We study the discharge of inelastic, two-dimensional dumbbells through an orifice in the bottom wall of a silo using discrete element method (DEM) simulations. As with spherical particles, clogging may occur due to the formation of arches of particles around the orifice. The clogging probability decreases with increasing orifice width in both cases. For a given width, however, the clogging probability is much higher for the nonspherical particles due to their arbitrary orientations and the possibility of geometrical interlocking. We also examine the effect of placing a fixed, circular obstacle above the orifice. The clogging probability depends strongly on the vertical and lateral position of the obstacle, as well as its size. By suitably placing the obstacle the clogging probability can be significantly reduced compared to a system with no obstacle. We attempt to elucidate the clogging reduction mechanism by examining the packing fraction, granular temperature, and velocity distributions of the particles in the vicinity of the orifice.

Day 03:
17 MARCH, 2019

Dr. Raksh Vir Jasra
Senior VP,
Reliance Industries Ltd.

Time: 10:30 AM -11:00 AM
Room No: 5002, New Class Room Complex

"Dimensions and Drivers for Innovations in Chemical Industry"

Talk will cover the significance of chemical industry in the sustenance of the modern society. It will also touch upon the macro global social and economic trends & challenges and how these challenges will drive innovations in chemical industry. The talk will be focus on the followings: > Various tenants of innovation such as difference between invention and innovation; > Why innovating is necessary in an organization, different drivers of innovations > Structured methodology to carry out innovations

Day 03:
17 MARCH, 2019

Prof. Anupam Saikia
Indian Mathematician
IIT Guwahati

Time: 10:00 AM -10:30 AM
Room No: 5004, New Class Room Complex

"The Birch and Swinnerton-Dyer Conjecture"

The BSD Conjecture is a million-dollar question that relates the algebraic structure of an elliptic curve to its analytic behavior. As a motivation we will start with a classical problem that is closely related to the conjecture. Then we will introduce the basic ingredients before stating the conjecture. We will conclude by briefly mentioning the progress made towards the conjecture.

Day 03:
17 MARCH, 2019

Prof. Dhirendra Nath Buragohain
Emeritus Professor
and Founder Director,
IIT Guwahati

Time: 10:15 AM - 11.00 AM
Room No: 5002, New Class Room Complex

About the Speaker

Prof. Dhirendra Nath Buragohain a Emeritus Professor in the Department of Civil Engineering, IIT Guwahati. He has to his credit vast experience of more than 35 years as an academician, teacher, researcher and administrator. He is credited with supervising the construction designs for rehabiliation of Latur after the devastating earthquake in 1993 that claimed the lives of around 10,000 people. He has also been involved in development and transfer of technology in large numbers of industrial consultancy. He has served as a Professor at IIT Bombay and Project Director and Founder Director of IIT Guwahati from 1994 to 2003. He also served as the Chief Technical Officer at Civil Engineering Network Systems, Pune. His research areas encompass Structural Mechanics, FInite Element Methods, Numerical Methods, Computer Aided Amalysis and Design and Drafting among others.

Day 03:
17 MARCH, 2019

Prof. Amaresh Chakrabarti
Professor and Chairman
Centre for Product Design &
Manufacturing,IISc Bangalore

Time: 11:00 AM -11:45 AM
Room No: 5004, New Class Room Complex

About the Speaker

Professor Amaresh Chakrabarti is a Senior Professor and current Chairman for Centre for Product Design & Manufacturing, Indian Institute of Science (IISc), Bangalore. An Honorary Fellow of Institution of Engineering Designers, He is the co-author of DRM, a Design Research Methodology, which is now used widely as framework for design research. He founded IDeASLab – India's first Design Observatory, co-intiated India's first Smart Factory Lab and also heads IISc-TCS Innovation Lab, IISc Press, and Springer International Book Series on Design Science & Innovation. He received Careers360 Faculty Research Award 2018 for being the 'Most Outstanding Researcher' in Decision Sciences.

Day 03:
17 MARCH, 2019

Prof. Arun Chattopadhyay
Professor, IIT Guwahati
Fellow of the Royal Society of Chemistry

Time: 10:30 AM -11:00 AM
Room No: 5002, New Class Room Complex

About the Speaker

Professor Arun Chattopadhyay is a professor in the Department of Chemistry at IIT Guwahati. Previously he has served as Head, Department of Chemistry and Head, Centre for Nanotechnology at IIT Guwahati. His research areas encompass Nanomaterials Synthesis, Composites, Nanobiotechnology, Chemical Locomotion, Quantum Dots and Chemical Reaction of Nanoparticles, among others. He along with his team is widely known for the development of simple, quick, point-of-care test for detecting excess bilirubin in patients. He is a fellow of the Royal Society of Chemistry and the Indian Academy of Sciences and recipient of Young Career Award in Nano Science and Technology in 2013 and Materials Research Society of India Medal – 2008.

Birds of IIT Guwahati

The bird count inside campus was held from February 15 - 18, 2019 during the Campus Bird Count. 'Campus Bird Count' a sub-event of Great Backyard Bird Count, an initiation by Cornell Lab of Ornithology, is organized every year to count the number of Bird species inside a campus. Since, IIT Guwahati holds the potential to host such a wide variety of birds, team Research Conclave'18 thought that it would be great to map the species inside our beautiful campus as well.

This was the second time that we had an extensive bird count for four days inside campus and we thank all the students and faculty members of IIT Guwahati for joining us early in the morning and co-operating with us throughout the session. We were overwhelmed by the presence of the famous Astrophysicist and an expert Bird watcher Prof. Dhruba Jyoti Saikia (Ex-VC, Cotton College State University, Assam). It was indeed a great experience for us to learn from him. A total of 75 species were documented in this Bird walk and it was not only the birds but also the trees on which the birds are dependent were noted down for future plantation.

We thank you all for your love and support.
With so many nature enthusiasts in our campus we believe that the biodiversity of our campus shall prevail.

The organizers for the bird walk included the following student members from IIT Guwahati: Umang Rathod, Smruti Ranjan Dash, Jayakrishnan U, Srikanth Katla, Atharva Ambdekar and Rupam Bhaduri.

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An amalgamation of Academia, Industry & Startups

Abstracts (Model)

Silk Based 3D Printing of Human Tissue Models

Shreya Mehrotra[1], Bibhas K. Bhunia[1], AshutoshBandyopadhyay[1]and Biman B. Mandal[1]

[1]Department of Biosciences and Bioengineering, IIT Guwahati,India

E-mail:*biman.mandal@iitg.ac.in*

Tissue engineering is poised to radically change our lives by helping us outlive the failure of our organs. It is now becoming plausible that several of tissues in our body, if damaged by injury or disease, can be replaced or regenerated by functional biological grafts [1]. With the emergence of advanced fabrication techniques in the micro and nano-scales tissue engineering has been uplifted to new levels. Three dimensional (3D) bioprinting has become one of the most popular fabrication techniques in the recent years [2,3]. Overcoming the practical shortcomings of the conventional fabrication methods, 3D bioprinting enables the creation of patient specific, biomimetic and anatomic 3D structures by using images obtained through computer tomography (CT) or magnetic resonance imaging (MRI) models [4]. 3D bioprinting allows for the automated fabrication of artificial tissues with high resolution, spatio-temporal gradient of cells and biologics similar to native tissue and then multiscaling it to form functional tissue constructs [5].One of the basic requirements for 3D bioprinting is bioinks for that help in harbouring, supporting and delivering the cells homogeneously in a precisely controlled 3D architecture [6]. The components of these bioinks mostly include cell suspension, biopolymers and compatible hydrogels, microcarriers, cell/tissue spheroids and decellularized matrix components. Polymeric hydrogels are the most commonly used bioink components for conventional micro-extrusion based bioprinting. Silk fibroin polymer due to its excellent biocompatible nature and tuneability has been used in the past for various tissue engineering applications. Silk fibroin possesses innate material and chemical features that are beneficial to formulate an array of bioinks for fabrication of biomimetic and functional tissue models. Silk fibroin along with other biopolymers provides the characteristics of a bioink that allows the incorporation of cells and biological materials for 3D printing of various tissues. The present models comprise of an array of 3D bioprinted tissues such as cartilage, bone, meniscus, cardiac patches, intervertebral disc and skin using developed silk fibroin based bioinks for various tissue engineering and drug discovery based applications.

eferences :

[1] G. Vunjak-Novakovic, N. Tandon, A. Godier, R. Maidhof, A. Marsano, T.P. Martens, R. Radisic, Challenges in cardiac tissue engineering, 16(2) (2009) 169-187.
[2] H.-W. Kang, S.J. Lee, I.K. Ko, C. Kengla, J.J. Yoo, A. Atala, A 3D bioprinting system to produce human-scale tissue constructs with structural integrity, 34(3) (2016) 312.
[3] A.C. Daly, F.E. Freeman, T. Gonzalez-Fernandez, S.E. Critchley, J. Nulty, D. Kelly, 3D bioprinting for cartilage and osteochondral tissue engineering, 6(22) (2017) 1700298.
[4] S. Vijayavenkataraman, W. Lu, J.B. Fuh, 3D bioprinting of skin: a state-of-the-art review on modelling, materials, and processes, 8(3) (2016) 032001.
[5] S. Vijayavenkataraman, W.-C. Yan, W. Lu, C.-H. Wang, J. B. Fuh, 3D bioprinting of tissues and organs for regenerative medicine, (2018).
[6] R.R. Jose, M.J. Rodriguez, T.A. Dixon, F. Omenetto, D.L. Kaplan, Engineering, Evolution of bioinks and additive manufacturing technologies for 3D bioprinting, 2(10) (2016) 1662-1678.

A Look into Evolution and Life through Calcium

Christy Noche K Marak, DarshanaBaruah and RanjanTamuli

Department ofBiosciences and Bioengineering,IIT Guwahati,India

E-mail:*c.marak@iitg.ac.in, darshana@iitg.ac.in*

Billion years ago, explosion of the stars gave birth to many elements that formed our planet earth. The element calcium was born when oxygen and neon captured successive alpha particles. When life was originating in the sea, calcium was abundant $>10^{-3}$ M, this exerts a selective pressure on the evolving life forms. Life in the beginning was in constant dynamic chemical interactions for its survival and diversification. The need for maintaining a critical levels of calcium within the cell led to the evolution of calcium pumps and internal calcium stores, by which cells could maintain their cytosolic free calcium at tolerable levels. Moreover, because of its unique chemistry, calcium is required for signaling almost all biological processes ranging from fertilization to death in all eukaryotes, and therefore, considered as molecule of life and death. Therefore, through this model we will be showcasing the importance of calcium in regulating different aspects of life.

A Technical Evaluation of Arsiron Nilogon for Community and household applications in Jorhat District

Abhishek Gogoi1, Debanga Sourav Saikia1, Bhrigu Kumar Pegu1

1 Department of Chemistry, JB College (Autonomous), Jorhat, Assam

E-mail: djdebanga@gmail.com

Arsiron Nilogon, a method developed in Tezpur University by Dr. Robin K. Dutta, professor, is one of the most efficient and low-cost methods used for removal of arsenic and iron from contaminated groundwater. The present project was undertaken to study the installation and understand the complete working process and performance of ArsironNilogon in community and household applications during a one-month summer internship at Tezpur University. Water samples were collected from SreeSreeKamalabariSatra H.S. School, Titabar, ChitralekhaSikshaBikashMandir, Dholajan, Binanda Hazarika's house, Borhulla and JayantaSaikia's house, Jorhat, where the arsenic concentration was found to be 86.6 ppb, 21.2 ppb, 98 ppb and 60.3 ppb respectively. After some preliminary investigation for suitable locations we installed four ArsironNilogon units in the respective areas for two community applications and two household applications. We have collected the water samples before and after treatment with this method and then analysed them for different water quality parameters using different analytical tools. After removal using ArsironNilogon, the arsenic concentration in the water reduced from 86.6 ppb, 21.2ppb, 98ppb, 60.3ppb to 0.5 ppb, 0.1 ppb, 0.02 ppb and 0.01 ppb respectively i.e., to below the WHO guideline value of 10 ppb. This study shows the high effectiveness of ArsironNilogon.
Keywords: *ArsironNilogon*, removal, ground water etc.

Powering Electronic Devices from Green Energy Harvested from Streaming Water through Cotton

*Kundan Saha, Jumi Deka and Kalyan Raidongia**

Department of chemistry, IIT Guwahati-781039

Email: k.raidongia@iitg.ac.in

The possibility of harvesting of electrokinetic energy from streaming fluids through porous medium was theoretical predicted more than half a century ago. However, it has not received any commercial attention yet, mainly because it is extremely difficult to tune/improve the energy efficiency as the two basic criteria (high flow rates and tight nanofluidic confinement) are mutually exclusive. Various reports claims streaming water through carbon nanotubes and graphene results in streaming voltage generation. But owing to the difficulty in device fabrication and low throughput of the systems, herein we intended to apply other carbonised materials for the purpose. Flowing water through raw cotton carbonised at inert atmosphere can generate a streaming voltage of around 11 V and a short circuit current of around 6 μA. Most importantly, the harvesting of streaming potential through the carbonized cotton are found to be convenient enough to gain energy from water flowing through household water taps, and multiple devices can be connected in series to add up power generated in each device. Looking at the amount of water that flows through household taps, energy harvesting through streaming potential could provide a valid contribution to our daily need for energy in a sustainable manner. So also a syringe equipped with a piece of carbonized cotton can generate a potential of around 5 V which is sufficient enough to light up a LED and many other electronic devices. It is also exhibited that incessant streaming voltage can be obtained when water is flown continuously through the carbonized cotton using a submersible pump. As in the recent years, several efforts are being devoted to overcome the requirement of large infrastructures in harvesting energy from naturally abandon water resources, we claim this system can support the decentralization process of energy sources.

Soil Based Triboelectric Nanogenerator: Green device to convert Mechanical energy to electricity

Anish Yadav, Nasrin Sultana, KundanSaha

Department of Chemistry, IIT Guwhati-781039

E-mail: anishyadav1295@iitg.ac.in

Two hundred years ago, the world experienced an energy revolution that launched the Industrial Age. The catalyst to this epochal shift was ordinary black coal, an energy-rich hydrocarbon that supplanted wood as the primary fuel. However, the world is now facing acute shortage of non-renewable resources. Dramatic increase of consumption of resources raised alarming signals to the existing resource base. To overcome all these difficulties and make the living better, renewable resources are introduced like solar energy, wind energy, hydrothermal energy etc. However, these are centralised and expensive on comparison to coal. Hence, for the recentralisation of energy, there is a need of devices that can be made and used directly without any need of transport. Triboelectric Nanogenerators (TENG) are the kind of devices that can be used to generate power instantly to power up electronic devices. TENG device converts mechanical and thermal energy to electrical energy. Besides the unprecedented output performance, this new energy technology also has a number of other advantages, such as low cost in manufacturing and fabrication, excellent robustness and reliability, and environmental friendliness. We have prepared a soil based TENG which works on Triboelectric pseudocapacitance and can provide voltage nearly 4V. As in the recent years, several efforts are being devoted to overcome the requirement of large infrastructures in harvesting energy from renewable resources. We claim this system can support the decentralisation process of energy resources.

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The science behind plate tectonics

1.Debasish Borah(B.Sc 6th semester)
2.Tapaswi Saikia (B.Sc 2thsemeste)
3.Girindra Bora(B.Sc 4thsemeste)
4.Pranalima Pujari(B.Sc 2thsemeste)
5.Sukanya Baruah(B.Sc 2thsemeste)

Jagannath Barooah college,
Jorhat,Assam

Email id: dborahjrt03@gmail.com

ABSTRACT: Plate tectonics is a scientific theory describing the large scale motion of 7 large plates and the movements of a large number of smaller plates of the earth's lithosphere.The entire earth surface is composed of several rigid but relatively thin plates. These plates are between 100 and 150km thick and carry both continent, ocean crust and a portion of upper mantle with them. They are continuously in motion with respect to each other. These plates are separated by ridges, transform fault and trenches. The northern side of the N-E Indian region is a plate boundary between India and Eurasian and Eastern side of N-E Indian region is a plate boundary between the India and Burma plates.Almost all seismic, volcanic and tectonic activity is localized around plate margins. Depending on the relative motion of the adjacent plates, the plate boundaries are classified into 3 groups:

1. Divergent boundaries (Constructive boundaries)

2. Convergent boundaries (Destructive boundaries)

3. Transform fault

This model is to demonstrate the plate movements and their activities and also to put a focus of these activities on N-E Indian region.

KEY WORDS: Plate tectonics, Plate boundaries (Divergent, Convergent, Transform boundaries), Plate activities on N-E Indian region.

IoT Based Prepaid Electricity

R. Thilak Chakravarthi

lakchakravarthir.16it@kongu.edu

Ph.no: 97904-31009 & 90803-09044

This paper presents a novel design method of minimizing the queue at the electricity billing counters and to restrict the usage of electricity automatically, if the bill is not paid. The project also aims at proposing a system that will reduce the loss of power and revenue due to power thefts and other illegal activities. The work system adopts a totally new concept of "Prepaid Electricity". The IoT based concept is used so that we can continuously monitor the consumption of power (in watts) and if it reaches the minimum amount, it would automatically alert the consumer to recharge through internet. In this Ardiuno processor is used to monitor and control the entire system model. This technology holds good for all electricity distribution companies, private communities, IT parks and self-containing housing projects. The implementation of this project will help in better energy management, conservation of energy and also in doing away with the unnecessary hassles over

incorrect billing. The automated billing system will keep track of the real time consumption and will leave little scope for disagreement on consumption and billing.

Keywords: Prepaid, Electricity, Arduino Controller, Constant Update through GSM and Internet.

Generation of Electricity From fans

A.Birendra Kumar B. UjalaKumari

A. Department of Computer Science a &Engineering B.

Department of Electronics & Electrical Engineering ,Nalanda College of Engineering, Chandi(Nalanda),India

E-mail: kbirendra848@gmail.com

Fans are used widely all over India, it can be found almost in every house, despite the widespread availability of Cooler's and air conditioners, when it comes to generate power for a domestic use and energy conservation, energy generating is a major issue for mankind.

We can renew and reuse the energy, it cannot be created or destroyed but can be transformed from one form to another form, taking fan as example, fan uses electrical energy to rotate and blow the surrounding air. What if we can use the rotational motion (mechanical energy) of fan to convert it into some electricity.We have made a working model/prototype which uses the concept of Electromagnetic induction i.e it generates alternating voltage by a rotating (changing) magnetic field within a stationary coil with the help of running fan. The generated power can be either used instantly or can be stored in a battery for powering some other devices.

Segmentation Of MRI Brain Tumor Images Using Clustering Methodology

Aichwajya Bora[1] ,

[1]School of Computing Science, The Assam Kaziranga university Jorhat,India

E-mail:aichwajyabora@gmail.com

A Tumour is an abnormal growth of cells in the body. It is considered a crucial disease as it affects the life of the human. However, early detection of a Tumour is very important to save the life of a patient. A Tumour occurs in various parts of the body but when it is in the brain the total system is collapsed. A brain Tumour has a different shape and size and requires different treatment. Over 120 different types of a brain Tumour exist and can be classified as a primary and metastatic brain Tumour. The normal brain image contains various tissues, such as WM, GM, and CSF. To diagnose human brain structure, safe imaging techniques are used throughout the world. CT, PET, MRI, and multimodal imaging techniques, such as MRI/CT and MRI/PET, are various imaging techniques that provide information from a variety of excitation sequences about brain tissues.Here in MRI Brain Image Segmentation it is commonly used to defining the anatomical structure of the brain structure for different medical purpose. It is the most challenging task to segment an image for performing better image quality after removal of noise and other factors. This paper gives an outline about Brain Image Segmentation helps to enhanced better image and follow the algorithm through clustering which is based on K-Means. Where depending on the clustered result, the threshold value is chosen one.

There are many segmentation systems to segment different medical images. In our segmentation system we

the proposed consists of four stages pre-processing, clustering with K-means, depending upon the cluster result thresholding value chosen and extract the tumour cluster. After the completing the all stages we get final image as output as result.

In the first stage It is a fundamental technique for the improvement of images which helps to reduce noise, perform contrast enhancement, image smoothing, and sharpening. While doing so, two basic properties are considered which are discontinuity and similarity. In the case of MRI Brain tumour images, it is more sensitive as compare to the other medical images. So, it should be maximum quality with minimum noise. For that, this stage consists of two different stages. The first stage is de-noising and after that the separating the skull i.e. skull removal.

After the first stage In this method it helps to minimize all the total points of an objects in which image is divided into K-segments and minimizing the total difference. K-Means clustering is the most important method of clustering. In this clustering technique it selects the K-value. Here in this clustering it selects the K number of disjoint cluster through some algorithm process which consist of parts; first it calculates the distance of centroid of certain disjoint clusters. Second, calculating the point of the nearest possible cluster point centroids which performs the minimum distance calculation of the distance points. After selecting the centroid of every points the proposed algorithm minimize the sum of the distance of objects in every cluster.

Image segmentation plays a significant role in the medical image analysis process to help physicians to diagnose the lesion and put the true treatment plane. A brain Tumor is very dangerous if not detected early. The first stage i.e. a pre-processing technique is utmost required for a better and efficient segmentation as otherwise, these type of images are fuzzy in nature which needs to be removed with some advanced fuzzy level based technique. A thorough understanding of the image under consideration and the segmentation methods is necessary for proper segmentation of the image. proposed new medical image segmentation system. It is based on two proposed hybrid clustering techniques. The first is integration between fuzzy C-means with K-means that are called KIFCM. It is one of the most accurate technique.

References:

1. Bora, DibyaJyoti. “Importance of image enhancement techniques in color image segmentation: a comprehensive and comparative study." arXiv preprint arXiv:1708.05081 (2017).
2. “MRI Scan Machine Definition, Uses, Safety, and Side Effects", MedicineNet, 2018. [Online]. Available: https://www.medicinenet.com/mri_scan/article.htm. [Accessed: 01- Jul- 2018].
3. Ilhan, Umit, and Ahmet Ilhan. "Brain Tumour segmentation based on a new threshold approach." Procedia Computer Science 120 (2017): 580-587.
4. Aichwajya Bora, Nawab Wasim Rahman, DibyaJyoti Bora “Segmentation Techniques for MRI Brain Tumour Images: A Critical Study”
5. Bora, DibyaJyoti. "An Ideal Approach for Medical Color Image Enhancement." In Advanced Computational and Communication Paradigms, pp. 351-361. Springer, Singapore, 2018.

Agriculture and Rural Development

Problem Id: LB1 Company Name: MindTree

Category: software Problem Statement:Efficient Farming

College Code: 1-3509556087 Team Name:Mighty_Coders

Team Leader Name: Harshita Paliwal

India is an agriculture based country and farmers are backbone of our country but unfortunately many farmers (nearly 5650 per year) are committing suicide due to crop destroy or loan sharks. To

decrease these suicides, we need to convert cultivation into a profitable job, our idea is a step in this direction.

In our country all the farmers are not capable to purchase tractors, costly machineries and other equipments which are used for better and effortless cultivation by which productivity of farming is also increases, therefore we want to develop an mobile application for poorer or economically weaker farmers by which, that farmers who are having costly machines and tractors for cultivation in better way and currently that machineries are not in use for them (or some merchants who want to buy machines for giving on rent) can also earn money by giving their machineries on rent.

Our idea is predominantly rooted on the hiring of mechanism for cultivation.

We are endeavouring to procreate a solution, in our solution we will include following factors (features):-

- In our proposed solution there is a GPS (Global Positioning System) facility available by which we can know about merchants who wants to rent their machines near us.
- There are also many farmers in our country who do not know English so, this application will also be available in many regional languages.
- It will be helpful for those persons who want to give his available machineries on rent and farmers will able to hire machines directly through this solution and if they want to buy it then also they can ask the merchant to buy it.
- By the use of this app we can also chat, call or contact to the merchant so communication becomes easier.
- There is a section also available in which this application teaches how to use these machineries.
- Facilityoftheratingisalsoavailableinthisappbywhichthefarmer'sprofileandrealconditionofthe machine can beknown.
- Machineries will be available at nominal cost by direc thiring.
- Rent will be calculated automatically on days or hours basis.
- Merchant also track its own machine by GPS.
- There is a payment gateway by which online payment can be done easily and transparency in payment process is increased.
- An administrator will monitor farmers, merchant, and machines to reduce the chances offraud.
- Through this application, we can take the information of the nearest soil testing centre with the help of GPS and seek help from technical experts.

We are trying to develop a mobile application by which the farmers which are unable to buying machineries can hire it from the Persons who want to give their machineries on rent, through this app the farmers will directly hire machineries from that persons on nominal charges.

In our proposed solution there will be a mobile application by which the poor farmers will be able to hire their required machine and machine will return and rent will be paid on the completion of their work.

Whenever farmers need a tractor or any farm equipment, they can simply use its mobile application, and place their order. They will receive a well-maintained tractor and machineries. Not only they can get their work done in a stress-free manner, with consistent use of mechanisation, their productivity increases too.

It aims to raise the level of mechanization in farming through the power of technology and a strong franchisee network to make farm mechanization easily accessible, affordable and reachable to farmers across India

Development and Design Strategies of Evidence Collection Framework in Cloud Environment

Yunus Khan and Sunita Varma

Ph.D. Scholar, Shri G.S. Institute of Technology and Science Indore M.P. India (RGPV Bhopal)
Professor and Head, Shri G.S. Institute of Technology and Science Indore M.P. India

Now a days cloud computing is one of the popular and widely used concepts in information technology paradigm. It is committed to improving the IT business technically and economically. On the other hand, digital forensic is the process of collection, identification, preservation, examination and analysis of data or information for the proof in the court of law as an evidence. It is very difficult and challenging to apply digital forensic operation in a cloud environment because CSP's are dependent on each other either they provide IaaS, PaaS or SaaS. So the cloud forensic is one of the applications of digital forensic in a cloud environment is just a subset of network forensic. It's a cross-field of digital forensic and cloud computing. In this paper, we investigate all the research issues, problems and implementation ethics of cloud forensic from the initial level. We found that lots of issues and challenges are remaining to address in this domain. Some major research domains are architectures, data collection and analysis, anti-forensic, incident first responders, roles and responsibilities, legal, standards, and some learning issues. In our research work we mainly focus on the data collection, cloud forensic architectures and also implement a cloud forensic framework in the context of cloud service models. This research work is tested using different private cloud solution such as eucalyptus, Open Nebula, VMware, vcloud and Hadoop platform. In our research work we implement pattern search facility using the proposed approach in open source software called digital forensic framework. We also implement in near future digital forensic triage using Amazon elastic map reduce. In this research we also implement designed and development of forensic method for the PaaS and SaaS delivery model of cloud computing. Also apply machine learning principles to design and develop new digital forensic methods, improve the efficiency of investigation using machine learning algorithms for future extraction priority of evidence classification of evidence in virtual machines.

Index Terms: Digital Forensic, Data Collection, Evidence Segregation, Dependency Chains, IDS, Multiple Jurisdictions and Tenancy, and VMware.

References:

[1] Saad Said Alkahtny, Thesis On "A Forensically Enabled Iaas Cloud Computing Architecture", University Of Plymouth, Http://Hdl.Handle.Net/10026.1/9508. Jan 2017.

[2] Mark Tangiwai Mathew Piwari, Thesis On "Digital Forensics In The Cloud: The Reliability And Integrity Of The Evidence Gathering Process", Auckland University Of Technology Newzeland 2016.

[3] Almarzooqi, A. And Jones, A., 2016, January. A Framework For Assessing The Core Capabilities Of A Digital Forensic Organization. In *IFIP International Conference On Digital Forensics* (Pp. 47-65). Springer International Publishing .

[4] Almarzooqi, A., Jones, A. And Howley, R, 2016 May. Applying Grounded Theory Methods To Digital Forensics Research. In *The 11th Annual Adfsl Conference On Digital Forensics, Security And Law*.

[5] AlecsandruP˘Atra¸Scuand Victor Valeriu Patriciu, "Implementation Of A Cloud Computing Frameworkfor Cloud Forensics", Proceedings Of The 18th International Conference On System Theory,Control And Computing, Sinaia, Romania, October 17-19, 2014978-1-4799-4601-3/14/$31.00 ©2014 IEEE.

[6] Victor R. Kebande& H.S. Venter, "Novel Digital Forensic Readiness Techniques In The Cloud Environment", In Australian Journal Of Forensic Sciences, Published In January 17, 2018.

HOOK-HANGER

UPASNA SEHJI
M.DES 1, IIT GUWAHATI

Hooks installed behind doors, in bathroom, in powder rooms etc are used most often to temporarily hang clothes to be reused later, worn the next day, evening party etc. But delicate clothes, jackets can not be hung on such hooks as this often leads to crumpling, formation of creases and thereby rendering it unwearable the second time. Hangers which are best suited for these situations can not be found at these locations.The design aims to solve the problem of hanging delicate clothes on such hooks in places such as behind the doors, bathrooms etc.

Dharni: A tool for Mulberry shoot plantation

Sericulture is one of the highly unorganized sectors of rural India, and hence does not have too many rights and regulations protecting the working conditions of the farmers. Mulberry shoot plantation is one of the key practices of the sericulture process, and requires the farmer to manually bend down and sow seeds. Moreover, in rural India, farmers do not have access, neither can they afford, sophisticated tools to assist them with the sowing. The REBA analysis of the squatting posture indicates that there is an urgent need for intervention. This paper introduces Dharni, a handheld ergonomic tool, that assists the farmer in sowing the shoots whilst standing, in turn making it an ergonomically feasible practice. The tool was shown to have a better REBA score, proving that it benefits the health of the sericulture farmer.

Geographical Indication of Handloom Sarees: Indian Scenario

Geographical Indication (GI) which represents authenticity and uniqueness is intrinsic to its place of origin. GI tags can't be enjoyed by an individual as a personal entitlement but as the member of a community which acts as a registrant of the product. There is lack of awareness regarding GI products in India. Many a time's GI products are unable to withstand in the competitive market due to duplication of such products, high cost and lack of exploration. Hence, in the current research an attempt has been made to explore the reason behind lack of awareness of GI products, the impact of GIs on various stakeholders especially from the perspective of manufacturers, what modifications can be done to make GI products competitive, and possibilities of innovativeness that can be brought into GI products. Comparison of visual features of GI product of same category (e.g. Sarees) has also been performed to identify the uniqueness of individual GI product and to prevent its duplication with the case example of handloom sarees to achieve the aforesaid objectives of the present review.

Only 303 GIs including 11 foreign products have been registered in India till date. Out of this, 149 GI registrations have been accomplished in Handloom and Handicraft sector. This sector includes 57 handloom products (25 registrations are on sarees) across the country. A comparative analysis of visual features has been conducted in present research to identify the uniqueness of GI registered sarees that generates the aesthetic experience. Marketability of such registered products in India and abroad are also touched upon.

The study provides valuable insights through a cross-functional approach to understand the purchase intention of consumers for GI products. Issues of GI has also been discussed as "pseudo branding". There are scopes of innovation in existing handloom sarees but that needs to be studied from the

perspective of GI to retain its ethnic attributes. Generic clothing for women is referred as sarees whereas till date only 25 registrations have been made. So there are immense possibilities to explore and bring other sarees under GI. In this context, Government has to play a role to protect the interest of the manufacturers of GI registered sarees and ensure the livelihood of the stakeholders. Rights of the manufacturers need to be protected by bringing more sarees under the purview of GI. Awareness needs to be generated for such provisions. GI registrations would help to weed fake or duplicated ones.
This review would be beneficial to bring awareness among consumers about the importance and unique features of GI registered sarees. The framework proposed to explore the possibilities of innovation in sarees without affecting the key features of GI would be immensely helpful for the manufacturers to keep their product viable in the market.

Urban Bamboo Furniture

A. Monikuntala Das[1], B. Vinod Gupta[2]

[1] Department of Design, IIT Guwahati, India

[2] Space Design Consultants and Opus Indigo Designs Pvt. Ltd.,

New Delhi, India

E-mail: *monikuntala22@gmail.com; vinod@space-design.com*

Furniture has the potential to cause serious ecological degradation if discarded irresponsibly. It accounts for 9.8 million tons (4.1%) of least recycled household waste in US (US EPA, 2009). India also faces identical issues, which must be countered by Greener Alternatives. Bamboo here, could come to rescue. North-East India dedicates itself to Commercial Bamboo production which constitutes 66% of the country's growing stock (National Bamboo Mission, India, 2017). This quick-growing, versatile, non-timber forest product weaves itself effortlessly into local livelihood generation. Preliminary urban market study regarding Bamboo products revealed that 'products sell only when it pleases the user's eye'. Unfortunately, the Bamboo Furniture Pieces fall short in Urban Finesse sought towards home decor, thus pushing them towards urban market failure.

Thus, to transform Bamboo into a 'sophisticated' material, two techniques have been developed :

1. Creating 'Cavity Frames' for torching Bamboo splits,
2. 'Drilling and Gun-Riveting' Bamboo splits for perfect joinery alignments.

A set of 'Bamboo Lounge Chair and Ottoman' marks the success of these techniques. It also provides for storage space requirement in an Urban Context through a Design Method of using 'Alternate Bamboo Members'. Through these methods, the Furniture pieces shall have an upgraded Design Standard to satisfy the Urban Market of the country. Also, with the available craftsmanship, a range of furniture pieces can be mass manufactured to help enhance the economic growth of the North-Eastern region. Additionally, after their shelf life, these pieces can be recycled effectively in multiple industries such as paper, building materials such as bamboo boards and fabric. This transferrable usability of Bamboo can eventually reduce the impending concern of furniture waste, thus promoting sustainability in urban livelihoods.

Fig 1 : Bamboo Lounge Chair and Ottoman in an Urban Household

Fig 2 : Display of Alternate Bamboo Members used for making furniture

Communication Barriers

ArzooKhare, SoumyaMukund

IIT Guwahati

Indian Institute of Technology Guwahati is a national institute which sees an influx of students of linguistically diverse backgrounds from all over India and abroad every year. The most commonly spoken languages are Hindi, Bengali and Assamese. For students who do not know these common languages, every activity turns into a hassle in their day-to-day lives owing to the communication barriers. They face trouble in settling down during the initial days and in developing meaningful relationships with their peers in the long run.Thus, a design intervention was needed to facilitate better and more effective communication thereby easing the students' problems.

Board game to educate students about career opportunities

Prakhar Jain, ShivamSunderam, Ankit Jain

Department Design,IIT Guwahati,India

Education in India, particularly in rural areas, is a domain marked with major challenges such as lack of motivation and proper guidance, unawareness regarding importance of education and many more. The paper targets the issue of the wide awareness gap amongst rural high school students regarding different occupational opportunities, and their respective prerequisites, and their inter-relation with school education. Since play is a powerful medium to indulge in a learning experience, the project attempts to intervene through an engaging board game. The elements of the game highlights the various subject qualifications and attributes required to achieve different career options. The attempt reflects the underlying intention of motivating students for active education, in order to achieve a quality life. The authors conceptualised and developed the prototype of the

board game, based on learnings from primary and secondary research. A pilot run was conducted with 24 participants with 4 participants per play. The results from the study suggest that the use of board game saw greater enthusiasm and motivation in children to acquire knowledge about different career opportunities. A backdrop of educational domain in India, an overview of serious games, primary research to validate influential factors, the design of the board game and outcomes of the pilot run are presented in the paper. It concludes with a discussion on future scope and its perceived impact based on user's feedback.

Fig 1. Prototype of the board game

Conceptual Design and Evaluation
of a Novel Self-Transfer-Assistive Device

S.Kelifa[1],A.K.Das[2].

[1,2]Department ofDesign,IIT Guwahati,India

E-mail:Kelifa.sm@iitg.ac.in

Research presented in this paper is part of a transfer assistive device project and its aim is to determine whether the required muscle activities during transfer from a wheelchair using the proposed methods are within a limit, as well as to determine the suitable transfer mechanism through a conceptual design synthesis.Experimental data collection based on surface electromyography is conducted on six healthy subjects to investigate the relationship between the grip force andmuscle activities, thereby to decide the best supporting device which is ergonomically and biomechanically have an excellent interface with the users. Digitalhuman modelling was adopted in order to evaluate the man–machine interference and an ergonomic fit. A paired sample t-test was conducted on the recorded RMS values of the EMG signals from the selected muscles and found a statistically significant difference between the two methods of transfer. Based on the EMG results, it has been observed that the assisted transfer condition requires no or aminimum muscular effort as compared to the non-assisted transfer. Finally,a proposed concept has been designed virtually based on the findings from EMG results and ergonomic aspects

Integration of design education with the school curriculum in the context of ATL & other similar govt. Initiatives

Sumit Rathore, Harshit Sharma

Department of Design, IIT Guwahati, India

rathoresumit73@gmail.com , harshitsharma12@gmail.com

Atal Tinkering Labs(ATL) are installed by the Govt. of India in schools around the nation, as a very ambitious initiative. Under this initiative, schools are provided with tools and equipment to create prototypes for the ideas and mentors to guide them through the innovation process. But the tools are not alone sufficient to achieve the goal of making an innovative nation, as the students and teachers are not that tech-savvy and the mentors are not well equipped to guide the students thoroughly. There is a lot of potential in modifying the school curriculum in accordance with ATLs tools and equipment to make the learning process more hands-on, collaborative and participative. The ideas and inspirations to solve the problems faced by the society should be taken from the community itself and the solution validation too. The Design Innovation Centre(DIC) is also set up with a similar initiative to support those brilliant ideas and projects which have high impact potential. Also, there is a lot we can achieve with the collaboration of DIC and ATLs such as handholding support, process mentoring, operational guidance and showcase platform. This project aims at the better integration of design education with the school curriculum in the context of ATL & other similar govt. initiatives. Under this, a platform will be created to provide virtual mentoring by the mentors allotted to respective schools. Also with a common digital repository for some of the best projects across the nation, to make guidelines for future projects, accessible to all ATL schools. Some sample experiments will be designed, matching the school's syllabus with ATL tools and equipment, to provide the teachers and students with building blocks on how to do similar projects in the future.

A mobile phone operated smart home

Anusheel Singh, Yashvardhan Katiyar, Richa Parasher, Runaal Bhowmick

Sarala Birla Gyan Jyoti, Guwahati

A mobile operated smart home for home automation is designed. The smart home is equipped with a light system that can be controlled using a smartphone via WiFi. We have used a WiFi module and a relay board for this application. The smart home also has a sensor based cloth hanger, which is useful during rainy days. When it rains the clothes hanging outside automatically comes inside the house. For this application 'Arduino Uno', a rain sensor and a servo motor is used. The rain sensor can detect the raindrops and signals the servomotor to rotate by 180 degrees. The smart home is also equipped with a gas sensor that detects flammable gases like LPG, Butane etc. If there is a gas leak then the alarm will start ringing and the person will be notified and can call the emergency services. We have also provided the smart home with a light alarm system for security purpose. When someone trespasses the front door, the alarm is activated. The smart home with above mentioned features can be useful to old aged persons and persons with disabilities.

Smart garbage level monitoring system

A.AnumetaDutta,B.RajitaPegu

[1]Department of Electronics & Electrical Engineering,
Guahati University Institute of science And Technology Guwahati,India

E-mail: 2parimeta@gmail.com

The Main aim of this paper is to develop an intelligence bin which can monitor waste through sensors and gives the information in detailed which are connected to internet. Initially all the sensors from different location are connected through Internet in every location sensors will measure and calculate the waste and information will be sent to the server. At Server it will Process the information and sent it to the concern Authorities to take necessary action. By This approach we can get information of bin by using an android app also. The Ultrasonic sensor will monitor the level of garbage and will send the details to the server.

The components required for this IoT based smart garbage level monitoring system are :-

- Node MCU esp8266
- Ultrasonic sensor
- Patch wires
- A dustbin

A. P.Enosh peter B .G.Prakasam C. P.SuryaBhaskar

[1]Department Of Electrical And Electronics Engineering,
Pragati Engineering College Andhra Pradesh India.

G-Mial:penoshpeter@gmail.com

With the current increasing in the population and rapid industrialization the Electricity needed in the country Is increasing day to day , as of 2017 INDIA is the world's 3rd largest country to produce electricity of 1,497,000 GwhrNext to china and united states. We cannot minimize the increasing demand but we can minimize the usage of Existing load. The idea we are proposing is applicable to rural as well as urban areas where there is unnecessary usage of load in homes as well as industries . many people do not know how much electricity bill they get until the actual bill come in end of month , with this project the consumer come to know about the utilization of his load day to day ,once a week a notification with predicted bill will sent to consumer if he continues to use that much of load entire month.With this project the consumer come to know about how much units consuming in a day , he can monitor and control the load where there is unnecessary usage and he can limit his usage via unit limit icon and using the pressure sensor the unnecessary load can be turned off after a certain limit . In the present market there is need to control the increasing demand in order to save the depletion of valuable resources ,in INDIA'S total generation conventional resources are of nearly 80%(79.9%) . which is also cause for the pollution and global warming in order to balance the generation level and increasing demand the only way to minimizing the existing load usage .not only saving his money the consumer also indirectly plays the role in balancing the generation level. The rural people also benfitted with the introduction of this app and internet usage also increase and enables the cashless transaction via internet banking.

Design of a fixed duration charger for mobile and laptop for efficient charging and improved battery life

Shrabana1, Souvik 1 Manas1, Subhalakhi1 and Pankaj Sharma*

[1]Student, Jorhat Engineering College, Jorhat, Assam, India
* Assistant Professor, Jorhat Engineering College, Jorhat, Assam, India

E-mail:*pankaj.sharma.5080@gmail.com*

Often in our day to day lives, we are getting busier day by day. We often come across problems of reduced battery life of our laptops and mobile phones as we forgot to turn off charger after complete charging. Thus, this overcharging of our mobile and laptop batteries is not only affecting our battery life, but also is wasting precious electrical energy. Additionally there is a new trend of mobile charging throughout night by our youth who put it to charge as they go to sleep. In such cases, mobiles charger are used for 4-5 hours more that what is required. A smart phone charger consumes 0.3Amp current. India have more than 300 million smartphones which are in use. Even if 10% charge them for 4-5 hour more than required, 9 million amperes current is being drown regularly at 240 volt which led to huge wastage of electricity. Further, life of charging circuit of the device and device itself saw a reduced life. The replacement of battery is nowadays quite costly as nowadays most of the batteries are non-user removable and one has to pay for the servicing charges as well. Similar problem is with laptop also.

To solve this, a device is designed which can provide just the right duration of charging after which it will automatically disconnect laptop/mobile from supply. This will help to enhance the battery life of our laptops and mobile phones and also promote energy conservation.

SAPIA-(Sense Accident and Provide Information to Ambulance)

A. ShivaniGoud B. Yamini Yadav C. SimranSisodiya

Department of Electronics & Electrical Engineering , JIT BorawanKhargone (M.P)

Jawaharlal institute of technology vidhyaviharBorawan ,Khargone(M.P)

Shivanigoud700@gmail.com

Accident are increasingly increasing due to the continuous use of vehicles. In most of accidents, many people lose their life due to non availability of ambulance or arrival delay. Main cause behind this was ambulance are not informed at the right time. Self automatic electronic system will provide information immediately to emergence service. The main aim of project is to design automated communication system between vehicle and command centre by that ambulance can automatically informed about any accidents and nearby ambulance will arrived immediate basis. Some time the accident spot is not in range of ambulance due to limited numbers of 108 and ambulances. To avoid this problem, we include the feature to register any free vehicle to be a temporary ambulance and the charges will be afforded by Govt. This will work like any cab booking service but unlike cab it can not pre-book for riding, this facility of ambulance will be work in case of emergency and inform to owner of vehicle via SMS and call centre. The main intention of this project is to find the accident spot at any place and intimating it to ambulance through the GPS and GSM networks use the GPS based vehicle accident identification module contents MEMS GSM module and a GPS modem connected to the micro controller global system.

SHOCK PROOF SWITCH

The "SHOCK PROOF SWITCH" is designed to prevent the electric shock which a person experiences while switching (either ON or OFF), mostly when the switch comes in contact with water as in rainy seasons.

The reasons behind the electric shock are as follows:-
1. Due to the water which comes in contact with the switches (in case of rain etc).
2. Due to high amperes of current flows through the switch that's why person experiences electric shock. This problem can be solved if the current flows through the switch is low.
3. Due to high moisture content around the switch, is also becomes a reason for electric shock.
4. Dust particles around a switch are also a reason for shock.
5. Some default in the switch.
6. Due to some leakage of electric current.

The main aim of designing the “shock proof switch” is to avoid the electric shock that people experiences in rainy or in humid seasons while touching the switch.
With the help of the proposed idea if a person will press the switch of the device he/she will not experience any kind of electric shock since only a very less amount of current flows through the switch.

Now we can easily perform switching operation. Risk of experiencing electric shock nearly ends and the life of the switch increases.
* Any device up to 1600 Watts can be operated without any risk of electric shock from switches.
* For all the devices connections will remain same.
* The proposed circuit can also be implemented in a switch board, so that multiple number of switches can be protected from shock.
* It will be the best domestic appliance either using in residential homes or also in Commercial automation industries.

III. Advantages:

1. With the help of this circuit people will not experience any kind of electric shock while switching as the current flowing through the switch is very low.
2. Now we can easily perform switching operation for those switches which are kept outside or kept in open.
3. Even in rainy seasons or in moisture conditions we can easily perform switching operation.
4. Risk of experiencing electric shock nearly ends.
5. The life of the switch increases.
6. While switching we sometimes see sparking problems when we use higher watt appliances, by using shock proof switch no sparking problem is seen.
7. Heating problem of switches can be solved.
8. Due to low cost it is affordable and can be implemented easily.
9. Entire switch board can be protected from shock by using this product.
10. This product makes the modern cities Smart as well as safe for people.

IV. Picture

V. Video Link

https://drive.google.com/open?id=1zf3d4BHrGCho3eLMB7DwW0avu1qWUAkd

MOVING OBJECT TRACKING USING A CAMERA MOUNTED ON 2-DOF ROBOTIC PLATFORM

(PAN-TILT MECHANISM)

Manmohan Sharma, Sami AL Issa and Srinivasan Krishnaswamy

Department of Electronics & Electrical Engineering, IIT Guwahati,India

E-mail: manmohan.s@iitg.ac.in, sami.issa@iitg.ac.in, srinikris@iitg.ac.in

A real-time visual servo control system which uses the visual feedback comes from a single camera mounted on a DC-motor driven robotic platform to track moving object has been described in this work. A pan/tilt platform has been designed and fabricated. Frame differencing algorithm along with colour segmentation have been implemented using openCV-python for detecting the moving object and keep tracking it. DC motor modeling and identification has been done and PI controller has been designed accordingly to give command to the platform to keep the object in the centre of image plane. The results show an effective and stable tracking for the object in both panning and tilting. Visual servoing (VS), the field of research which combines computer vision, control system and robotics, can be divided into two main tasks: Visual information extraction (Visual Tracking) and Control algorithm implementation. The output of the first task is the trajectory of the object's centroid which will be used as the input for the second task. A Pan/tilt mechanism basically is a robotic manipulator with 2-DOF revolute joints as shown in Fig.6. It can point at any point in the space by only adjusting the angular displacement for both pan and tilt angles. Many research have been recently published in various applications like defence sector, security and surveillance systems, traffic-monitoring and human tracking.
The objective of this work can be expressed shortly as, how to develop a low-cost prototype pan/tilt system which can detect and track a moving object in defined space automatically in real-time using the visual feedback to keep it in the center of field of view. The camera movement should react smoothly to the quick change in the target trajectory and velocity. Integration between computer vision and control is needed to solve this problem. The computer vision algorithm extracts the visual information object (area, colour and centre of gravity COG) followed by dilation and erosion from each image acquired by a camera (the output of this task is shown in Fig.4). A step response of the real system (Fig.1) is used to model and identify the pan and tilt motors as first order system following by designing the PI controller which is able to track reference signals as shown in Fig.2 and Fig.3. Using transformation methods, the required pan and tilt angles are calculated and the PWM signals are generated and sent to motors through Arduino. The joints of the robotic platform are moved accordingly to them. This procedure is repeated for each frame in real time. Both the smooth movement and an instant reaction for fast changing in target trajectory and velocity have been achieved as shown in the final tracking results in the Fig.5.

Is E-commerce ruling over retail sector? : a study based on consumers' perception in Jorhat town.

Mukut Chakraborty
PratikshyaBorpujari

B.Sc 4th semester (STATISTICS)
JagannathBarooah College, Jorhat.

Contact-6002197750
Email ID pratikshyajrt@gmail.com

E-commerce or electronic commerce is a process of buying and selling of goods and services, and transaction of money through electronic medium. The products in retail stores comes from manufacturers to distributers and then to whole sellers, and finally to retail location whereas in E-commerce the supply chain involves lesser steps. Lots of factors affect the preferences of consumers in between E-commerce and retail sector and these involves :age-group, gender, locality, occupation, season, personal experience, quality of products, malpractices by the suppliers, payment mode, return policies, and so on. Since the world is heading faster day-by-day with digitalisation, so an attempt is made to demonstrate the effect of these parameters on E-commerce through a model, which is based on a statistical survey conducted in Jorhat town.

Keywords- E-commerce, retail, consumer, digitalisation.

Impact of Internet Usage on the Academic Performance of UG students; a study carried among the students of various Educational Institutes in Jorhat.

AsmitaTamuli, AnanyaSaikia

B.Sc. 4th semester (Department of Statistics)

JagannathBarooah College, Jorhat.

Email ID- asmitatamuli591@gmail.com, saikiaananya1998@gmail.com

We are entering a new era of computing technology that many are calling the Internet and being the most popular trend, it has a huge potential. Most of the students prefer internet for different purpose like academic knowledge, social connection, entertainment and also to learn the latest news all around the world as well as getting information that serves different purpose. Therefore, it can be said that the internet is the source of spreading information quickly to a large audience. Thus, the aim of the study is to look at the impact of Internet usage on Academic Performance of UG students. The study is conducted among the students of various Educational Institutes in Jorhat.
Keywords: Internet, academic, performance.

Fabrication of a Reciprocating Platform Based Segregator

MebanteilangSyiemlieh, Edmund BanteibokDkhar, Sylvanus Khonglein, JerrybertKhongsit and PranjalSarma

Department ofMechanicalEngineering,School of Technology,
Assam Don Bosco University, Guwahati-781017, India

E-mail: mebanteilang123@gmail.com

In this work endeavour has been taken to conceptualize and fabricate a working prototype of a machine which will be able to do segregation of different elements in a mixture based on size and weight. The primary motivation is to ease the labour intensive work of sorting out the common impurities like pebble, stalk, twig etc. normally present in common commercial food grains like rice, pulses, lentils, barley etc. This is frequently carried out in a large percentage of Indian household, mainly by the lady member or the child members of the house. To make their work somewhat easier, here the process of sorting is made mechanized by designing a simple mechanism which will be able to segregate the different materials available in the mixture under consideration. For instance, we are looking for a way of how to segregate pebbles from flour, or sand from rice. The working of this machine is based on the known knowledge of a slider crank mechanism where the rotational crank of the lever would produce a reciprocating movement of the platform. Various standard seives can be used for segregation purpose and also by providing certain slope to the platform, gravity based separtion also will be incorporated. This can be done on a large scale as well by increasing the size and capacity of the machine. Based on the individual requirement, the process can be made automated also. A proof of concept prototype is being fabricated and various tests will be performed on the prototype to evaluate its performance.

Keywords: segregation, reciprocating platform, sieves, slider-crank mechanism

AUTOMATIC BIO/ORGANIC-FERTILIZER DISTRIBUTION MACHINE

S.SURYA, VIJAYARAGUL.M
ssuryakumar1998@gmail.com, kargil99.edu@gmail.com

B.E Mechanical engineering
8682069235

World is keen in witnessing **automation** in nooks and corners of every sector in order to increase the productivity and **reduce** the **man-money-time** involved. Though the role of machine is employed in every field of worlds' production, some of the complications are being un-witnessed. **Bio/organic-fertilizer distribution** in agriculture is one of them, since it has been done manually involving much time and pay than we expect. Hence our project aims at **automating the distribution of Bio/organic-fertilizer** from the tractor trailers into the agricultural fields, which is the initial process of any agricultural practice after the land is ploughed. This could be an **efficient helping hand** for the agriculturist people to reduce the cost and time of fertilizer distribution. A two wheeled setup is fixed behind every tractor trailers upon which **a rotating shaft** with number of **spine bars and rectangular plates** is mounted. This machine is **universal**, that is it can be connected to the opening of **any hydraulic trailer** using specially designed clamp. The power will be drawn from the wheels of the trailer by chain drive. Hydraulic trailer is initially filled with bio/organic fertilizer. Our machine is connected at the back exactly at the opening of the trailer. Now the tractor is driven all over the agricultural field. When the trailer tilts up, fertilizer slides down to the rotating shaft. The spine bars and plates present grind and spread down the fertilizer uniformly throughout the land. This automation process takes only about **2 hours** for the distribution of fertilizer over an acre, whereas manual distribution takes almost 2 days. The cost of operation is drastically reduced, since there is no need of

wage to be paid for workers. Fuel for tractor is the only cost involved in this process, which is **economical**

Design and Fabrication of Sand Screening Machine

PragyanGoswami[1],Pranjal Das[1] andBirkangNarzary[1]

[1]Department of Mechanical Engineering,Assam Engineering College,India

E-mail:pragyan.goswami.aec@*gmail.com*

The size distribution is a crucial importance to the quality of product. Primary goal of the present study is to design and fabricate a sand screening machine for workers mainly in the field of construction. Sand Screening Machine is used to separate fine grain sand from the mixture of it with uneven and bigger sized particles like rocks, sediments etc. The sand collected from different sources like bank of the river or from the sea is not uniform. In construction sites when requirement of the uniform sand comes, the use of these machines becomes very necessary.

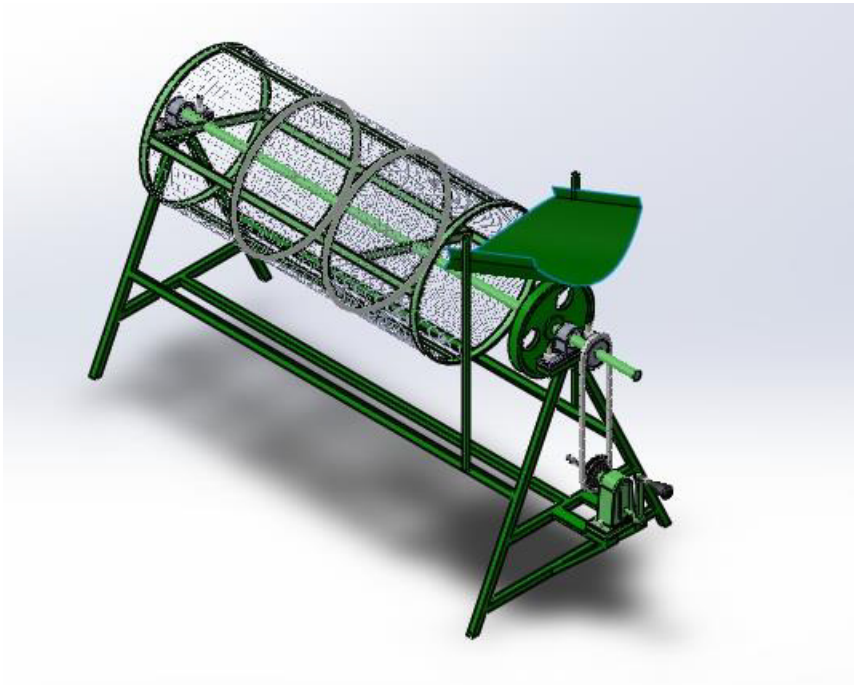
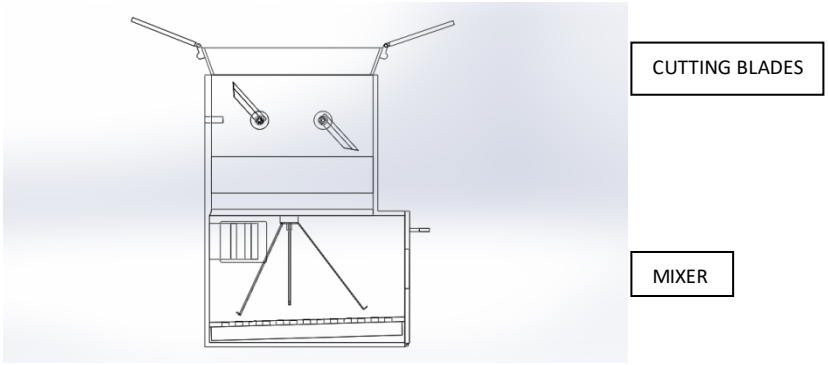


Fig 1. Sand Screening Machine

Composting Machine

This invention relates generally to rotating cutting blades and in particular to an improved rotating cutting blade adapted for use in a composting machine. The development of multi-element balanced feed mixtures for fattening livestock, and also meal fowl of all descriptions, has resulted in an increased demand for efficient machinery of various types to grind and cut organic waste of different categories. There is in public use today a great number of expensive machines which prepare feed mixtures for sale on the market. The small farmer, however, generally cannot afford the large capital investment required for the machinery presently available on the market. If he desires to utilize a balanced feed mixture rather than raw waste to fatten his stock or fowl, he is dependent upon the commercial mixtures now available. This dependency frequently represents a prohibitive operating cost to the small operator. This state of affairs has spurred the large scale development of small farm machinery of all types, both on the farm and commercially. Additionally, expanding electrification of rural areas has made it feasible to develop small electrically driven units capable of handling the small operators requirements. In addition to the demand for cutting devices to prepare compost for feed mixtures there is an increased demand for such devices to prepare organic waste of various types for use as compost It is frequently desirable to introduce nitrogen and other elements into the soil to increase its fertility. An inexpensive source of these elements is found in organic matter in the form of fertilizer, ploughed under the soil to compost the land and are lucrative sources of beneficial soil-enriching organic waste. Organic waste (such as vegetable peels) may be put into a machine which has a chamber having some rotating cutting blades of improved design characterized in that a constant resistance torque is produced by the load in the machine Another object of the invention is the provision of a cutter for a composting machine which functions as its own sizer to fix the length of the cut peels of vegetables waste. These and other more specific objects will appear in the attached picture.



Motor Vehicle CO Emission Measurement Devices with Based on Arduino

A. HEMACHANDRAN R1 ,
B. SENTHILRAJA M2 and
C. BALAMURUGAN R1

123 Department of Automobile Engineering, BIT Erode, India

E-mail:hemachandran.au16@bitsathy.ac.in
senthilraja.au16@bitsathy.ac.in
balamuruganr@bitsathy.ac.in

Reducing the emission from automobiles is one of the most challenging goals for vehicle manufacturers. The motor vehicles exhaust emission containing harmful pollutant gases that can damage the environment and cause health problems for humans. In India recent days everyone using old

vehicles such as BS I BS II and BS III vehicles, But drivers are not properly maintain the vehicle for service. This is major problem to increase the Carbon monoxide (CO) level in atmosphere to affect the environment pollutant. This project work measure the Carbon monoxide (CO) from motor vehicle exhaust and indicate the warning while CO level increase certain emission norms. The work make an Arduino based pollution nmonitoring system in BS I , BS II and BS III vehicles which we will monitor the quality of CO in the exhaust system and will indicate by different color LED light in dashboard with a help of MQ07 sensor, transmitter,receiver, Arduino UNO etc. when the CO level increases beyond the emission norms. Arduino UNO as the brains of this device, Transmitter and receiver module as an intermediary between the device with arduino, and MQ07 sensor as CO emission measure of resulting from exhaust. This work really helpful for pollution generating vehicles easily to find in road ways.

Demonstration of Electro Aerodynamic Propulsion system

Mandeep Saini 174103141

Prasoon 174103103

Shobhit Kumar Singh 174103104

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The concept of using electric fields to accelerate ions was first explained in late 18th century by scientist named Chattock [1]. Initially scientists were skeptical about this motion and some thought that gravitational forces are causing motion of these ions, but with extensive experimentation and researches scientists have explained this mechanism. When a very high voltage (more than breakdown voltage of air) is applied across two electrodes with air in between them a blue colored spark is produced and is termed as corona and mechanism is called corona discharge. The corona discharge is characterized by high voltage and low current. This corona leads to ionization of air, these ions then try to rush towards opposite charged electrode in due course hitting neutral molecules of air in between and accelerating them as well, thus producing a wind commonly called as electric or ionic wind. The ionization already finds application in air-purification and ion pumping [2], many designs of aircrafts propelled by ionic winds (generally called electro aerodynamic (EAD) propulsion systems) are proposed in past but none of them seem to be practically feasible until 2018 when research group from MIT reported a sustained flight of EAD powered UAV carrying all its battery loads onboard [3]. This technology can prove to be helpful in fulfilling projected demand of drones.

The EAD propulsion is way more superior to conventional propulsion systems explained as follows [3]:

a) The EAD propelled vehicles produce almost negligible noise during their working as they do not include any moving parts.

b) It does not emit any kind of harmful gases to the atmosphere because there is no burning of fuel.

c) These provide higher thrust to power ratio as compared to conventional propulsion system.

EAD propulsion systems provide very low thrust density which make them practically infeasible in application. NASA’s Halios and Lockheed-martin HAA already display EAD technology in which solar panels are used to produce electricity which then used to produce corona discharge [4].Demonstration

We want to demonstrate a mechanism depicting EAD propulsion technology. A small aircraft is powered by EAD is attached to a horizontal arm which is free to rotate. This horizontal arm is attached to a vertical arm by a deep groove ball bearing. The whole setup is put on a stand. The battery system and transformer (placed outside the aircraft) used to produce high voltage for corona discharge. Ion movement causes the aircraft arm to rotate and an Ion wind and blue color corona can be easily observed. Due to the corona discharge, the propulsion of aircraft can be seen. The setup of above model is depicted in the figure below.

Demonstration of electro aerodynamic propulsion system

References

[1] **Chattock, A. P., Walker E. W., and Dixon E. H.**, (1901), On the specific velocities of ions in the discharge from points, *The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science*, pp. 79-98.

[2] **Stuetzer, Otmar M.** (1960), Ion drag pumps, *Journal of Applied Physics*, pp. 136-146.

[3]**Xu, Haofeng, et al.** (2018), Flight of an aeroplane with solid-state propulsion, *Nature,* pp. 532.

[4] **Wilson, Jack, Perkins H. D., and Thompson W. K.** (2009), An investigation of ionic wind propulsion."

[5] https://www.youtube.com/watch?v=x5dyIIpnE0Y&t=2s

Morphology Tuning of BiOCl nanocrystals by Citric Acid variation: Application in visible light assisted dye degradation

Ratna Sarkar[1#], Dimitra Das[2], Anuradha Mitra[1], Subrata Sarkar[1], Kalyan Kumar Chattopadhyay[1,2*]

[1]Department of Physics, Jadavpur University, Kolkata, India

[2]School of Materials Science and Nanotechnology, Kolkata, India

E-mail:ratnasarkar60@gmail.com

Bismuth oxyhalides (BiOX, X= Cl, Br, I) are well known highly efficient photocatalysts for the degradation of toxic organic pollutants. They exhibit different types of crystal structures along with unique electrical and optical properties. These materials can efficiently degrade different types of textile dyes and pharmaceutical products. Among the different oxyhalides, BiOCl is a p-type indirect band gap semiconductor with band gaps lying in the range of 3.2 ~ 3.5 eV.
In the present work, a simple and efficient synthetic strategy has been followed to prepare nano-disk like BiOCl samples with prominent growth along the {00l} planes. The precursors {$Bi(NO_3)_3$, $5H_2O$} and HCl in appropriate molar ratio along with the capping agents citric acid and PVP are subjected to hydrothermal condition for 3 hours at 160˚C. Variation in the molar ratio of the citric acid during the synthesis procedure resulted in subsequent variation in the morphology of the as-prepared samples from nanodisks [1] to nanosheets. The samples were characterized in details by several techniques to have a proper insight into the phase formations, chemical bonding, morphology and electronic band gaps. The X-Ray diffraction (XRD) analysis revealed the preferential growth in the {001} direction whereas the Fourier Transform Infrared (FTIR) analysis and Raman spectra analysis confirmed the presence of all the respective chemical bonds. The morphology of the samples was revealed from the Field Emission Scanning Electron Microscope (FESEM) and Transmission Electron Microscope (TEM) images. The band gaps of the as-synthesized samples varied from 3.2 to 3.5 eV with change in the morphology from disk to sheet as obtained from diffuse reflectance spectra (DRS) analysis. The samples were further exploited for effective degradation of toxic Rhodamine B (RhB) dye under visible-light irradiation. The variation in citric acid resulted in changes in the morphology which in turn led to the variation in the photocatalytic dye degradation efficiency of the as-prepared BiOCl samples.

Keywords: Bismuth oxyhalides, citric acid, photocatalysis.

References:

1. X. Zhang, X.B. Wang, L.W. Wang, W.K. Wang, L.L. Long, W.W. Li & H.Q. Yu. *ACS Appl. Mater. Interfaces* 2014, 6, 7766−7772.

SPY-RAT

A. Pralay Chakraborty1 B. Nayana Swargiary2 C. Neetashri Borah3

1. Department of Physics, Bodoland University, Assam, India
2. Department of Physics, Bodoland University, Assam, India
3. Department of Physics, Jorhat Institute of Science and Technology, Dibrugarh University, Assam, India.

Email : pralaychakraborty8@gmail.com

We demonstrate our model in the form of a “SPY-RAT” as our primary preparation for vision research. The device is in the form of a rat so that itl becomes unrecognizable as a spy device. It can be controlled by remote from a specific distance which may vary depending upon the circumstances and obstacles. An attempt also has been made to make it such that it won’t make any sound. It has a spy camera and a recorder so that it can record every footage that are required. Further it also has a sensor so that it will not come in contact with anything while moving. We hope this device will help several spy works in future.

Design of a Low Cost Energy Solution for Lighting in rural areas for Disaster Management

Mathura1 , Puneet1 , Aditya1 , Abhishek1 and Pankaj Sharma*

[1]Student, Jorhat Engineering College, Jorhat, Assam, India
* Assistant Professor, Jorhat Engineering College, Jorhat, Assam, India

E-mail:*pankaj.sharma.5080@gmail.com*

Rural areas have a limited access of electricity. Due to remote location and hilly terrain, electricity supply maintenance and restoration takes longer duration as than expected. This makes it tougher in case of a disaster. Due to absence of localized power solutions, during disasters, rural areas are disconnected from rest of the world. This makes disaster management more difficult.
To solve this, a device is designed which can provide lighting solution with the help of locally available faulty material. This may not only provide a lighting, but can also provide a way to exhibit SOS and attract help from outside world. This solution may also save rural people from reptiles and animals during the disaster management in night hours. This device will have wireless transmission of electricity and may work on any discarded UPS Battery, pencil cells and other batteries which are locally available in village during the disaster.

Wind Energy as An Alternative Resource: GIS Assessment andAnalysis

PradhyunKashyap[*], SaikumarRondla[**], ManojkumarGaddam[***], GajananRamteke[****]

[*, ** & ***]Department of Soil and Water Conservation Engineering, College of Agricultural Engineering, Kandi, Sangareddy, Telangana, India.

[****]Telangana State Remote Sensing Application Centre.

Being cleaner and climate friendly, wind energy has been increasingly utilized to meet the ever-growing global energy demands. In the region of Nalgonda, Telangana, India a wide gap exists between wind resource and actual energy production, and it is imperative to expand the wind energy development. Because of the formidable costs associated with wind energy development, the locations for new wind turbines need to be carefully selected to provide the greatest benefit for a given investment. Geographic Information Systems, have been widely used to identify the suitable wind farm locations. In this study, a GIS-based multi-criteria approach was developed to identify the areas that are best suited to wind energy development in Nalgonda Region. Several criteria were adopted in this method, including distance wind potential, land use, distance to cities, slope and exclusionary areas. The suitability of wind farm development was modeled by a weighted overlay of geospatial layers corresponding to these criteria. The results indicate that the model is capable of identifying locations moderately suited for wind farm development. The approach could help identify suitable wind farm locations in other areas with a similar geographicbackground.

Keywords: wind energy; GIS; multi-criteria; wind farm; Nalgonda

GEOTHERMAL : MILESTONE TO A RENEWABLE ENERGY WORLD

1)Ms. BismakshreeNeog
2)Mr. Radrath Paul
3)Ms. Barbie Dutta

B.Sc 2nd Semester, Department of Geology
JagannathBarooah College,
Jorhat, Assam

Contact: 8876151972,
Email id- radrath44@gmail.com

The thermal energy which is generated and stored in this vast global storage called Earth is one of the most important aspect of the renewable energy world. Initially, in the earth's crust this energy originated from the original formation of the planet and from the radioactive decay of materials.Geothermal Power- A sustainable and environment friendly power plant has come to effect considering geothermal energy as its main resource. Recent technological advances have dramatically expanded the range and size of viable resources and various applications too.The model is to demonstrate the work of geothermal energy in harvesting earth's heat for a sustainable development of our planet.

Keywords: Earth System Science, Geothermal Energy, environment friendly power plant..

ORIGIN OF THE EARTH'S MAGNETISM

-GEODYNAMOMODEL-

Mr.AbhishekSarmah, Mr.HimangshuSaikia, Mr.DixitSaikia

B.Sc, 2nd SEMESTER

The Earth has a magnetic field which is similar to that of a bar magnet tilted 11 degrees from the spin axis of the planet. Earth's magnetic field is caused by electric currents due to the motion of convection currents of molten iron in the Earth's outer core. These convection currents are generated due to the heat which escapes from the core of the Earth. There are several models on magnetic field of the Earth; The most popular model is known as the "Geodynamo Model". The self sustaining process responsible for maintaining the Earth's magnetic field in which the kinetic energy of convective motion of the Earth's liquid core is converted into magnetic energy can be defined as the Geodynamo. The time-variable behaviour of the Earth's magnetic field shows that its source cannot be a permanent magnet; furthermore, the high interior temperatures of the Earth would prevent minerals from retaining any permanent magnetism. Instead, The Earth's magnetic field is maintained by a gigantic dynamo- the outer core.

Keywords: Geology, Geodynamo, Convection Currents, Earth, Magnetism, Energy

GROUNDWATER AQUIFER

Sukanya Dutta
JyotiNayan Panging
Neha Hussain

B.Sc4th semester, department of Geology
Jagannath Barooah College, Jorhat.

Contact-9101440263
Email ID- sukudutta01@gmail.com

Aquifers are saturated water-bearing rock medium that transmits water to wells and springs. Aquifers are mainly of two types-confined and unconfined. Confined aquifers are truncated both above and below. A confined aquifer has water pressure greater than hydrostatic and so when the aquifer is penetrated by a well, the water rises up to a level .beyond the top of the aquifer. In a confined aquifer ground water is released to wells mainly from pressure storage. This model is to demonstrate the phenomenon of recharge and discharge from a confined aquifer.

KEYWORDS: Aquifer, ground water.

A Domestic and Low-cost Wastewater Filter

SubhenduSekhar Bag[1, 2*], Sayantan Sinha [1, 2], KaustabhRakshit[1], Aniket Banerjee [2]

[1.] Centre For The Environment, IIT Guwahati
[2.] Bio-organic Chemistry Lab, Dept. of Chemistry, IIT Guwahati

Even though, India has an ample source of natural water resources, availability of clean water is a challenge. People generally depend on the municipal supplied and ground water facilities to quench their daily need. However from facts and figures it could be inferred that the demand to supply ratio could not be satisfied in the present scenario. This situation even worsens at times of natural calamities like flood. Every year millions of people in India acquire severe infections from common water borne pathogens like Shiegella, E.coli, V.cholerae, Salmonella etc. It has been observed that the tendency of epidemics or pandemics becomes common at times of flood situation. The origin of cause is unavailability of safe water due to contamination of river water with sewage/sewage water. Therefore, the utmost necessity that we have envisioned in flood prone regions of Assam and other states, is the instant development of an efficient and low cost technology/system that can provide comparatively safe grade water at times of emergency. Working towards this goal we have developed a low cost and efficient wastewater filter made from easily available material. We have tested the efficiency and working capacity of this filter in real world scenario.

*** Prof. SSB is the supervisor and corresponding author; SS is inventor; KR is associate inventor and AB has helped in performing the experiments*

Single Stranded DNA Based Silver Nanoplex for Liver Cancer Treatment

Aditi Banerjee[1], Neha Arora[2], Pallab Sanpui[3], Siddhartha Sankar Ghosh[1,2]

[1]Centre for Nanotechnology, IIT Guwahati, Guwahati- 781039, Assam
[2]Department of Biosciences and Bioengineering, IIT Guwahati, Guwahati- 781039, Assam
[3]Department of Biotechnology, BITS Pilani, Dubai Campus, PO Box 345055, Dubai International Academic City, Dubai, United Arab Emirates

A single stranded DNA-silver nanocluster -chitosan complex was formulated for bioimaging and anti-cell proliferative activities against liver cancer treatment. A 27bp ssDNA template enabled synthesis of AgNCs, which upon complexation with chitosn formed a “nanoplex”. Characterization of nanoplex confirmed the synthesis of spherical complex with size 43 nm embedded with 10 silver atoms. Cell viability assay of drug loaded nanoplex on liver cancerous cell line HuH7 depicted IC_{50} of 0.18 □g/ml and 0.04 □g/ml for doxorubicin and cisplatin, respectively.

Keywords: single stranded DNA, silver naocluster, nanoplex, cytotoxicity

Redesigned Pottery Wheel for rural artisans

Bibhuti Ranjan Bhattacharjya[1]&Sashindra Kumar Kakoty[2]

Centre for Rural Technology, Indian Institute of Technology

b.bibhuti@iitg.ac.in[1] &sashin@iitg.ac.in[2]

Traditional Pottery works are labour intensive and time consuming. The productivity of the traditional process is relatively low. Besides, the existing Pottery wheel is not ergonomically correct. It results back pain and musculoskeletal disorders of the artisans. Keeping above factors in mind, traditional Pottery Wheel is redesigned. While designing the machine, societal norms and constraints for new technology intervention is considered. The new intervention is expected to improve the productivity four to five folds.

Wave Analyser

Our project, Wave Analyser, is a simple device that is used to analyse signals in the form a 2-D image. It uses the principle of Chladni's surface vibration and a lasing system to project the 2-D image. We have taken a rubber membrane as the vibrating surface and a simple pointing laser and a piece of mirror as the lasing system. The application of this project will be mainly in Space Research projects, to study wave patterns from outer space and of different celestial bodies. The lasing system creates the image of the vibration on a screen. We can see different pattern of different frequencies of the wave. By studying the patterns, we can determine the origin of the wave, its source nature and many more. It’s a new application of the Chladni's surface vibration theory. Its is very simple way of analysing waves at a low cost . So it is basically a cost efficient project.

SMART BATTLE-SHIP (SBS 4)

Chinmoy Deka

B. Baruah College (Cl- XI)

The news of injured soldiers and families losing their loved ones in the battlefield saddens all of us. The numbers of martyrs in wars are ever increasing. In order to save lives in a battle field, a smart battleship which will detect and destroy targets is the need of the hour. We have developed an unmanned ship that will use sensors to detect any obstacles in its path and shoot missiles to destroy them. It will detect anything within 20-200 m radius for the model (which can be much higher for the actual model). The smart ship will be equipped with motion sensors. It will be a battery operated system and can fly. The model can be controlled by remote as well as mobile phone. It could be further used as an aircraft carrier for carrying and recovering aircraft with wounded soldiers on board. This will facilitate the wounded to receive medical aid faster. The demonstration of Smart Battleship will be presented through this model.

MAPS- Medical and Pedagogue Shopper

Musabbir Islam,Parvez Mustafa,Shabnam
Jashmin Ahmed,Amlan Jyoti Das

“A vehicle to change the country.”

MAPS is an integrated cycle that can serve medical and educational purposes for the country. It is composed of two components:-

1. An educative electric cycle.

2. An attached mobile ambulance.

we intend to present our hypothesis with respect to the cycle and ambulance components of the integrated cycled, MAPS. We hope that the cycle component of MAPS brings a revolution in the educational sphere. If we take a look into the past years, we will see a developmental change in everything but one thing that has not developed is our classroom. It is still the same, a room, some benches, a blackboard and some students. So we took the class out of the room in the form of an educative cycle. Moreover, with the help of digital equipments, we intend to digitalize the learning method for the students. We have also tried to reduce the cycling effort by inducing a reduction gear motor, making it an electric cycle. Next, one of the biggest reasons to develop the idea of an attached mobile ambulance is that Assam is a place where potholes are deeper than anywhere else. So, we designed a vehicle which can run on almost all kinds of roads and provide medical emergency whenever and wherever necessary. During floods the vehicle can also run on water and do its duty. It is our firm belief that if this idea is properly utilized, it will be of great profit to everyone around us. It will help in reducing the number of unwanted casualties every year.

The Electric Cycle: -

The cycle is powered by a 250 watt reduction gear motor, run by two batteries of 12 V and 32 amp. The chain system consists of two interconnected gears that boost the efficiency of the motor. The batteries can be charged through a charger, solar panel or dc dynamos.

Air-cooling system: - The air-cooling system works on a peltier cooling system. The cooling box is filled with ice and the peltier system prevents the ice from melting and it continuously gives cool air for a long period of time.
Study Equipment: - The cycle has in-built facilities such as a student desk, a tablet holder and a study

lamp to facilitate a comfortable study environment for the students.
Extra facilities: - We have incorporated a speedometer, a GPS tracker and a music system for extra benefits of the students.

Ambulance component: -

The attached mobile ambulance can be attached to the back of the cycle. The ambulance has two wheels with two shock absorbers to reduce the jerk. At the back of the ambulance we have a hydraulic panel powered by an air compressor to provide safety to a patient with leg injury. On the sides of the ambulance, we have two more hydraulic plates which are used to store medical first aids and other equipments. We also have an oxygen tank, saline stands and bottles for emergency cases. One of the outstanding features of our ambulance is that it can run on water. It has an inflatable hover boat below and can be inflated during floods. During floods the ambulance is powered by a turbine attached to a 250 watt and 2750 RPM motor. It helps in moving the vehicle forward.

Final Note: -The Medical and Pedagogue Shopper (MAPS) can be the next generation of cycles in our country. With proper development and investment, this integrated cycle will be able to work wonders for the populace of India and beyond. We strongly believe that MAPS can be a road towards a better society tomorrow that understands educative value and enjoys better medical facilities at minimum expenses.

Research Conclave'19

An amalgamation of Academia, Industry & Startups

Abstracts (Oral)

Design, fabrication and behavioural study of in situ forming silk hydrogel for nucleus pulposus tissue engineering

Bibhas K. Bhunia and Biman B. Mandal* Biomaterial and Tissue Engineering Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati – 781 039, India Author for correspondence: *

biman.mandal@iitg.ac.in; mandal.biman@gmail.com

Hydrogels consist of three-dimensional networks of hydrophilic polymers that either crosslink covalently or physically interact (intra- and inter-molecular attraction) with each other. It has the ability to absorb large quantity of water or biological fluid and swell up to several hundred times without dissolving the polymers. In swollen state, hydrogels become semi-solid and elastic, resembling to the living tissues or extracellular matrix surrounding them that attract attention of the tissue engineers. Formulation of biologically active hydrogels with desirable characteristics is one of the prerequisites for successful applications like nucleus pulposus (NP) tissue engineering to address disc degeneration. To achieve such a benchmark, the present study illustrates the rapid gelling property of aqueous solution of SF, formed via blending of two different varieties of silk (i.e., Bombyx mori and Antheraea assamensis). The hydropathicity of these two types of SF is different due to their amino acid composition, sequence and arrangement. The protein chains in aqueous SF solution self-assembled and transformed into gel (due to alteration of the hydrophobic-hydrophilic microenvironment) in absence of any cross-linker or given external stimulus. A comprehensive study on sol-gel transition of fabricated hydrogels in physiological fluid microenvironment (pH, temperature and ionic strength) was conducted using optical and fluorescence analysis. Tunable gelation time (~8-40 min) was achieved depending on combinations. The developed hydrogels were validated by extensive physicochemical characterizations which includes confirmation of secondary structure, surface morphology, swelling and degradation. Mechanical behaviour of the hydrogels was further analyzed in various in vitro-physiological-like conditions with varying pH, ionic strength, diameter, storage time and strain values to determine their suitability in native physiological environments. Rheological study, biocompatibility using primary porcine NP cells and ex-vivo biomechanics of hydrogels were explored to validate their in situ applicability in minimally invasive manner towards potential disc regeneration therapy.

An investigation on the role of TIPE family of proteins in the development and progression of lung cancer

Devivasha Bordoloi and Ajaikumar B Kunnumakkara

Cancer Biology Laboratory & DBT-AIST International Laboratory for Advanced Biomedicine (DAILAB), Department of Biosciences & Bioengineering, Indian Institute of Technology (IIT) Guwahati, Assam-781039, India. *

Email: kunnumakkara@iitg.ernet.in

Lung cancer represents the most common cause of cancer deaths in the world, accounting for about 1.2 million deaths annually. It is also the most common cancer as well as the cause of cancer related death among men in India, with the highest reported incidences from Mizoram in both the sexes. Despite the significant advances in the field of therapy for lung cancer, the prognosis for patients with lung cancer remains utterly poor. Lack of suitable biomarkers presents a major obstacle in the effective management of this aggressive neoplasm. Tumor necrosis factor (TNF)-α-induced protein 8 (TNFAIP8 or TIPE) family, a new subfamily of death effector domain (DED), consisting of TIPE, TIPE1, TIPE2 and TIPE3 possess enormous potential in this regard. The expression analysis of the

family of TIPE proteins revealed that TIPE, TIPE2 and TIPE3 are significantly upregulated in lung cancer tissues compared to normal lung tissues whereas TIPE1 showed significant downregulation in malignant lung tissues than the normal lung tissues. Further, treatment of normal lung cells as well as lung cancer cells with tobacco extract and different tobacco components such as NNK, NNK, Nicotine and Benzo-A-pyrene resulted in marked alteration in the expression of TIPE, TIPE1, TIPE2, and TIPE3 clearly indicating their role in the progression of lung cancer. Further, CRISPR/Cas9 mediated stable knock out of TIPE, TIPE2 and TIPE3 caused marked inhibition in the proliferation, clonogenic potential and migration of lung cancer cells. On the other hand, stable knock out of TIPE1 led to the increased proliferation, clonogenic potential and migration of lung cancer cells. In addition, knock out of TIPE, TIPE2 and TIPE3 resulted in the modulation of different genes and proteins involved in the proliferation, survival and cell cycle regulation of lung cancer cells such as survivin, Cox-2, Cyclin D1, Cyclin E1, CIAP1, XIAP. Further, alteration in the expression of caspase 9, REDD1 and tumor suppressor genes such as PTEN, p21, p16 and p53 were also observed. Knock out of TIPE2 and TIPE3 caused significant doenregulation in the expression of Akt and NF-kB. In addition, TIPE2 knock out also caused downregulation of EGFR expression. Further, decreased proliferation, migration and clonogenic potential was observed in TIPE, TIPE2 and TIPE3 knocked out lung cancer cells even after treatment with tobacco components when compared to scramble control. Mechanistic studies revealed that these proteins are involved in tobacco mediated lung carcionogenesis through modulation of survivin, cyclin D1, XIAP, p53, p21, REDD1, caspase 9, LC-3B, c-myc, Akt1 and NF-kB which are involved in diverse cellular processes of lung cancer. Thus, these results clearly indicate TIPE family of proteins as potential biomarkers in the effective management of lung cancer. However, their potential in the in vivo as well clinical setting need to be evaluated.

Concomitant production of fatty acid methyl ester (biodiesel) and exopolysaccharides using efficient harvesting technology in flat panel photobioreactor with special sparging system via Scenedesmus abundans

Mahesh R1, Soumen kumar Maiti1 1 Department of Biosciences and Bioengineering, IIT Guwahati, India

E-mail: soumenkm@iitg.ernet.in

Current study focusses on the concomitant production of fatty acid methyl ester (FAME, biodiesel) and exopolysaccharides (EPS) from Scenedesmus abundans cell factory in flat panel photobioreactor using cost effective harvesting strategy. Parallel mini and medium scale flat panel photobioreactors (PBRs) with special gas sparging system enabling high gas to liquid mass transfer and efficient mixing were designed. Biomass titer of 6.9 g/l with overall biomass productivity of 1.2 g/l/day was achieved with constant high light intensity of 2162µE/m2/s in growth phase (134 h) using optimum nutrient concentration. FAME concentration of 1.53 g/l was achieved after 15 days of nitrogen deprivation condition with productivity of 67 mg/l/day. The EPS production of 236 mg/l with a yield of 37 mg/g biomass was achieved. The strain proved its capability to produce multiproducts simultaneously in a single stage PBR by natural autoflocculation harvesting technology.

Keywords -
Flat panel photobioreactor, Microalgae, Biodiesel, Exopolysaccharides, Autoflocculation, Mass transfer

Optimality of Papaya Drying Processes from Nutritional Perspective

Paushali Mukherjee1 , Ramgopal Uppaluri2 and Latha Rangan1 1 Department of Biosciences and Bioengineering, IIT Guwahati, India 2 Department of Chemical Engineering, IIT Guwahati, India

E-mail: paush174106041li@iitg.ac.in

The social and industrial fabric post globalization era is indicative of improved consumer lifestyle, rapid urbanization and high disposable income, all of which prompt towards ever increasing demands for ready-to-eat foods in the market. Papaya is abundantly produced in the North-east India and its ready-to-eat food applications are in niche. Raw and ripe fresh papayas constitute significant water content which prompts for their rapid spoilage. Drying through sun/oven/tray processes effectively reduces water content and enhances preservation through effective resistance towards microbial attack and post-harvest loss. Thereby, the return on investment can be increased significantly for the farmers through enhanced consumption of the dried fruit throughout the year. With moderate infrastructural availability in the region, oven and tray drying processes can be regarded as the most suitable and scalable processes for dried papaya production and ready-to-eat preserved papaya foods.
This work refers to unripe Papaya (Carica papaya L.) drying to effectively maximize retention of antioxidants and Vitamin C content in due course of the process. Both oven and tray drying processes have been optimized in terms of their process parameters (drying temperature and time) for constant sample thickness and fixed air velocity (tray dryer). For comparison purposes, fresh unripe and ripe papaya have been as well evaluated for the said parameters. Among both cases, the tray drying process provided maximum retention of nutritional parameters (antioxidant activity, vitamin c content and moisture content for an optimized drying temperature and time respectively). Thereby, it is apparent that drying is effective to retain the desired nutritional parameters which are highly relevant for medicinal purposes and food industry. These experimental findings are eventually utilized towards an effective ready-to-eat soup formulation with unripe papaya.

Development of an aptasensor for the detection Plasmodium lactate dehydrogenase

Smita Das, Prof. Pranab Goswami

Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati

Malaria is one of the significant health threats especially to the people of tropical and subtropical zones. According to the WHO World Malaria Report 2018, there were approximately 451000 deaths worldwide. Five known species of Plasmodium parasite are known to cause malaria of which P. falciparum is the most dreaded one causing severe illness and ultimately to death. The overuse of anti-malarial drugs such as artimisin has resulted into the development of drug resistant parasite. So early diagnosis plays an important role in preventing malaria associated mortality. Conventional techniques such as microscopy as well the more recent RDT's cannot detect malaria at submicroscopic level. Thus there is a need for a highly sensitive, rapid, portable, low cost detection system. Plasmodium falciparum lactate dehydrogenase (PfLDH) is a widely used biomarker in malaria detection mostly because of the marked differences of structural and kinetic parameters from the mammalian counterparts. We developed a DNA-aptamer based highly sensitive detection test for malaria using Plasmodium falciparum lactate dehydrogenase (PfLDH) as a target in an electrochemical transducer based detection platform. The 90 mer ssDNA aptamer (P38) was immobilized over glassy carbon electrode using graphene oxide as the immobilization matrix and the modified electrode was investigated for detection of PfLDH. The developed aptasensor when challenged with the target could detect as low as 0.5fM PfLDH. The specificity of the biorecognition system on the electrode was confirned voltametrically by measuring the NADH formed as result of enzymatic activity of PfLDH. The efficiency of the developed aptasensor in detecting the biomarker was found to be higher than the commercially available antibody specific pan malaria RDT. Studies on interference from some

common proteins, storage stability, repeatability and analysis of real samples demonstrated the practical application for detecting low parasitemia samples in yes/no format.

DNA methylation-dependent regulation of GPER1 expression in colon cancer cells: The role of the upstream CpG island

Sujasha Ghosh1 , Dr. Anil Mukund Limaye2 Department of Biosciences & Bioengineering, IIT Guwahati, India

E-mail: ghosh174106028@iitg.ernet .in

Endogenously produced estrogens play an important role in the regulation of normal physiology, aging and many disease conditions. Although the classical estrogen receptors (ERs) have traditionally been described as ligand-activated transcription factors which mediate genomic effects in hormonally-regulated tissues, recent studies have revealed that estrogens are also capable of stimulating rapid signaling events via membrane-bound receptors. The G protein-coupled estrogen receptor GPER1 (formerly known as GPR30) is the most recent entry to the list of membrane-associated ERs (mER) capable of inducing non-genomic estrogen signaling effects. Moreover, this mER is also garnering attention as a prognostic marker and potential therapeutic target in various cancers. Indicating its possible tumor-suppression role, studies suggest that a higher expression of this receptor correlates with better clinical outcomes for cancer patients, and this expression is reduced in the course of disease progression. The relevance of GPER1 in endocrine cancers in understandable, given estrogen's protective role. But surprisingly, significant levels of GPER1 expression in the colon and its down modulation in associated cancers have been observed. A previous publication from our laboratory has demonstrated the existence of an eight CpG dinucleotide-long Differentially Methylated Region (DMR) in the GPER1 locus in breast cancer cell lines. In this study, we investigate the effect of epigenetic modification in the silencing of this newly-found receptor via DNA methylation of that upstream CpG island across a panel of colon cancer cell lines.

Biocompatibility and anti-cancer activity analysis of pectic oligosaccharides produced from waste of Pineapple (Ananas comosus)

Vikky Rajulapati, Arun Dhillon and Arun Goyal
Carbohydrate Enzyme Biotechnology Laboratory,

Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India

Presenting author: E-mail: r.vikky@iitg.ac.in

Pectin is a complex polysaccharide found in primary plant cell walls. It is used as gelling agent or stabilizer in jams, jellies and other food products in food industry and also in healthcare and pharmaceutical industries [1,2].
Pineapple waste is a potential source of pectin. In this study, pectin from the waste peel of Pineapple (Ananas comosus) was extracted by Ultrasound Assisted Extraction (UAE) process [3]. The FESEM analysis of UAE treated and untreated fruit peel showed that the fruit peel sample was more porous than the untreated fruit peel sample. The extracted pectin from pineapple was characterised by FTIR, HPSEC, DSC-TGA, XRD and NMR analyses. FTIR and NMR analyses of extracted pectin showed esterified galacturonic acid residues. TGA showed thermal degradation at 248°C. XRD analysis revealed its crystalline nature. HPSEC analysis showed the molecular size, 73 kDa. The pectic oligossacharides were produced by using a pectate lyase (CtPL1B) from Clostridium thermocellum

[4]. HPLC analysis showed the action of PL1B on extratced pineapple pectin produced mainly DP2 oligosaccharide followed by DP1 and DP3. Anti-cancer activity of pineapple pectic oligossacharides was analysed. The viablity of colon cancer (HT29) cells after treatment with 1 mg/ml of pineapple pectin oligossacharides for 24h reduced by 13% and for 48h by 40%. Pectin is involved in induction of apoptosis and inhibition of galectin-3 receptor [5]. The microscopic observation of treated HT29 cells revealed the reduced proliferation, cell to cell contact and the change in cell morphology from undifferentiated to globular shape.

Key words: Pineapple waste, UAE process, Clostridium thermocellum, pectic-oligosaccharides, anticancer effect.

References

[1] D.R. Kashyap et al., Bioresour. Technol., 77(3) (2001) 215-227.
[2] P. Sriamornsak, Silpakorn Univ Int J., 3 (2003) 206-228.
[3] A. N. Grassino et al., Food Chem., 198 (2016) 93-100.
[4] Chakraborty et al., PLoS One., (2015) e0116787.
[5] Do Prado et al., Sci. Rep., (2017) 16564.

DEVELOPMENT AND CHARACTERIZATION OF ANTIBODY CONJUGATED BIODEGRADABLE POLYMERIC NANOPARTICLES SYSTEM FOR TARGETED PROSTATE CANCER THERAPY: IN VITRO AND IN VIVO STUDY

Ashique Al Hoque and Biswajit Mukherjee*

*Department of Pharmaceutical Technology, Jadavpur University, Kolkata-700032, India

Currently extensive research has been carried out to develop nano drug carriers, to overcome the lack of specificity of conventional chemotherapeutic agents for the treatment of prostate cancer, the second most common cancer in men. The aim of the present study is to develop and characterize PLGA nanoparticles (NPs) containing an anticancer agent, tagged with anti-Prostate specific membrane antigen (anti-PSMA) antibody. Their uptake in Prostate cancer cells (PC3) was also investigated. Nanoparticles were prepared by a multiple emulsion solvent evaporation method. Drug-excipients interaction, surface morphology, zeta potential and size distribution, cellular uptake were carried out using Fourier transform infrared spectroscopy (FTIR), Field emission scanning electron microscopy (FESEM), Zeta sizer Nano ZS90, particle size analyzer and confocal microscopy respectively. No chemical interaction was observed between the drug and the selected excipients. NPs had a smooth surface, and a nanosize range (250–380 nm) with a negative surface charge. Drug loadings of the prepared particles were 1.5%±0.02% weight/weight (w/w), 2.68%±0.5% w/w, 4.09%±0.2% w/w, 8.16%±0.58% w/w for NP1–NP4, respectively. A sustained drug release pattern was observed from the nanoparticles and they were internalized well in the PC3 cancer cells on a concentration dependent manner. Drug loaded nanoparticles were found to be more cytotoxic than the free drug and were taken up well by the PC3 cancer cell line in vitro. Thus the formulation might be suitable for the effective treatment of prostate cancer.

Keywords: PLGA Nanoparticles; Prostate Cancer; Anti-PSMA antibody.

References:

1. DeGrendele H, Jain VK. The anti-HER2 monoclonal antibody pertuzumab may be effective in androgen-independent prostate cancer. Clinical prostate cancer. 2003; 2(3):143-5.
2. Yan J, Wang Y, Zhang X, Liu S, Tian C, Wang H. Targeted nanomedicine for prostate cancer therapy: docetaxel and curcumin co-encapsulated lipid–polymer hybrid nanoparticles for the enhanced anti-tumor activity in vitro and in vivo. Drug delivery. 2016; 23(5):1757-62.
3. Cheng J, Teply BA, Sherifi I, Sung J, Luther G, Gu FX, Levy-Nissenbaum E, Radovic-Moreno AF, Langer R, Farokhzad OC. Formulation of functionalized PLGA–PEG nanoparticles for in vivo targeted drug delivery. Biomaterials. 2007; 28(5):869-76.

4. Sinha B, Mukherjee B, Pattnaik G. Poly-lactide-co-glycolide nanoparticles containing voriconazole for pulmonary delivery: in vitro and in vivo study. Nanomedicine. 2013; 9(1):94–104.

Study on Differentiate Procedure of Alkaline Phosphatase Test by Conventional Colorimetric Method and Optimized Standard Method in Pasteurized Milk

A. Avra Pratim Chowdhury1, B. Mohammad Abul Manchur2, C. Kazi Mohammad Rokonuddin3
Citations:
1. Ph.D. Research scholar, Dept.of Botany, Gauhati University, Assam, India.

(Mail: avranu132@gmail.com) E-mail: abc.author@iitg.ernet.in

In order to determine pasteurized milk, one of the enzymes milk phosphates, is measured. A negative phosphates' result indicates that any pathogenic bacteria have been destroyed during pasteurization. If it is positive, it means the pasteurization process was inadequate and the milk may not be safe for human consumption and will have a short shelf life. In conventional method the milk samples are diluted with buffer at pH 10.2 and incubated at the temperature at 37ºC for 2hrs.Any alkaline phosphates present in the milk samples will liberate Para nitro phenol from artificially added disodium p-nitrophenyle phosphate which can be compared with the standard color disc. There are differences for measuring the phosphatase activity in between conventional method and Optimized Standard Method. So Chowdhury AP1 et.al., applied " Optimized Standard Method" according to the recommendation of the German clinical chemistry association (Deutsche Gesellschaft fur Klinische Chemie, DGKC) at the purpose of showing its better performance than conventional procedure with in short time.

Objectives: Study on differentiate Results of ALP analysis from Milk samples (Raw, Pasteurized and UHT) distinguishing between conventional method and newly applied DGKC method.

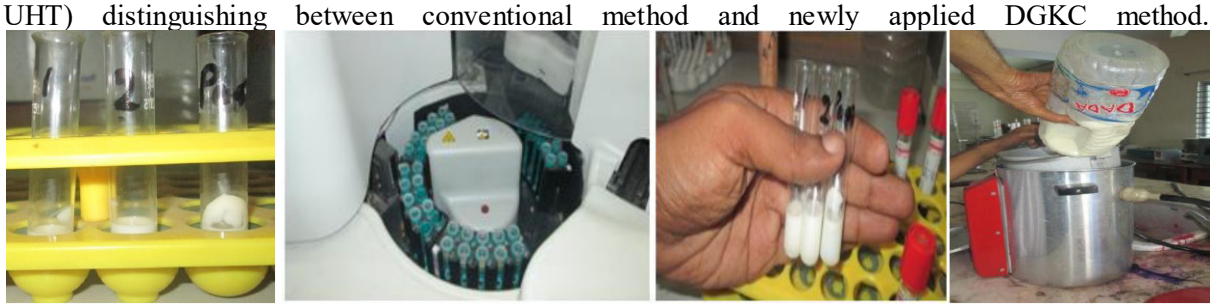


Figure: 1.a Samples for ALP analysis 1.b Samples setup for ALP analysis (DGKC) 1.c Synchronization of Samples 1.d Pour on milk in Home Pasteurizer

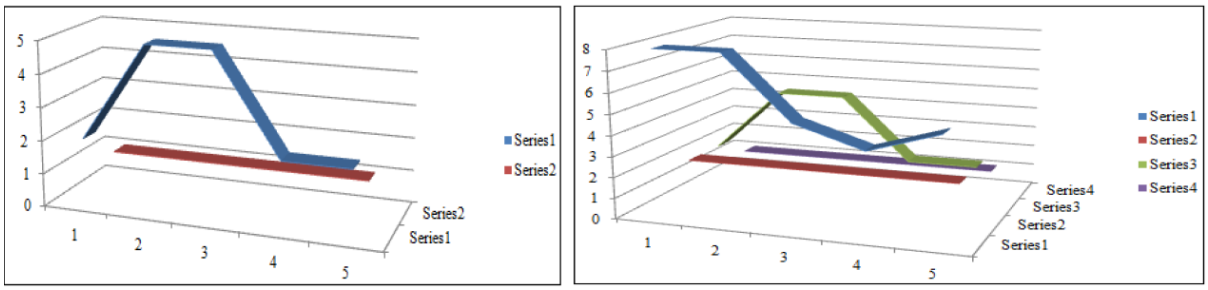


Figure: 2.a Fluctuation of ALP values in Optimized Method (Seres1) accordance with time 1hrs (Seres2) 2.b Comparative study of parameter (ALP values) in Conventional Method (Seres1) accordance with time 2hrs (Seres2) and Optimized Method (Seres3) accordance with time 1hrs (Seres4).

References
[1]Chowdhury AP, et al., (2015), International Journal of Science and Research (IJSR). P:1029-1039 (Paper ID: NOV164207, http://dx.doi.org/10.21275/v5i6.NOV164207)
[2]Cunniff, P. 1995. 16th Ed. Official method of Analysis: Association of Official Analytical Chemists. Washington DC.
[3]De Angelis, M., Di Cagno, R. Gallo, G. Curci, M. Siragusa, S., Crecchio, C., Parente, E. and Gobbetti, M 2007. International Journal of Food Microbiology 114:
[4]Desbourdes,C.and Nicolas M.2008. Discussed about "Phosphatase activity in cheese" 11th Workshop of the EURL for Milk and Milk Products.
[5]Eklund, C. and Lankford, C.E. 1967. Laboratory Manual for General Microbiology.Prentice Hall, Inc Englewood Cliffs, New Jersey, pp. 51-55.
[6]Fernandez-del-pozo,B., Gaya, P., Medina, M. Rodriguez-Marin, M.A., Nunez, M. and Fernandex-del, P.B. 1988. J. Dairy Res. 55(3): 449-455.
[7]Florez, A.B., Delgado, S. and Mayo, B. 2005. Antimicrobial susceptibility of lactic acid bacteria isolated from a cheese environment. Can. J. Microbiol. 51 (1): 51-58.

Prospects of Aeroponics for Seed Production in North-East India.

Madhuryya Mohan Khanikar * and Bhaswati Sarmah
Assam Agricultural University, Jorhat-13,Assam

Email: madhuryyak7@gmail.com ; Ph:(+91) 9365162563

Driven by the dire need for food and an all-around drought-like situation in several places with failing rains and a depleting water table, researchers have been trying various methods of farming to increase crop yield with minimum investment and water requirement. Aeroponics is the process of growing plants in an air or mist environment without the use of soil or an aggregate medium (known as geoponics). The word "aeroponic" is derived from the Greek meanings of aer ("air") and ponos ("labour"). Aeroponic culture differs from conventional hydroponics; which uses a liquid nutrient solution as growing medium and essential minerals to sustain plant growth, aquaponics; which uses water and fish waste, and in-vitro (plant tissue culture) production with a growing medium. However, most of these techniques have limitations due to the inadequate aeration of the root. To begin with, aeroponics technology offers higher yields per plant, and, in the long-term, at a significantly lower cost. Aeroponic systems require much less water and fewer fertilizers than conventional systems; however, the initial set-up cost to install the system is higher. The aeroponic seeds grow roots hanging in complete darkness (in dark plastic bags) and are nourished by a spray system. They are free from infectious disease and produce up to five times more seeds than conventional techniques. Since there has been a considerable decrease of agricultural soils in the world, the "soil-less method" is an important production alternative in urban and peri-urban areas, and particularly in developing countries affected by climate change since this method is adaptable to any climate. In this system, around 6,000 litres of water would be enough to cultivate 900 kg of vegetables a day. Water would be sprayed intermittently at the root of the crops the whole day while the crops absorb only 2,000 litres as a top up, and the remaining water can be recycled. The net result is a 10-time higher yield from one unit area, which justifies the capital investment. Aeroponics yield higher production using fewer natural resources and no harmful chemicals compared to conventional methods; this efficiency is win-win for the environment and producers. Though this type of farming already exists in developed countries, it is yet to get popularized in the agricultural system of India and particularly in the North-East regions.

In-silico evaluation of structurally critical fragments in HopS2 effector protein

Sapna Mayuri Borah1 and Anupam Nath Jha1 1Department of Molecular Biology and Biotechnology, Tezpur University, India

E-mail: sapna@tezu.ernet.in, anjha@tezu.ernet.in

While Type III secretion-system (T3SS) serves for a set of pathogen functions, the most notable ones include its use as nano machineries in gram-negative bacteria that facilitate the translocation of effector proteins from bacteria into their host. These effector proteins are potential targets to control the pathogenicity conferred to the bacteria. However, the task to disrupt the cellular machinery through effector protein targeting fails due to lack of concrete sequence-structure-function relationship for these set of effector proteins. Therefore, in the current work we have focussed on understanding such relations of an effector protein, HopS2 secreted by the phytopathogen Pseudomonas syringae pv. tomato DC3000. The study has helped in the mining of some critical regions in the selected effector protein via a bioinformatics approach. The presence of the important regions in HopS2 is validated with the occurrence of the same in other functional parts of Hop family proteins. In order to confirm the stability of these regions in 3D-organisation, we performed an ab-initio structure prediction of the protein followed by 100 ns long molecular dynamics (MD) simulation. Eight separate predicted models are simulated to analyse the dynamics and stability of the structures in the three dimensional space over time. The overall analysis has provided essential insights on vital functional regions that may be vital to the effector functioning. In dearth of ample experimental evidence, such a bioinformatics approach has helped in the revelation of a few structural regions which can further be validated by experimental proceedings.

References:

1. Guo M, Tian F, Wamboldt Y, Alfano JR: The majority of the type III effector inventory of Pseudomonas syringae pv. tomato DC3000 can suppress plant immunity. Molecular Plant-Microbe Interactions 2009, 22(9):1069-1080.
2. Coombes BK: Type III secretion systems in symbiotic adaptation of pathogenic and non-pathogenic bacteria. Trends in microbiology 2009, 17(3):89-94.
3. Borah SM, Jha AN: Identification and analysis of structurally critical fragments in HopS2. BMC Bioinformatics 2018. (Accepted).

BIOPROSPECTING OF MARINE RESOURCES FOR BIOPOLYMER PRODUCTION

1Sourish Bhattacharya, 1Dinesh Ramalingam, 2Surajbhan Sevda, 1Sandhya Mishra,

1Division of Biotechnology and Phycology, CSIR-Central Salt and Marine Chemicals Research Institute, Bhavnagar, 364002, Gujarat, India.
2Department of Biological Sciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati-781039, India.

West coast of India can be considered as an important area for collecting diverse marine microorganisms with biopolymer producing capacity. In this attempt, 200 marine isolates from the west coast of India was obtained, out of which one strain CSMCRI's Bacillus licheniformis PL26 was found to be potential for producing ε-polylysine and polyhydroxyalkanoate simultaneously in the same fermentation medium. The PHA produced by Bacillus licheniformis was found to be poly-3-hydroxybutyrate (P3HB). Further, in order to improve the ε-polylysine production, the carbon source was replaced with glucose which yielded 1.2 g L-1 ε-polylysine as oxygen transfer rate is very low in the medium containing crude glycerol. Further, an advanced modelling and optimization technique was applied to optimize medium parameters for enhanced ε-polylysine production by marine

bacterium Bacillus licheniformis. The critical nutrients including glucose, yeast extract, magnesium sulphate, and ferrous sulphate were incorporated in artificial neural networks (ANN) as input variables and ε-polylysine as the output variable. The ANN topology of 4-10-1 was found to be optimum upon training the model with feed-forward back propagation algorithm and on application of the developed model to particle swarm optimization resulted in 3.56 ± 0.16 g L-1 of ε-polylysine under the following optimal conditions: glucose, 34 g L-1; yeast extract, 2.3 g L-1; magnesium sulphate, 0.44 g L-1 and ferrous sulphate, 0.08 g L-1. Thus, this optimization technique could significantly improve ε-polylysine by 196.7 %, as compared to the un-optimized medium.

Key words: Biopolymer, Marine Microorganisms, Poly-3-Hydroxybutyrate, Artificial Neural Networks.

Corresponding Author
Dr. Sourish Bhattacharya
Email: sourishb@csmcri.res.in
Cell: +91-8017750689

Seed Assistant OSDA Free Mordenite Synthesis for Carbohydrate Conversion to Value Added Chemicals

Bharath V1 , and N R Peela1 1 Department of chemical engineering, Indian Institute of Guwahati, Guwahati, Assam- 781039, India

E-mail: bharathv@iitg.ac.in; peelanr@iitg.ac.in

5-HMF was considered as the platform chemical for the production of plastics, fine chemicals. HMF can be transformed into levulinic acid, formic acid, biofuels like 2,5-dimethylfuran and other alkanes. HMF has been produced by various catalysts like HCl, acid based catalysts, metal encapsulation into the zeolites, Ionic liquids, etc. In this work, 5-HMF was produced using a heterogeneous catalyst. Mordenite is a zeolite with parallel 12 membered ring (MR) and 8 MR channels. This is one of the important zeolites and best catalyst used by the petroleum industry for various reaction like methanol conversion, etc. Here the work explains the efficient method of Mordenite synthesis (i.e., conventional seed assistant method where the target and seed have the same crystal structure). The synthesised catalysts were tested for carbohydrate conversion of Glucose to 5-HydroxyMethylfurfural (5-HMF). Varies parameters were studied such Si/Al ratio, Si/Na ratio, starting precursors, Aging time to identify their effects on the crystal structure formation and acid sites strength. Catalysts were thoroughly characterized using XRD, Py-FTIR, TGA, FESEM, FETEM, N2 sorption techniques. These synthesised catalysts were tested to investigate their effects on glucose dehydration. The efficient way of conversion of glucose to 5-HMF using the synthesized Mordenite zeolite in a process intensified method. The highest conversion was observed for smaller particle size silica precursor and lower Si/Al ratio. Highest selectivity of 5-HMF was achieved with ageing samples. This work concludes that conversion and yields can be improved by incorporating the mesoporosity with efficient acidity.

DROP SIZE CHARACTERISTICS OF GAS-LIQUID-LIQUID DISPERSION IN A DOWN FLOW GAS-LIQUID-LIQUID CONTACTOR

Bharath Kumar Goshika 1 and Subrata Kumar Majumder 1

1 Department of Chemical Engineering, Indian Institute of Technology Guwahati, India

E-mail: goshika@iitg.ernet.in, skmaju@iitg.ernet.in

As gas-aided liquid-liquid process has advantage over non-gas-aided process, it is gaining importance as a simple and inexpensive means of achieving mass transfer. In order to increase the efficiency of columns, the contact time between the two liquid phases should be increased without any back mixing. The efficiency of column can be increased by introducing an inert gas (air, nitrogen, oxygen) as a mixing agent in the two-phase liquid-liquid (L-L) system. The gas-liquid-liquid downflow three-phase contactor has the advantage by dispersing gas and lighter liquid into the contactor in a continuous denser phase without any requirement of external power. Drop size characteristics have significant impact on altering the mass transfer coefficients, as well as hydrodynamics in the downflow contactor. In the present study the drop size characteristics and Sauter mean drop diameter in gas-liquid-liquid downflow contactor are studied. Drop size characteristics are studied using Paraffin liquid-water and Kerosene-water in the gas-liquid-liquid downflow contactor. A schematic diagram of downflow gas-liquid-liquid contactor is shown in Fig. 1.

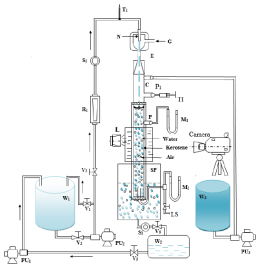


Figure 1: Schematic diagram of experimental column

The variation of drop size with fixed secondary lighter liquid volume at different gas flow rates is studied. It is observed that the Sauter mean drop diameter is decreased with jet velocity and decreases with increase in gas velocity. An empirical correlation was developed for Sauter mean drop diameter which is in good agreement with experimental value. The study of the drop size in the downflow contactor may give insight into a further understanding and modelling of the three-phase flow characteristics in industrial applications.

Keywords: Three-phase; downflow; gas-liquid-liquid; drop size; dispersion

Refrences -

S. K. Majumder, Analysis of dispersion coefficient Analysis of dispersion coefficient of bubble motion and velocity characteristic factor in down and up flow bubble column reactor. Chem. Eng. Sci., 63: 3160-3170, 2008.

S. Lu, Z. Mia, L. Wang, Y. Wang, Z. Zhu, and S. Fu. Experimental investigation and simulation of gas–liquid–liquid reactive extraction process for the production of hydrogen peroxide. Chem. Eng. Sci., 60: 6298 – 6306, 2005.

Unsteady State Approach for Characterization of Forward Osmosis Membrane and Experimental Error Minimization

Habtom Teklu* and Senthilmurugan Subbiah
Department of Chemical Engineering, Indian Institute of Technology, Guwahati – 781039, India
Email habtom@iitg.ac.in

Membrane characterization is a science that helps in improving the preparation and design of membrane and membrane processes, and the overall system related to membrane properties. Different membranes require different characterization techniques. In this study, dynamic membrane characterization method is used for open circulatory Forward Osmosis (FO) process. The estimated model parameters were mass transfer coefficients (kf and kd), solute and water permeability coefficient (B and Lp), solute reflection coefficient (σ), and solute resistivity (K). The membrane parameters were estimated by minimizing the error between experimental and model results using Modelica language in Dymola software. Error minimization during solvent flux estimation was done by incorporating the rate of water evaporation from the surface of both draw solution (DS) and feed solution (FS). Neglecting the evaporation loss from the solution tank could add significant errors in the estimated membrane transport parameters. For instance, for the case where water evaporation is not considered, the percentile errors for steady state model in water and salt permeability coefficients were 391 % and -7 % respectively in comparison to unsteady state model. In addition to this, the model parameter errors were also found to vary with both FS and DS flow rates, concentration and volume. The proposed model equations are able to predict the mass and concentration variations of the solutions in the tank with maximum relative errors of 0.37 % and 5.69 % respectively.

Hemodynamics in a three-dimensional curved pipe: velocity distribution and secondary flow dynamics

Mahesh Nagargoje and Raghvendra Gupta
Corresponding author: guptar@iitg.ernet.in

Department of Chemical Engineering, Indian Institute of Technology Guwahati, Assam-781039.

Understanding the blood flow dynamics properties in a curved pipe is important for biomechanics of aorta (which supplies blood flow from heart to all body parts). The flow structure in a curved channel is very complex because of presence of secondary flow. We investigated this hemodynamic complexity in a bend channel by solving steady three-dimensional Navier-Stokes equation using ANSYS Fluent 15. We observed secondary flow vortex i.e. Dean vortices are function of bend angle and flow Reynolds number along the channel. We proposed a relation between vortex size with the Reynolds number and bend angle.

Reference:

1. Matsumoto D, Fukudome K, Wada H, Matsumoto D, Fukudome K, Wada H. Two-dimensional fluid dynamics in a sharply bent channel : Laminar flow , separation bubble , and vortex dynamics Two-dimensional fluid dynamics in a sharply bent channel : Laminar flow , separation bubble , and vortex dynamics. Phys Fluids. 2016; 28, 103602.
2. Shusser M, Ramus A, Gendelman O. Flow in a Curved Pipe With a Sudden Expansion. J Fluids Eng. 2016; 138.

Copper based bimetallic catalyst with low CO selectivity for methanol steam reforming

Punampriya Borgohain1*, Pankaj Tiwari1 and Rajesh Kumar Upadhyay1
1Department of Chemical Engineering, Indian Institute of Technology Guwahati-781039

Email:punam176107013@iitg.ac.in

Methanol steam reforming is one of the most promising technique for onboard hydrogen production particularly when integrated with Proton Exchange Membrane Fuel Cells (PEMFCs). However, PEMFC requires ultra-pure hydrogen (purity more than 99.99 %) with CO content less than 10 ppm. Further, PEMFC operates at low temperature hence, a low temperature reforming reaction is more suitable for integration. Steam reforming of methanol can provide hydrogen stream at low temperature with low CO content. Theoretically zero CO content hydrogen stream is also possible from steam reforming of methanol if the selectivity of catalyst is higher towards methanol reforming reaction. However, most of the catalyst reported in the literature yields relatively high CO content (due to methanol decomposition or reverse water gas shift reactions) and operates at relatively higher temperature (~300 to 400 °C). In this work a highly active catalyst which is capable of operating at low temperature (200-300°C) and having low CO selectivity (<10 ppm) has been synthesized, characterized and tested. Copper based bimetallic catalyst was prepared by co-precipitation method and characterized by Energy Dispersive X-Ray (EDX), Brunauer Emmett Teller (BET), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM) and X-Ray Diffraction (XRD). The prepared catalyst was tested in the temperature range of 150-350 °C, pressure 1-3 bar and with variable steam to methanol (S/M) molar ratio.

Keywords: Methanol steam reforming, hydrogen production, copper based bimetallic catalyst, Proton exchange membrane fuel cells.

Electric Field Mediated von Kármán Vortices in Stratified Microflows: Transition from Linear Instabilities to Coherent Vortices

Satarupa Dutta,*1 Partho Sarathi Gooh Pattader,1,2 Dipankar Bandyopadhyay*1,2

1Department of Chemical Engineering, Indian Institute of Technology Guwahati, 781039, Assam, India.
2Centre for Nanotechnology, Indian Institute of Technology Guwahati, 781039, Assam, India

*Corresponding author: satarupa.dutta@iitg.ac.in, dipban@iitg.ac.in

The electrohydrodynamic instabilities of the stratified flow of a pair of miscible fluids inside microchannels have been investigated. Application of a direct current electric field potential across the flow helps in the development of interesting convective instabilities beyond a threshold field intensity. The onset conditions for these instabilities have been predicted by an Orr-Sommerfeld analysis, which reveals the presence of five distinctive finite-wavenumber modes under varied conditions. While the much shorter wavelength electric field modes, namely, E-I-mode and E-II-mode, manifest beyond a critical value of electric field Rayleigh number ( ), a more conventional longer wavelength viscous (V-mode) appears in the interfacial region due to the viscosity stratification of the layers. Beyond a critical value of Schmidt number (Sc) a diffusive mode (D-mode) of instability is also observed at the mixed interfacial region owing to the convective transport of the perturbed concentration. Contrast of ionic mobility in the fluids leads to the appearance of the K-mode of instability at much shorter wavelengths.

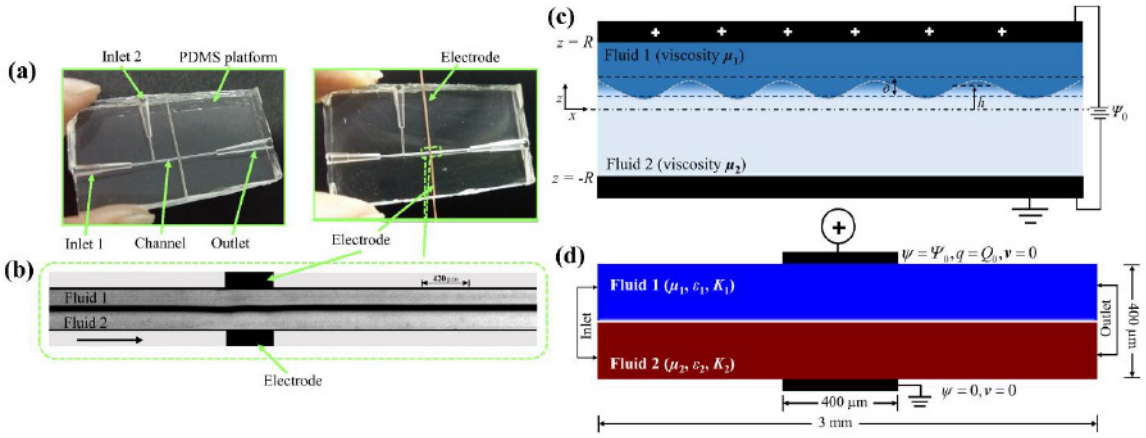


Fig. 1. Image (a) shows the top-view of the experimental microchannel on a PDMS platform. Image (b) shows the experimental micrograph of the top view of the of the region marked in the image (a). Fluids 1, and 2 formed a stratified flow in the channel (side by side), and were subjected to an electric field via copper wire electrodes. The arrow in image (b) indicates the direction of the flow. The average Re of the flow was maintained at 0.5. (c) Schematic illustration of the theoretical framework for linear stability analysis. (d) The computational domain for the non-linear CFD stimulations.

Experiments uncover distinctive instability regimes with an increase in electric field Rayleigh number ( ) – linear-onset regime, time-periodic non-linear regime analogous to von Kármán vortex street at the downstream, and a regime with coherent flow patterns. The experiments also reveal that such linear and nonlinear instabilities can be stimulated non-invasively in a microchannel to mix or de-mix fluids simply by turning the electric field on or off, indicating the suitability of the process for on-demand micromixing. The reported phenomena can be of significance in the domains of microscale mixing, pumping, heat-exchange, mass transfer, and reaction engineering.

References:
1. Sahu, K. C. & Govindarajan, R. 2016 Linear stability analysis and direct numerical simulation of two-layer channel flow. J. Fluid Mech. 798, 889–909.
2. Zhang, M. 2016 Weakly nonlinear stability analysis of subcritical electrohydrodynamic flow subject to strong unipolar injection. J. Fluid Mech. 792, 328–363.
3. Dutta, S., Ghosh, A., Pattader, P. S. G. & Bandyopadhyay, D. 2019 Electric Field Mediated von Kármán Vortices in Stratified Microflows: Transition from Linear Instabilities to Coherent Mixing. J. Fluid Mech.

Fouling studies on Graphene Oxide membrane: A Molecular Dynamics study

Shivam Tiwari1, Abhijit Gogoi2, Anki K Reddy1

1Department of Chemical Engineering, Indian Institute of Technology Guwahati, Guwahati - 781039, India
2Department of Mechanical Engineering, Indian Institute of Technology Guwahati, Guwahati- 781039, India

Graphene Oxide (GO) has emerged as a futuristic water desalination membrane material because of its amazing salt rejection and water permeation properties. GO has also exhibited excellent antifouling performance in recent experiments. Therefore, it will be interesting to see GO in action at the microscopic level. Here we use molecular dynamics simulation to investigate the interaction between GO and bovine serum albumin (BSA) as a model foulant in the presence and absence of excess ions (seawater concentration). The presence of excess ions was found to affect the GO-BSA interaction, BSA being diffused away from the GO surface. Adsorption of negatively charged chlorine atoms on GO surface screened the interaction between GO and BSA and repelled the negatively charged protein away from the surface. The study provides molecular insight into the membrane fouling mechanism, which may lead to improved membrane design in the future.

Adsorption of hexavalent chromium from aqueous solution by water - caltrop shell

A. Shravan Kumara, N. Selvarajub*, R. Prasanna Venkatesh a*

aDepartment of Chemical engineering, Indian Institute of Technology Guwahati- 781039, Assam, India. bDepartment of Biosciences and Bioengineering, Indian Institute of Technology Guwahati- 781039, Assam, India.

Email: shravan.k@iitg.ac.in , selva@iitg.ac.in, rprasanna@iitg.ac.in *corresponding author

The discharge of substantial amount of chromium from steel, lather, electroplating and painting industries will lead to water pollution [1]. The presence of chromium in water beyond the threshold limit causes several issues to mankind. Therefore, removal of chromium from industry effluents prior to disposal in environment received a great deal of attention among researchers [2]. In this study, water caltrop (WC) shell was used as a potential biosorbent to evaluate it's feasibility on removing the hexavalent chromium from synthetic solution. The morphology of WC shell was characterized by FESEM and porosity was measured by adsorption of N2 at 77 K. FTIR spectroscopy was carried out over the range of 400 to 4000 cm-1 to analysis the functional groups responsible for bonding the Cr(VI) on WC shell. Biosorption experiments were performed

in batch mode to study the effect of some parameters in biosorption such as adsorbent dose, pH, contact time and initial concentration of Cr(VI) metal. The results of isotherm modelling and kinetics modelling indicate that the experimental data fits better with Langmuir isotherm and pseudo-second order kinetic model. The maximum biosorption capacity of WC shell was found to be 98.04 mg/g at an optimum pH 2 of solution. The results of the thermodynamic parameter study suggest that biosorption process was spontaneous and random in nature. This study reveals that WC shell can be used as low cost biosorbent for the Cr(VI) removal from synthetic solution under the considered condition.

1. Bhuiyan, A. B., Mokhtar, M. B. , Toriman, M. E. , Gasim, M. B. , Ta, G. C. , Elfithri, R., Razman, M. R., (2013).The environmental risk and water pollution: a review from the river basins around the world. American- Eurasian Journal of Sustainable Agriculture, 7(2), 126-136.

2. Rai, M.K. , Shahi, G. , Meena, V., Meena, R. , Chakraborty, S. , Singh, R.S. , Rai, B.N., (2016). Removal of hexavalent chromium Cr (VI) using activated carbon prepared from mango kernel activated with H3PO4. Resource-Efficient Technologies 2 , S63–S70.

Silica Nanoparticle suspended Inorganic Alkaline flooding for Enhanced Heavy oil recovery.

Vikas Kumar sharma1, Nazrul Haque 2, Pankaj Tiwari 1 and Anugrah Singh 1.

1 Department of Chemical Engineering, IIT Guwahati, India 2 Department of Mechanical Engineering, IIT Guwahati, India

E-mail: vikas176107010@iitg.ac.in

Alkaline flooding is one of the chemical EOR methods, which has great potential to enhance heavy oil recovery, especially in acidic crude oil. This technique is effective because when the alkaline solution is injected in the reservoir; it reacts with the acid component of crude oil which leads to in-situ surfactant Generation at the interface. This surfactant reduces the interfacial tension which assists in the formation of a water-oil emulsion. This emulsion will have the viscosity higher than water as well as crude oil. So alkaline flooding reduce the problem of viscous fingering and thereby sweep efficiency increases which is the main cause for Enhanced heavy oil recovery.

Although some of the authors used the nanoparticles for EOR purpose but still the Role of Nanoparticles in enhancing the Heavy crude oil recovery is not well understood microscopically. So, in this paper, Silica Nanoparticle suspension in the inorganic alkaline solution was used to enhance Heavy oil recovery. As an inorganic Alkali sodium Hydroxide (NaOH), sodium bicarbonate ( ) and a combination of both was used in Deionized water. Effect of Nanoparticles was investigated on PH, rheological behavior, interfacial tension, emulsification and wettability alteration in enhancing the heavy oil recovery. A silicon-based porous 2D microfluidic device fabricated using soft lithography was utilized for qualitative assessment of displacement mechanism of silica nanoparticle assisted alkaline flooding to understand Pore-scale phenomena such as water oil emulsion formation, interfacial tension reduction, viscous fingering, inter-pore, intra-pore bridging of oil and pore wall transportation, etc.

The porous micromodel comprising of regularly spaced cylinders constructed with Polydimethylsiloxane (PDMS) was utilized to understand the pore-scale flow field using micro-Particle image Velocimetry (M-PIV) technique. The velocity vector field was obtained at different locations in Micromodel to understand the fluid flow dynamics quantitatively. Therefore the aim of the paper is to perform rheological analysis, PH analysis, emulsification tests, interfacial tension, wettability test, and Micro-PIV analysis to understand the significance of Nanoparticles in heavy oil recovery and investigating the microscopic displacement mechanism using micromodel.

Keywords: Alkaline flooding, Nanoparticles, wettability, emulsification, Heavy oil.

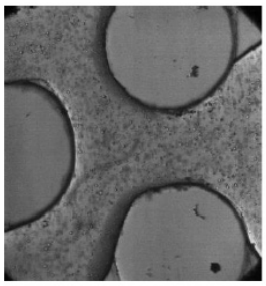


Fig (Fluid flow in micromodel)

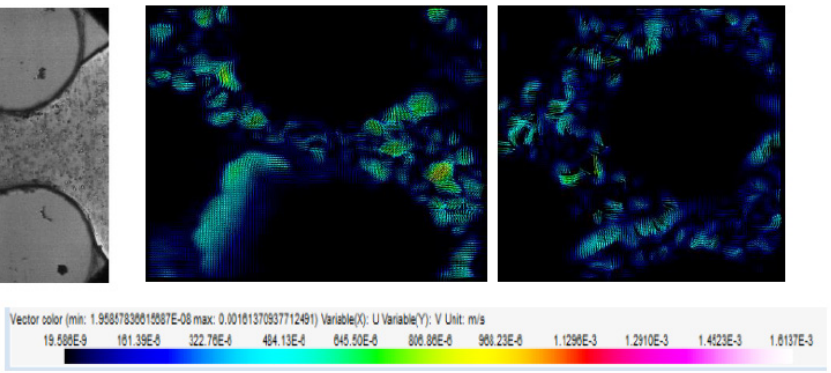


Fig (velocity vector field at different locations in micromodel)

REMOVAL OF FLUORIDE CONTENT IN WATER USING ACTIVATED CARBON AS ADSORBENT PREPARED FROM Aegle marmelos FRUIT SHELL

A. Malavika Aji1, B. Amal Basheer1, C. Haritha V1, D. Sony K Cherian1, E. Shamnamol G K
1. Department of Biotechnology and Biochemical Engineering, Sree Buddha College of Engineering, Pattoor, Kerala, India

E-mail: gkshamna@gmail.com

Fluoride is an ionic form of the element fluorine. Presence of fluoride beyond the permissible limit (>1.5 ppm) in drinking water is harmful and causes health hazards like dental and skeletal fluorosis. Considering the range of health effects associated with high levels of fluoride, decontamination of polluted water by fluoride adsorption using activated carbon was investigated. Precursor used for the synthesis of micro porous (<2 nm) activated carbon was a lignocellulosic waste material from a feasible plant precursor i.e., Aegle marmelos fruit shell (Bael fruit shell).Lignin and cellulose content of the precursor were determined and it shows that bael fruit contain high cellulose content. Chemical activation of the precursor was done using phosphoric acid and potassium hydroxide. The study was made by varying the acid concentration, activation temperature, and holding time and the effect was determined in terms of yield and iodine number. Optimum conditions for the preparation of activated carbon was 30% phosphoric acid impregnation and carbonisation at 400oC for 1hr. Characterization of the synthesized activated carbon was done with respect to proximate analysis, pH, yield, iodine number, methylene blue number, SEM, FTIR, and XRD and the results proved that the activated carbon prepared from bael fruit shell is highly microporous in structure. The removal efficiency of fluoride ion was investigated using batch studies by varying the parameters such as dosage, pH and contact time and it was found that efficiency was more than 80% and the optimum conditions are 2g/l adsorbent dosage at a pH of 7 for a contact time of 60 min and the residual fluoride concentration was 1 mg/l which is below the prescribed limit of WHO. The equilibrium adsorption data are modeled with Langmuir adsorption isotherm and the values of qm, b and correlation coefficient (R2 = 0.9461) shows that the adsorbent fitted Langmuir isotherm.

Keywords: Groundwater, Fluoride content, Aegle marmelos, Activated Carbon, Adsorption, Adsorbent dosage

References:

1. Gottipati, R. and Mishra, S., 2016. “Preparation of microporous activated carbon from Aegle Marmelos fruit shell and its application in removal of chromium (VI) from aqueous phase”. Journal of Industrial and Engineering Chemistry, 36, pp.355-363.
2. Pratibha R.Gawande., Dr.Jayant Kaware., November 2017. “Characterization and activation of coconut shell activated carbon, Research Paper”. International Journal of Engineering Science Invention, Vol. 6, Issue 11, pp. 43-49.

3. Manisha Poudyal, Sandhya Babel, 2015. “Removal of Fluoride using Granular Activated Carbon and Domestic Sewage Sludge”. International Conference on Informatics, Environment, Energy and Applications, Vol.82, pp. 139-143.

Study of thermal behaviour and product characterization of almond shell pyrolysis for bio-energy generation

Neha Shukla, Goutam Kishore Gupta, Monoj Kumar Mondal

Department of Chemical Engineering and Technology, Indian Institute of Technology, Banaras Hindu University, Varanasi,221005, India

Energy from biomass now is being considered as future renewable fuel and thus in this study almond shell (AS) was pyrolysed for the production of biofuels (bio-oil, biochar and pyrolytic gas). Thermal degradation characteristics of AS by TGA revealed the abundance of volatile matter and thus pyrolysis experiments were performed in the temperature range of 300 to 700 °C in a packed bed reactor system under continuous current of nitrogen. Bio-oil yield increase with temperature, whereas biochar yield decreased continuously. Physicochemical properties (appearance, viscosity, density, carbon residue, pH and HHV) of bio-oil were determined whereas the chemical properties were inspected by FTIR and GC-MS. Proximate, ultimate, HHV, FTIR, SEM-EDX, BET surface area and XRD analysis was used for the biochar characterization. Non-condensable gases evolving out from the outlet were analyzed by gas chromatography and amount of H2, CH4, CO and CO2 were determined. According to above results bio-oil can be upgraded to be utilized as biofuel or it can be a source of valuable chemicals, biochar can serve triple purpose as efficient solid fuel, in soil amendment or in waste water treatment as it has very high BET surface area. Pyrolytic gases has significant amount of methane, hydrogen and carbon monoxide that grants excellent combustion properties.
Keywords: Almond shell; pyrolysis; biofuel; bio-energy.

Studies on Zinc based Air-breathing Fuel Cell

Thanmayee Shastrya, Hiralal Pramanika*

aDepartment of Chemical Engineering & Technology, Indian Institute of Technology (Banaras Hindu University), Varanasi, U.P., India

*Corresponding author Email id: hpramanik.che@itbhu.ac.in

A Zinc (Zn) based air breathing fuel cell was developed to generate electricity. High surface metal zinc was used as fuel at anode and oxygen/air was used as oxidant at cathode. The metal Zn was connected with a wire to collect the electron from the Zn anode and supply to the air breathing cathode side for reduction reaction. The electrolyte of different concentration was used at anode chamber. The air-breathing cathode was fabricated using MnO2 as cathode electro- catalyst. The cathode was pasted on a Polyvinyl alcohol (PVA) based alkaline membrane using hot pressing at a temperature of 80 oC for 1 minute. The various operating parameters like different temperature and concentration of electrolyte were studied to achieve maximum power output. Experiments were performed at various concentrations, e.g., 2 M, 3 M, 4 M, 5 M, 6 M, 7 M of KOH electrolyte. The temperature of the cell was for varied from 30 oC to 70 oC. The optimum concentration of electrolyte was 4 M KOH solution. The optimum temperature was found out to be 60 oC. The maximum current density of 15 mA/cm2 and power density 9.9 mW/cm2 was obtained at optimum concentration of 4 M KOH for MnO2 at a temperature of 60 oC.

Fatty Amine Conjugated Cationic Bovine Serum Albumin Nanoparticles Exhibit Antifouling and Target-Specific Hydrophobic Doxorubicin Delivery Properties

Abhishek Saha,§,† Nirmalya Pradhan,§,† Rakesh Singh,‡ Vishal Trivedi,*,‡ and Debasis Manna*,†

†Department of Chemistry, Indian Institute of Technology Guwahati, Assam 781039, India.
‡Department of Bioscience and Bioengineering, Indian Institute of Technology Guwahati, Assam 781039, India.

KEYWORDS: Antifouling • cationic BSA nanoparticles • fatty amine conjugation • sustained release • target specific drug delivery

The development of suitable drug delivery systems (DDS) can improve the efficacy of chemotherapeutic approaches. Protein based nanostructures has reformed the nanoscience and nanotechnology on the account of their smaller sizes and greater surface areas, which instigates their interactions with other molecules. The protein nanoparticles (NPs) have better biocompatibility, biodegradability and also have the easy access for additional surface modifications. These NPs have been successfully used as drug delivery system with increased bioavailability and reduced toxic side effects of the drug molecules. Herein, we report a simple 2
approach to formulate fatty amines conjugated cationic BSA (FCBSA) NPs by conjugating laurylamines to the BSA protein. Partial neutralization of the negatively charged glutamic acid or aspartic acid residues by the formation of amide bond with laurylamines leads to the formation of cationic NPs under physiological conditions (iso-electric point = 7.7 and zeta-potential = +7 mV at pH 7.2). The small positive nanoassembly surface of FCBSA exhibit high stability against thermal, pH, and proteolytic enzyme stresses. The FCBSA demonstrated excellent biocompatibility against both normal and cancer cell lines. The nanovehicles efficiently encapsulate hydrophobic anticancer drug, doxorubicin (Dox) and shows controlled release property (~ 40% release after 3 days), human blood serum stability, antifouling property and higher binding affinity for the anionic membranes. Furthermore, the cellular studies also showed that biotin tagged cationic FCBSA (bt-FCBSA) can efficiently deliver Dox to the biotin receptor-positive HeLa cells leading to significant cell death. Overall, an easy access to the fatty amines modified cationic protein NPs with their surface modification capabilities could be eminent candidates for both passive and active targeted delivery of anticancer agents.

Topography or Chemical Modulation—Which is More Sensitive to Superhydrophobicity

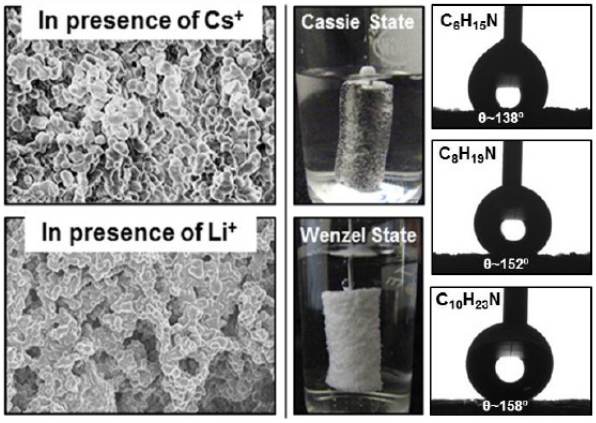
Adil Majeed Rather, Uttam Manna*

Department of Chemistry Indian Institute of Technology-Guwahati, Kamrup, Assam 781039, India

umanna@iitg.ernet.in*

In general, chemistry and topography are vital in the synthesis of various smart and functional materials. In this regard, the polymeric materials with hierarchical topography (micro/nano-scale domains) are widely known for its prospective applications in gas storage, separation, bioengineering, support for catalysts, drug delivery etc.1-3 The lotus leaf and rose petal-inspired wettabilities are developed artificially via assimilation of hierarchical topography and appropriate chemical functionality. However the more sensitive parameter towards superhydrophobicity among hierarchical topography and essential chemical functionality is yet to be addressed. The design of a common approach for tailoring both the hierarchical topography and chemical functionality is highly essential for various fundamental aspects. Here, in this current study, the Michael addition reaction between unsaturated ester and primary amine groups was found to be more rapid in the presence of alkali metal

ions, and the mixture of branched polyethylene (BPEI) and dipentaerythritol pentaacrylate (5-Acl) in ethanol transformed into a chemically reactive polymeric material with tailored hierarchical features with the change in alkali metal ions. The current study revealed that the specific arrangement of micro/nano features in the hierarchical topography has barely any impact on the nature inspired super wettability, however, the alteration in chemical modulation have significant impact in controlling the metastable trapped air in the artificially biomimicked interfaces, and eventually controls the Wenzel, Cassie-Baxter and Cassie-Wenzel transitional states. This current approach also allows to modulate various other physical properties in the material including shrinkage and compressive modulus of the material. The materials with desired antiwetting property was successfully explored for separation and collection of oil spills through both selective absorption and gravity driven filtration process4, even under practically relevant severe chemical settings. Hence, such facile and general approach for tailoring both the chemical functionality and topography could be of potential interest for developing various functional and smart materials.



(1) I. Bozic, J. G Reiter, B. Allen, T. Antal, K. Chatterjee, P. Shah, Y. S. Moon, A. Yaqubie, N. Kelly, D. T. Le, E. J. Lipson, P. B. Chapman, L. A. D. Jr, B. Vogelstein and M. A. Nowak, eLife, **2013**, 2**,** 747.
(2) T. S. Wilems and S. E. Sakiyama-Elbert, Journal of Controlled Release, **2015**, 213 103.
(3) J. H. Doroshow and R. M. Simon, Cell, **2017**, 171, 1476.
(4) A. M. Rather, A. Shome, S. Kumar, B. K. Bhunia, B. B. Mandal, H. K. Srivastava, U. Manna, J. Mater. Chem. A, **2018**, 6, 17019.

Insights into the Mechanism of Antimicrobial Activity of Seven-Residue Peptides

Gopal Pandit,† # Humaira Ilyas,‡ # Suvankar Ghosh,§ Anil P. Bidkar,§ Sk. Abdul Mohid,‡ Anirban Bhunia,* ‡ Priyadarshi Satpati,* § and Sunanda Chatterjee* †

†Department of Chemistry, Indian Institute of Technology, Guwahati 781039, India.
‡Department of Biophysics, Bose Institute, P-1/12 CIT Scheme, VII (M), Kolkata 700054, India.
§Department of Biosciences and Bioengineering, IIT, Guwahati 781039, India.

The ever increasing episodes of antibiotic resistance in bacteria and other microorganisms poses a serious threat to human health and well-being. In this context, antimicrobial peptides (AMPs) have emerged as promising alternatives owing to their unique structural and functional characteristics. AMPs are the first line of innate defense present in most living organisms from bacteria to humans, against invading pathogens like gram positive and gram negative bacteria, fungi, protozoa, yeast and viruses. They have various modes of action among which rupture of the microbial plasma membrane leading to cell lysis is the primary mechanism of action. Apart from this, nuclease activity against

pathogenic genetic material, targeting of intracellular machinery of the hosts to stimulate secondary immune system response against the pathogens, etc. are some secondary mode of action. Such diversity in the activity of the AMPs lead to very slow/negligible development of resistance against them, in contrast, to the antibiotics which generally have a fixed intracellular target. This has led to significant advances in the area of AMP research in the last few decades as potential drugs of the future. Several, synthetic peptides and peptidomimetic molecules have been reported in recent times possessing potential antimicrobial activity.

RESULTS

Here, we report a detailed structure-function correlation of two non-toxic, non-hemolytic and salt tolerant de novo designed seven-residue leucine-lysine based peptides, NH2LKWLKKLCONH2 (P4) and NH2LRWLRRLCONH2 (P5), with strong antimicrobial and antifungal activity. Biological experiments, low- and high-resolution spectroscopic techniques in conjunction with molecular dynamics simulation studies, could establish the structure-function correlation. The peptides are unstructured both in water as well as in bacterial membrane mimicking environment, suggesting that the secondary structure does not play a major role in their activity. Our studies could justify the probable membranolytic mode of action for killing the pathogens.

CONCLUSION

Positive charge on the peptides and the presence of tryptophan residues are the primary and secondary factors ascribed to their activity. The mechanism of action of the peptides as revealed through experimental studies and supported by NMR and MD simulations is membranolytic. Such a fundamental understanding will definitely stimulate the design of better antimicrobial agents in the future.

1. Pandit, G.; Ilyas, H.; Ghosh, S.; Bidkar, A.; Mohid, Sk.; Bhunia, A.; Satpati, P.; Chatterjee, S.; J. Med. Chem. **2018**, 61(17), 7614-7629

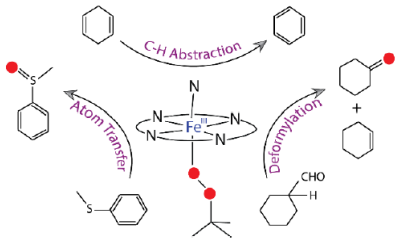
Versatile Reactivity of an Iron(III)-Alkylperoxo Complex towards Electrophilic and Nucleophilic Reactions

Gourab Mukherjee and Chivukula V. Sastri*

Department of Chemistry, IIT Guwahati email: sastricv@iitg.ac.in

Reactivity of iron(III)-alkylperoxo complexes has always remained a riddle to inorganic chemists owing to their insufficient thermal stability and impotency towards organic substrates.[1] These iron-oxygen adducts have been labelled as sluggish oxidants towards oxidative electrophilic and nucleophilic reactions.[2] In biological reactions, however, iron-dioxygen adducts are known to be pivotal in the catalytic cycles of dioxygen activation by various heme and nonheme enzymes.[3] There is evidence of the influence of Fe(III)-alkylperoxo complex in Purple lipoxygenase and homoprotocatech-uate-2,3-dioxygenase.[4] Herein we report the synthesis and spectroscopic characterization of a novel mononuclear iron(III)-alkylperoxo complex supported by an engineered bispidine framework.

Against the notion, this complex serves as a rare example of versatile reactivity of a ferric alkylperoxo towards both electrophilic and nucleophilic reactions. Selective structural modification in the rigid backbone of the bispidine ligand made the otherwise metastable intermediate stable enough to allow us investigate the mechanistic aspects of its reactivity under ambient conditions. This complex is capable of oxygen atom transfer (OAT) reactions to thioanisole where a Hammett analysis confirms a group transfer to the heteroatom via electrophilic pathway. In the C-H activation reactions, it can abstract active hydrogen atoms from substrates with a range of C-H bond dissociation energies. Further, its hydrogen atom transfer (HAT) ability is confirmed by KIE analysis. Moreover, the reactivity towards aldehyde deformylation reaction was also examined and a nucleophilic reaction pathway was established from mechanistic studies.



[1] (a) T. Ogihara, S. Hikichi, M. Akita, T. Uchida, T. Kitigawa, Y. Moro-oka, Inorg. Chem. Acta **2000**, 297, 162. (b) J. Kim, Y. Zang, M. Costas, R. G. Harrison, E. C. Wilkinson, L. Que Jr, J. Biol. Inorg. Chem. **2001**, 6, 275. (c) T. K. Paine, M. Costas, J. Kaizer, L. Que Jr, J. Biol. Inorg. Chem. **2006**, 11, 272. (d) J. Bautz, P. Comba, L. Que Jr, Inorg. Chem, **2006**, 45, 7077.
[2] M. S. Seo, T. Kamachi, T. Kouno, K. Murata, M. J. Park, K. Yoshizawa, W. Nam, Angew. Chem. Int. Ed. **2007**, 46, 2291.
[3] (a) E. G. Kovaleva, J. D. Lipscomb, Nat. Chem. Biol. **2008**, 4, 186. (b) E. I. Solomon, S. D. Wong,L. V. Liu, A. Decker, M. S. Chow, Curr. Opin. Chem. Biol. **2009**, 13, 99. (c) P. R. Ortiz de Montellano, Chem. Rev. **2010**, 110, 932. (d) J. Rittle, M. T. Green, Science, **2010**, 330, 933.
[4] (a) E. G. Kovaleva, J. D. Lipscomb, Science, **2007**, 316, 453. (b) E. Skrzypczak-Jankun, R. A. Bross, R. T. Carroll, W. R. Dunham, M. O. Funk Jr, J. Am. Chem. Soc. **2001**, 123, 10814.

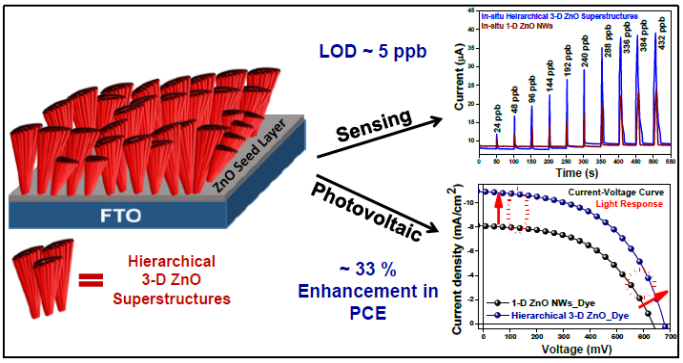
Multifunctional Hierarchical 3-D ZnO Superstructures Directly Grown over FTO Glass Substrate: Enhanced Photovoltaic and Selective Sensing Applications

Mohammad Shaad Ansari1, Avishek Banik1, Mohammad Qureshi1*

1Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati, 781039, Assam, India

*E-mail: mq@iitg.ernet.in

Sensing device which relies on electron transport often suffer from the drawback of higher Ohmic contacts between the active materials and its collecting electrode, in most of the cases, a transparent conducting oxide. Designing such systems, would become more important when the vapor pressure of the compounds yield very low concentrations of sensing elements. Here, an in-situ growth of hierarchical three dimensional Zinc oxide superstructures over conductive glass substrate i.e., fluorine doped tin oxide under controlled hydrothermal route has been reported for low Ohmic contact, thereby an efficient charge injection. An anionic polysaccharide “k-carrageenan” is employed for assisting the hetero epitaxial aggregated growth of 1-D nanocrystals. We have successfully demonstrated the applications of as-characterized multifunctional 3-D ZnO hierarchical structures in photovoltaic and selective chemical vapor sensing. A significant enrichment (33 %) in power conversion efficiency (η) for hierarchical 3-D ZnO superstructures based photovoltaic device as compared to 1-D ZnO nanowires was observed, mainly due to the larger surface to volume ratio for sensitizer loading, better light-scattering effect, better charge separation and collection. Two terminal sensor devices displayed high sensitivity and selectivity for NH3 vapors with the limit of detection value of 5 parts per billion (ppb) for three dimensional ZnO hierarchical superstructures while 17 ppb for 1-D ZnO NWs, which is very less as compared to maximum permissible limit i.e., 25 parts per million (ppm).[1] Selectivity, recyclability, response/recovery time and sensitivity for primary, secondary and tertiary amines are studied to understand the probable mechanism for such high sensing ability of the hierarchical superstructures.



References:
1. M. S. Ansari, A. Banik, A. Kalita, P. K. Iyer, M. Qureshi, J. Mater. Chem. A, **2018**, 6, 15868.

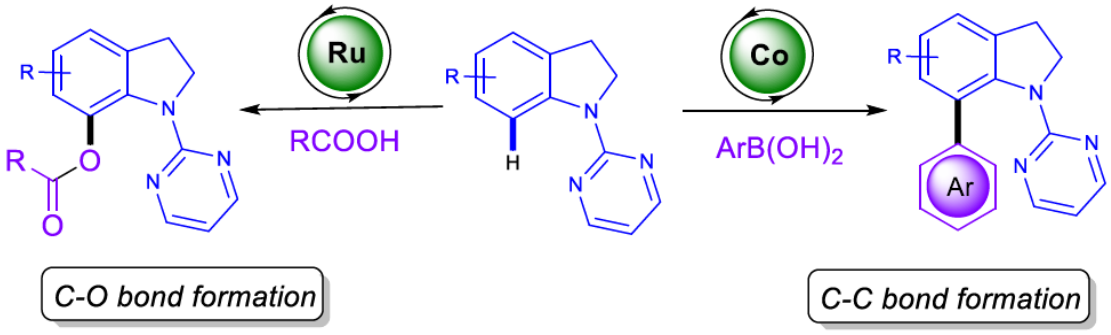
Transition-Metal-Catalyzed C-C and C-O Bond Formation of Indolines at the C7 Position

Pinaki Bhusan De, Sourav Pradhan, Sonbidya Banerjee and Tharmalingam Punniyamurthy*

Department of Chemistry, IIT Guwahati, India

E-mail: tpunni@iitg.ac.in

C7-Decorated indoles are important essential motifs present in a surplus of bioactive and pharmaceutical compounds. Direct C-7 functionalization of indoles is comparatively problematic compared to functionalization at C-2 and C-3 positions due to the inherent reactivity of the pyrrole-type ring.1 However, transition-metal-catalyzed site-selective C-7 functionalization of indoles with the aid of chelating group has recently emerged as a potential synthetic tool for the regioselective carbon-carbon and carbon-heteroatom bond formation. Herein, we developed C-C bond formation for the C7-arylation of indolines utilizing arylboronic acids as coupling partner2 and C-O bond formation for the C7-oxygenation using carboxylic acids as oxygenating source3 at moderate temperature.



References - [1] T. A. Shah, P. B. De. S. Pradhan, T. Punniyamurthy, Chem Commun. **2019**, 55, 572. [2] P. B. De, S. Pradhan, S.Banerjee, T. Punniyamurthy, Chem. Commun. **2018**, 54, 2494. [3] P. B. De, S.Banerjee, S. Pradhan, T. Punniyamurthy, Org. Biomol. Chem. **2018**, 16, 5889.

Time Dependent Evolution of Amyloid Nano Flower: An Early Stage Therapeutics for Alzheimer Disease

Subrata Mondal, Sachin Kumar, Parameswar K. Iyer*

Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati, Assam – 781039, India
Department of Bioscience & Bioengineering, Indian Institute of Technology Guwahati, Guwahati, Assam – 781039, India

pki@iitg.ac.in

Alzheimer's disease (AD) is pathologically highlighted by the aggregation of intracellular neurofibrillary tangles shaped by tau proteins and extracellular feeble torment by amyloid β-proteins (Aβ) in the patient brain. Numerous studies have demonstrated that the aggregation of Aβ into amyloid fibrils containing trademark cross-β-sheet structure in the mind of AD patients is firmly connected to the pathogenesis of AD and dissolvable Aβ oligomers and/or protofibrils are the most poisonous species, in charge of neuron brokenness and death. Here, in this work, nontoxic, biocompatible water soluble polymeric conjugate have been used to modulate toxic amyloid aggregates in human CSF and as well as in preformed amyloid aggregates from commercial Aβ1-40. This modulation strategy leads to the formation of polymer-protein co-aggregates instead of toxic amyloid aggregates which is responsible for plaque formation and is related to disease progression. The intriguing prospect of amyloid fibrils using luminescent conjugate materials technique as a scaffold for polymer-protein hybrid materials is well delineated as this technique provides a direct link between spectral signal and protein conformation and can further be used to gain more information concerning the morphology of the protein deposits and facilitate a greater understanding of the conformational phenotype encoded in the native protein aggregates.

References

(1) B. A. Yankner, L. K. Duffy, D. A. Kirschner, Science **1990**, 250, 279−282.
(2) J. Hardy, D. J. Selkoe, Science **2002**, 297, 353−356.
(3) S. R. Chowdhury, M. Agarwal, N. Meher, B. Muthuraj, P. K. Iyer, ACS Appl. Mater. Interfaces, **2016**, 8, 13309–13319.

Ohmic type Resistive Switching in Bulk SnO2

Monika Duhan, Manpreet Kaur, Gyaneshwar Sharma, Harminder Kaur*

Department of Applied Sciences, Punjab Engineering College, Sector-12, Chandigarh

Presenting Author: hkaur@pec.ac.in

Phenomenon of resistive switching – fashionable alteration of resistive state from high to low (reversible) – under the gradient of electrical potential is observed in metal oxides thin film. From technology point of view, there is significant appreciation towards the insurgence of unconventional activity – realized at cost of intimation of various degree of freedom – for more promising nature and versatile potential. Such electrical response of tin oxide is exploited in Resistive switching based memory devices for their extra reliability, fast switching, high data storage capability, having room towards unprecedented low scalability (suitable for high storage density) over ferroelectric-magnetic-semiconducting analogous. Here, we report electric field induced switching behavior from one resistive state to other resistive state in bulk SnO2 materials. From the gradually rise in interest towards more reliable and high energy storage devices, metal oxides with different morphologic structure are investigated. Instability in resistive state of metal oxides are driven through field induced

lattice distribution, which causes a scattering of mobile electron of different strength. The emergence of resistive switching in "bulk SnO2" along with Ohmic nature is rarely reported. Resistive switching behavior is less studied in bulk form; but appearance of resistive switching in bulk state may provide a more space towards the theoretical studies and its proper understanding beyond the existing limit.

Ref:
1. D. S. Jeong, R. Thomas, R. S. Katiyar, J. F. Scott, H Kohlstedt, A Petraru and C. S. Hwang, Rep. Prog. Phys. 75 (2012) 076502
2. F. M. Simanjuntak, D. Panda, K-H Wei and T-Y Tseng, Nanoscale Res. Lett. 11 (2016) 368
3. K. M. Kim, D. S. Jeong and C. S. Hwang, Nanotechnology 22 (2011) 254002
4. D. S. Jeong, R. Thomas, R. S. Katiyar, J. F. Scott, H Kohlstedt, A Petraru and C. S. Hwang, Rep. Prog. Phys. 75 (2012) 076502
5. T. Wan, B. Qu, H. Du, X. Lin, Q. Lin. D.-W. Wang, C. Cazorla, S. Li, S. Liu, D. Chu, Journal of Colloid and Interface Science 512 (2018) 767–774.
6. S. Almeida, B. Aguirre, N. Marquez, J. McClure and D. Zubia, Integrated Ferroelectrics, 126, (2011) 117-124

Polyaniline-based nanomaterials for water treatment and applications

1,2Mohammad Shahadat*, 1S.Z. Ahammad, 2S. W Ali

1Department of Biochemical Engineering and Biotechnology,
2Department of Textile Technology, Indian Institute of Technology, Delhi, New Delhi-110016, India

*Email: mdshahadat93@gmail.com mdshahadat93@gmail.com

Doping of polyaniline with CNT/biopolymer is conisdered as significant alternative to improve the functionality of conventional composites. Polyaniline (PANI), Poly-lactic acid (PLA) and Multiwall Carbon Nanotube (MWCNT) supported nanomaterials (MCNT/PANI-Ti, PANI-PLA-TiO2) have been synthesized via in-situ oxidative polymerization. The synthesized materials have been characterized using various chemical, morphological and thermal analysis techniques. The existences of the functional groups and the morphology of nanocomposite were exposed based using Fourier transform infrared spectroscopy (FTIR), thermogravimetric-differential thermal analysis analysis (TGA/DTA), X-ray diffraction (XRD), and scanning electron microscopy (SEM) analyses. The nanocomposite materials showed good ion uptake capacity for Na2+ ion (2.9 meq g-1). The adsorption behaviour of PANI-MWCNT-Ti towards solvents (CH3CN, ACOH) and surfactant (CTAB) verified its selective its selectivity for detection of Ni2+, Cd2+, Cu2+ and Fe3+. The samples of Polylactic acid-polyaniline (PLA- PANI) and PANI-PLA-TiO2 prepared by incorporating a fixed content of metal oxide nanoparticles (TiO2) and different loadings of PANI (2, 5, and 10 %) demonstrated noteworthy EMI shielding and UV-protection by guarding the passage of UV-visible light. Thus, PANI-MWCNT and PLA-PANI-supported metal oxide nanopaticle conatainig composites could be effectively used as an adsorbent, a UV protector, and EMI shielding material for various sustainable applications.

Design of organic molecules for piezoelectric polymer based energy harvesting devices

Nayim Sepay, and Umesh Chandra Halder*

Department of Chemistry, Jadavpur University, Kolkata-700032, India

Email: nayimsepay@yahoo.com and uhalder2002@yahoo.com

Non-covalent interactions (NCIs) mediate the large architecture of molecular self-assembly, crystal designing, and drug discovery, but also facilitate the control of the functions of molecular machines and molecular recognition. The polyvinylidene difluoride PVDF have repeating -[CF2-CH2]- units, exist in five crystalline polymorphs-α, β, γ and δ. The most thermodynamically stable α (TGTG')-phase is the principle polymorph of PVDF whereas β (TTTT) phase which is highly polar and responsible for piezoelectric properties. The conversion of α-phase to β-phase in PVDF crystal is the manifestation of its piezoelectric property, which occur through a large transformation of stereochemistry as well as NCIs of polymer chains. The study of this relation is the central point of chemical physics of PVDF based devise.To make a general idea for the structure- activity relationship of organic compounds to the β phase conversion, efforts have been given. Furthermore, the choice of organic compounds and the mechanism for the phase transition is often found unjustified. In the present study, we first reveals core importance of NCIs in organic compounds induced β phase conversion mechanism, and develop a knowledge to design new organic molecules.

Conversion of α-phase to β-phase of PVDF

References -

1 J. Wu, Z. Lan, J. Lin, M. Huang, Y. Huang, L. Fan, G. Luo; Chem. Rev. **2015**, 115, 2136.
2 A. Sultana, P. Sadhukhan, Md. M. Alam, S. Das, T. R. Middya, D. Mandal; ACS Appl. Mater. Interfaces, **2018**, 10, 4121.
3 M. G. Salameh, Applied Energy, **2003**, 75, 33.
4 M. Green, K. Emery, Y. Hishikawa, W. Warta, E. Dunlop; Prog. Photovoltaics Res. Appl. **2014**, 22, 1.
5 A. Yella, H. Lee, H. Tsao, C. Yi, A. Chandiran, M. Nazeeruddin, E. Diau, C. Yeh, S. Zakeeruddin, M. Gratzel; Science, **2011**, 334, 629.
6 S. Roy, P. Thakur, N. A. Hoque, B. Bagchi, N. Sepay, F. Khatun, A. Kool, and S. Das; ACS Appl. Mater. Interfaces **2017**, 9, 24198.

Phase segregation in complex Fe-Al binary alloys

Subhamoy Char, Dasari L. V. K. Prasad

Department of Chemistry, Indian Institute of Technology Kanpur, U.P- 208016, India

In the periodic table, elemental Fe and Al are well known metals but alloying of these two elements with different atomic percentage leads series of FexAly phases across the Fe-Al experimental phase diagram with wide variation of structure, electronic and mechanical properties. It is daunting task to establish the structure property relationship of these alloys due to temperature induced order-disorder phase transformations, accumulation of thermal vacancies and antisite defects, as well as ambiguous phase segregation between different Fe-Al phases. The Fe-rich FeAl and Fe3Al phase persist for broad range of composition whereas Al dominated phases are populated with narrow compositional variations. Most of the Al enriched phases (FeAl2, Fe2Al5, Fe4Al13) are crystallized in low symmetric unit cell with presence of large number of atoms and partially occupied sites. As these phases are intrinsically disordered and nonstoichiometric, it is required to clarify the structures with different Fe:Al composition which can assist to understand the complicacies related with phase separation between different Fe-Al alloys.

On this context, we have predicted stoichiometric crystal structures at FeAl2 composition from stochastic and evolutionary algorithm at normal pressure and T~0 K. To calculate electronic and magnetic properties of different Fe-Al alloys, we have utilised Density Functional Theory (DFT) with Perdew-Burke-Ernzerhof (PBE) exchange correlation functional form. The effect of onsite coulomb interaction is dealt with inclusion of Hubbard-U correction (DFT+U). To incorporate the role of vibrational entropy on phase segregation at elevated temperature, we have computed phonons from Density Functional Perturbation Theory (DFPT) and quasi harmonic approximation (QHA) method. The Gibbs free energy between different Fe-Al phases are compared to highlight the thermodynamical feasibility at high temperature. Finally, we have given plausible explanation of eutectoid decomposition of high temperature Fe5Al8 alloy (which is detectable in experiment for short temperature interval) into FeAl and FeAl2 phases from comparison of the relative change of Gibbs free energy at the onset of decomposition. As Fe5Al8 is not quenchable in experiment with respect to cooling, DFT based molecular dynamics approach is used for quenching the sample from high temperature to room temperature with ultrafast cooling method to clarify the quenchability issue of this high temperature phase.

References:

1. U. R. Kattner and B. P. Burton: ASM Handbook Vol. 3: Alloy Phase Diagrams, (ASM International, Materials
Park, OH, 1992) p. 44.
2. M. Mihalkovič and M. Widom, Phys. Rev. B 85, 014113 (2012).
3. F.Stein, S. C. Vogel, M. Eumann, M. Palm, Intermetallics 18, 150-156 (2010).
4. Subhamoy Char and D. L. V. K. Prasad, Manuscript is under preparation (2019).

Zn-NiO: A REUSABLE CATALYST FOR OXIDATION OF ALCOHOL

Sushmita Nath

Department of Chemistry
North – Eastern Hill University, Shillong

Email: sushmitanath96@gmail.com

Nanotechnology is considered one of the key technologies of 21st century. The use of catalysts in chemical technology is of great importance. Use of small amounts with high activities is particularly desirable for economic and environmental considerations.

This project aims at the utilization of our synthesized heterogeneous reusable ZnO-Ni catalyst, in order to oxidize a variety of alcohols into aldehydes and ketones. Thus, to check the level of activity, a variety of alcohols was used for oxidation to corresponding aldehydes and ketones. I have optimized the reaction condition for ZnO-Ni-promoted oxidation of alcohols, and synthesized eight different aldehydes and ketones under an optimized reaction condition.

Table 1 Screening of Catalyst for oxidation of benzyl alcohol to benzaldehyde

S. No.	Catalyst	Amount(mg)	Oxidant	t, h	Solvent	Yield (%)
1	ZnO-Ni	2	TBHP	24	MeCN	70
2	ZnO-Ni	5	TBHP	18	MeCN	100
3	ZnO-Ni	10	TBHP	12	MeCN	100
4	ZnO-Ni	15	TBHP	12	MeCN	100
5	ZnO-Ni	15	O2	24	MeCN	30
6	ZnO-Ni	15	H2O2	18	MeCN	No Reaction

Table 2 Reusability test of ZnO-Ni for oxidation of benzyl alcohol to benzaldehyde

S.No.	Catalyst	Cycle	t, h	Solvent	Yield (%)
1	ZnO-Ni	1	12	MeCN	92
2	ZnO-Ni	2	18	MeCN	85
3	ZnO-Ni	3	24	MeCN	80
4	ZnO-Ni	4	24	MeCN	62
5	ZnO-Ni	5	24	MeCN	42

Net CO2 fluxes and seasonal variability in Bay of Bengal

Abhishek Dixit , Lekshmi K, Rishikesh Bharti, Chandan Mahanta

Department of Civil Engineering, IIT Guwahati, India

E-mail: abhishek.dixit@iitg.ernet.in

Oceans play a key role in global carbon cycle. They act as source or sink of atmospheric carbon dioxide depending on the partial pressure of CO2 (pCO2) gradient (Fig 1 and Fig 3) which further depends primarily on sea surface temperature and CO_2 aqueous concentration. In this study, the moored pCO_2observations from autonomous pCO_2 (MAPCO2) system deployed at 15°N 90°E (Fig 2) in Bay of Bengal (BOB) were used to derive CO_2 fluxes to examine variability over time scale at BOB. Calculated CO_2 fluxes shows that BOB is mild source of CO_2 (0.4128 g-C/m^2/year) to atmosphere, unlike other part of global oceans that shows strong CO_2 source/sink characteristics. It can be stated that surface water of BOB seems close to equilibrium in terms of CO_2 fluxes on annual time scale. Also, normalised pCO_2at observed SST and mean SST show the influence of seasonality on seawater pCO_2 which is further reflected on seasonal CO_2 fluxes (Fig. 4).

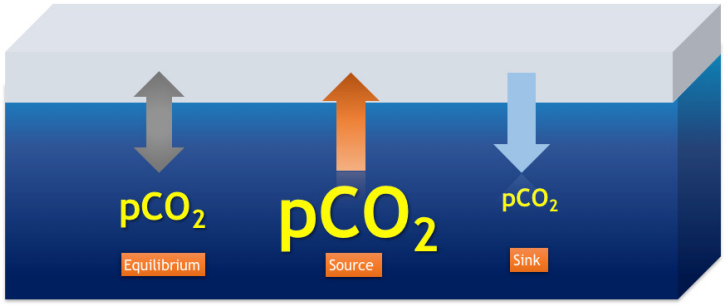


Fig 1. Condition for source and sink of CO_2. pCO_2 in yellow and red represent seawater and atmospheric pCO_2. Bigger font size represents a higher value.

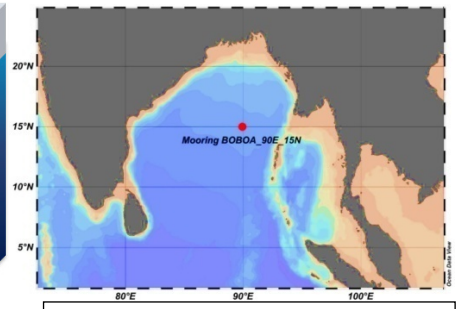


Fig 2. Graphical depiction of BOB. Red dot shows the location of deployed

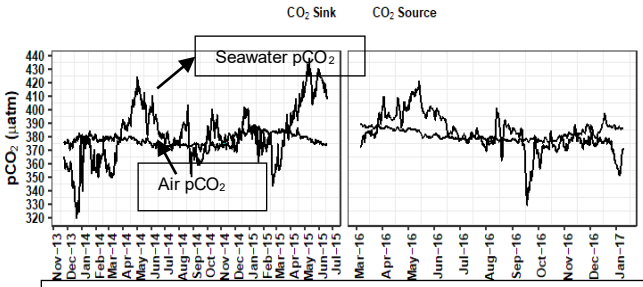


Fig 3. CO_2 source and sink characteristic variation. Source characteristic in blue and sink characteristic in red

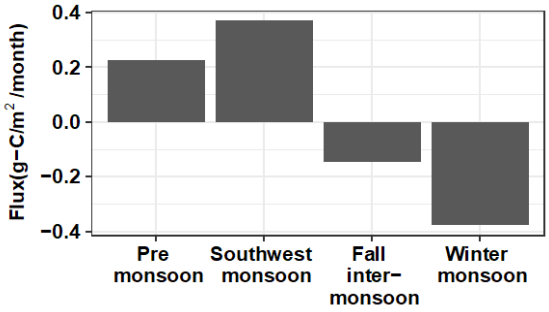


Fig 3. Seasonal average of CO_2 fluxes

Evaluation of landfill gas production and emissions from different composition of MSW landfills operated by landfill simulation reactors

Chejarl Venkatesh Reddy,
Chakka Nagendra subrahmanyam and Ajay Kalamdhad

Department of Civil Engineering, IIT Guwahati, India

Email:chejarla@iitg.ac.in

Waste that is dumped and left unmanaged can lead to a number of different environmental impacts, gaseous emissions being one of them. The gas that is produced when organic material is decomposed under lack of oxygen has a high content of methane, which is a potent greenhouse gas, but also a potential source of energy. Different phases of a municipal solid waste (MSW) landfill were monitored in laboratory scale landfill simulation reactors (LSRs) with the aim of investigating the impact of variation of MSW composition on generation of landfill gas (LFG). The study was conducted by using fresh waste in landfill simulator reactor (LSR). Ten Landfills Simulator Reactors (LSR) were constructed for evaluate the gas production of fresh MSW landfilled. The LSR was made of plastic has 53 mm outside diameter and 25 mm of high. The fresh waste was collected from different sources and unseggrated waste filled in the LSRs. The landfill gas produced of LSR operated laboratory conditions. The composition of landfill gas produced was dominated by CO2 with the composition of CH4, N2 and O2 respectively. The results showed that high organic waste produces maximum amount of gas as compared to low organic containing reactors. This kind of study is to understand the quantity of landfill gas is sufficiently large to be used as an energy source from the landfill.
Keywords: landfill simulation reactor, waste composition, LFGs.

Integrated social vulnerability index for a hilly terrain.

Dilip Kumar1 Rajib Kumar Bhattacharjya2 1,2

Department of Civil Engineering, IIT Guwahati, India

E-mail: k.dilip@iitg.act.in

The vulnerability is generally used to define the status of a community to prevent, mitigate, prepare for or respond to a natural and a man-made hazard. The absence of coping strategies which is also known as resilience has altered the vulnerability of the community. Thus vulnerability index of a community has to be calculated considering physical, social, economic and environmental factors associated with the community. This research paper tries to find out an integrated social vulnerability factor. The proposed integrated social vulnerability is determined by considering various factors such as physical, social, economic, and environmental factors. All these factors increase the susceptibility of a community to the impact of hazards. Poverty, occupation, child population, literacy rate, disability, marginalization, and inequities in wealth distribution of a society or community will also change the social vulnerability. Proposed Integrated social vulnerability
index also incorporated the local technical knowledge insight, skills, desires so that local people and local administration are able to identify problems and can offer a solution to resist future emergencies. The index has been calculated for the hilly district of Uttarakhand, India.

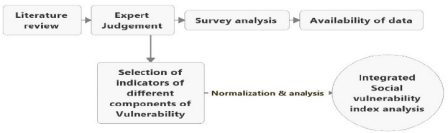


Fig. 1. Social vulnerability index analysis approach.

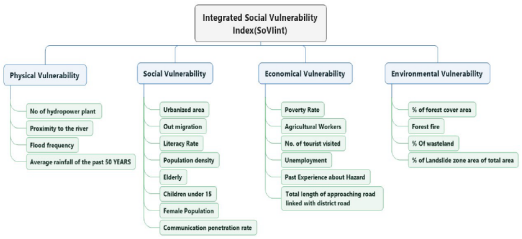


Fig. 2. Different components and sub components of Social vulnerability index

The factors like poverty rate, length of approaching road and education system are better in the plain area in comparison to the fully hilly areas of the state. As a result, Almora district which is located in partial plain area of the state comes with least economic vulnerability. The upper Himalayan district Chamoli has the highest economic vulnerability. The migration rate, unemployment, health services are relatively poor in hilly districts of Uttarakhand. As a result, all the hilly districts are almost in same range of social
vulnerability index.

References:

Adger, W.Neil. Indicators of Social and Economic Vulnerability to Climate Change in Vietnam. 1998, p. 42, doi:10.1596/978-1-4648-0958-3.
Bahinipati, Chandra Sekhar. Assessment of Vulnerability to Cyclones and Floods in Odisha , India : A District-Level. 1999.
Balica, Stefania, et al. Reducing the Complexity of the Flood Vulnerability Index Reducing the Complexity of the Flood Vulnerability
Index. Vol. 7891, no. June, 2017, doi:10.3763/ehaz.2010.0043.
Bhadra, A., et al. Assessment of Vulnerability of Arunachal Pradesh (India) to Floods. 2009.
Briguglio, Lino. ECONOMIC VULNERABILITY AND RESILIENCE : CONCEPTS AND MEASUREMENTS. no. March, 2004.
Chakraborty, Anusheema, and P. K. Joshi. Mapping Disaster Vulnerability in India Using Analytical Hierarchy Process. Vol. 5705, no.
November, Taylor & Francis, 2017, doi:10.1080/19475705.2014.897656.

Air Quality Index of IIT Guwahati

M. Krishna Chaitanya1, Subhradip Pal2

1 Department of Civil Engineering, IIT Guwahati, India 2 Department of Civil Engineering, IIT Guwahati, India

E-mail: mkris174104025@iitg.ac.in

Air is one of the renewable natural resources. Human being use air as a medium to survive. From the dawn of human civilization, the air quality continuously degraded due to various artificial or natural causes. Climate change and the degradation of overall quality of the air is a global phenomenon. Air

Quality Index is a tool for effective communication of air quality status to people in terms, which are easy to understand. It transforms complex air quality data of various pollutants into a single number (index value), nomenclature and colour. There are six AQI categories, namely Good, Satisfactory, Moderately polluted, Poor, Very Poor, and Severe. AQI of IIT Guwahati was measured and quality was under specified limits and it was in the category 'SATISFACTORY'. The dominant pollutant was PM10. This value indicates that there may be some breathing discomfort to sensitive people. This study gave an idea about the existing air quality of the IIT Guwahati Campus. However, AQI values can vary from one season to another. In winter, carbon monoxide may be high in some areas because cold weather makes it difficult for car emission control systems to operate effectively. Ozone is often higher in warmer months, because heat and sunlight increase ozone formation. Particle pollution can be elevated in any time of the year. AQI values also can vary depending on the time of day.
Keywords: Air quality index, IIT Guwahati

Role of extracellular polymeric substances (EPS) secretion in bacterially-assisted recovery of cadmium from aqueous phase as CdS nanoparticle

A. Siddhartha Paul1, B. Pranab Kumar Ghosh1

1Department of Civil Engineering, IIT Guwahati, India

E-mail: vibgyor93sid@gmail.com

With the advent of modern tech savvy society and ever depleting natural ores comes a question of sustainability. However, effort has to be made in managing and recovering the valuable metals from e-waste to meet the global need of metals as secondary resource to sustain. One such metal being cadmium, which is used in Ni-Cd battery and electronic parts, has created global outrage owing to its hazardous nature and age-old mining practices which are not eco-friendly. So, to propose novel approaches with a lower environmental footprint, bio-based methods using anaerobic bacteria like sulfidogenic mixed microbial consortia are being developed. In this study, focus has been made on the usage of SRB for cadmium recovery from aqueous phase and on the exploitation of their anti-bacterial property to immobilize aqueous cadmium by bio-precipitation and bio-mineralization as CdS nanoparticles, which has got wide application from low-cost solar cell manufacturing to medical uses. Batch studies with aqueous Cd2+ were performed at pH 7±0.2, 30±5°C and 120 rpm for quantifying the removal rate of Cd2+ from aqueous phase as biogenic CdS nanoparticles which was validated by XRD and FETEM imaging. Furthermore, in order to decipher the removal mechanism, EPS generation was also studied at high Cd2+ stress which will help in commercializing the process in near future.

Keywords: Cadmium; metal sulfides; nanoparticles; recovery; bacteria

Stochastic differential equations with application in civil engineering

A. Tapas Tripura1, B. Budhaditya Hazra2 1 Master student,

Department of Civil Engineering, IIT Guwahati, India 2 Assistant Professor, Department of Civil Engineering, IIT Guwahati, India

E-mail: tapas174104029@iitg.ernet.in

Identification of time dependent behavior of structural and mechanical systems undergoing degradation due to aging, fatigue, operational changes and extreme loads like hurricanes, typhoons and earthquakes, has a significant importance in real time structural health monitoring (SHM) [1]. A real time preventive measure to arrest the possibility of further degradation can be achieved through online damage diagnosis and prognosis. In this paper, a robust output-only based real time identification technique for degradation in multi degree of freedom (MDOF) systems using recursive canonical correlation analysis (RCCA) is proposed. The impact of damage to a vibrating system gradually progresses with time which constitutes a progressive event and sustains until the system degrades to a considerable extent. In order to model this degradation event, simulations aimed at successfully capturing its behavior in real time, becomes necessary. To capture the event in its entirety, resorting to stochastic modelling [2] becomes imperative as the evolution of system parameters under degradation are completely stochastic in nature [3]. This necessitates that the solution model for the system should embody certain stochastic approaches, which is dealt with, in this paper. The modelling of such systems is usually accomplished by using stochastic differential equations (SDEs) [2]. One of the key advantages of using SDE based formulations remains in the natural mapping of the constraints into differential noise term [2]. An SDE preserves the equilibrium of a dynamical system and accounts for the uncertainties using a diffusion coefficient where the resulting solution model becomes quite complex [2,3]. Literature considering the mutual coupling of system dynamics for characterization of effect of degradation on system responses, in real time, is scarce, which motivates the present research. In this context, the Ito-Taylor based stochastic numerical integration schemes can be potentially utilized for accounting the effect of degradation on system responses and simultaneously track the growth of degradation. A considerable number of terms appearing in the expansion holds the key to accurately capture the progressive events, path-wise. In this paper, methods based on Ito-Taylor expansion are utilized that provide step wise estimation of the response parameters of the system in real time. Numerical simulations carried out on MDOF systems subjected to stationary broadband excitation, with different levels of degradation conditions; illustrate the robustness of the proposed RCCA algorithm for identification of time varying behavior of degrading structures. A simple case study involving a simulated 2DOF system modelled as a degrading system, induced by fatigue crack growth, through its floors, is considered. As observed from Fig. 1, the amplitude of the time dependent acceleration responses increases with time after the 20s-time stamp, denoting stiffness degradation. The degrading state at each time instant provides information about the fatigue crack accumulation. It is also observed that the TVAR coefficients [1] provide an accurate instant of damage by indicating a distortion at 31s. The change in the mean level after 20s is consistent, thereby illustrating the degradation event for the remainder of the excitation.

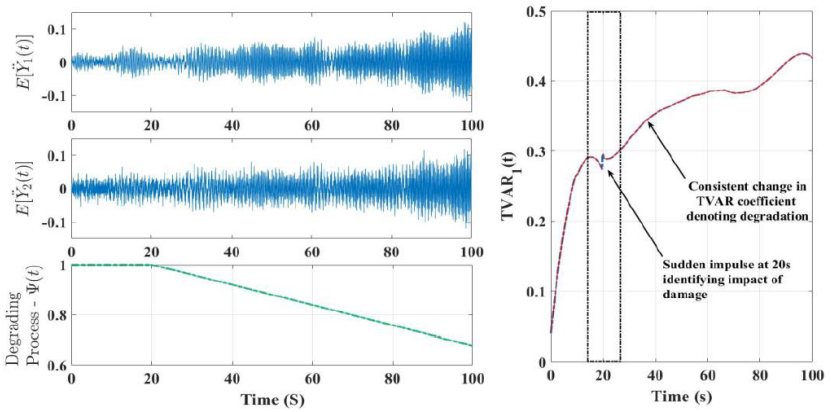


Fig. 1. Time varying response of a degrading 2DOF structure and detection of the degradation using RCCA-TVAR algorithm in real time

References:

1. Krishnan M, Bhowmik B, Hazra B and Pakrashi V. 2018 Real time damage detection using recursive principal components and time varying auto-regressive modelling, Mechanical Systems and Signal Processing, Elsevier.vol.101, pp. 549 – 574.

2. Kloeden P E and Platen E 1992 Numerical solution of stochastic differential equations, Springer. pp. 103—160.

3. Sobczyk K. Stochastic dynamics and reliability of degrading systems. TECHNICAL SCIENCES 2006; 54(1).

Flow Structure in Natural Heterogeneous Vegetation Patches

Vinay Chembolu and Subashisa Dutta

Department of Civil Engineering, Indian Institute of Technology Guwahati, Guwahati, Assam, India.

Corresponding author: v.chembolu@iitg.ac.in

The Brahmaputra River, one of the largest braided river system in the world is morphologically dynamic due to its high flow and sediment load variability. The large braided belt width of the river provides wide space for the morphological activity and controls the sand bars movement. At few locations, the river flood plain and sand bars are vegetated with different vegetation forms which are capable of promoting the sediment deposition and eventually makes the sand bar stable. To understand the flow structure responsible for this phenomenon, in the present study laboratory experiments were formulated based on field investigations. Three different plant forms viz. flexible bladed, leafy and rigid cylindrical vegetation were chosen to morphologically characterize the real species along the Brahmaputra River. Experiments were conducted in 20 m long, 1 m wide laboratory flume with vegetation planted as a patches in the test section. Instantaneous velocity components were measured along the flow depth with ADV inside and outside of vegetation patches and, turbulence characteristics like velocity, Reynold stress and turbulence intensity were analyzed. The results show that heterogeneous patches are capable of providing spatial heterogeneity in velocity zones and, also varying zones of increased and diminished turbulence levels. With the inclusion of other vegetation forms (leafy and cylindrical) to flexible vegetation, the velocity reduction was relatively more and also peak turbulent stress at canopy top is restricted to move into the canopy. Moreover, additional drag due to leafy and rigid forms reduce the shear generated turbulence at the canopy top and shifted its peak to above the canopy. The patch form, location and its alignment significantly alters momentum exchange between canopy and surface flow regions. The findings from the present study are beneficial for river restoration schemes in creating sediment promotion and ecological zones.

SUSTAINABLE WATER HARVESTING STRUCTURE BY CONDENSATION OF WATER THROUGH ATMOSPHERE FOR RURAL AREAS

Akshay Chavan1, Sagar Davate2 , Manav Dodiya3 (UG Student1 2 3)

(Pillai HOC College of Engineering and Technology 1 2 3)

Living beings require food, water and shelter for survival. People from some rural areas lack safe drinking water causing several health issues and deaths. Water harvesting structures (WHS) is a vertical conical structure designed to collect clean water from the air. In this research work, WHS is constructed by using easily available material such as bamboo and mesh which absorbs the water from surrounding air. This absorbed molecules gets stuck in mesh and forms water droplets through condensation and collected under the action of gravity. Rasayani was the nearest suitable area for collection of water through enough rain, fog and dew. Because of meteorological characteristics of the area, it was easy to collect water with WHS. Water harvested was pure and can be utilized for various domestic purpose like drinking, cooking, etc. This research signifies that WHS can be built by reusable materials with minimal maintenance and zero energy sources.
Keywords: Condensation, Sustainable material, Water scarcity, economical.

Analysis of geomorphic indices using GIS to decipher tectonic activity in Dimapur and Peren districts of Nagaland

J.N. Moiya

Department of Geology, Nagaland University, Kohima Campus, Meriema - 707004, Nagaland

E-mail: moiyakonyak14@gmail.com

Nagaland and its adjoining region of NE India are considered seismicallyactive and therefore placed at the high seismic risk Zone-V. This region has experienced two great earthquakes with magnitude of more than eight (8) along with numerous other large earthquakes. Geomorphic indices have proved to be powerful tools to indicate ongoing tectonic activity. Such analyses have been carried out in various tectonic regions of the world. These parameters allow identification of deformation and uplift experienced by an area. The present study is carried out to throw light on ongoing tectonic activity in the region.The indices such as asymmetry factor and transverse topography symmetry factor of the study area suggest basin tilting toward NE and SW. The calculated values of mountain front sinuosity index ranges from1-1.7, while basin elongation ratio shows value less than 0.6indicating active basins. Channel sinuosity shows sinuous and meandering channels while low values of valley floor width to valley height ratio and high values of stream length gradient index toward the thrusts zones suggests the area to be tectonically active.

Behaviour of Naturally Sustainable Sisal Fiber and Synthetic Fiber in Stone Matrix Asphalt

A.K. Chouksey1, M.Sukhija1 and M.Chaudhary1

1 Department of Civil Engineering, IIT (BHU), Varanasi, India

E-mail: mayanksukhija.rs.civ18@itbhu.ac.in

There are many modes of failure in flexible pavement such as cracking (fatigue), rutting (permanent deformation) and damage due to moisture. Rutting is one of the permanent deformation due to which longitudinal surface depressions are formed which causes failure of pavement prematurely. So there is a requirement of bituminous mix which can provide maximum resistance against the rutting failure. The Stone Matrix Asphalt mixtures are preferably constructed for the prevention of deformations caused by rutting. The S.M.A. mix consists of 70-80 % of coarse aggregate of total aggregate mass, 10-12 % fillers, higher bitumen content near about 5.5-7 % and about 0.2-0.4 % fiber which holds the mix together.

Addition of small quantity of fiber prevents drainage of binder during transport and placement. Sisal fiber (natural) and acrylic fiber (synthetic) were used. The main objective of this research work is to determine the viability of sisal and acrylic fiber in S.M.A. The Marshall Stability test, drain down test, Indirect Tensile Strength test and contabro abrasion test were performed on test specimen to determine the effects of fibers in bituminous mix.

Marshall Stability value increases by adding the above mentioned fibers. Adding Acrylic fibers in bituminous mix leads to 39% increase in Marshall Stability while Sisal fibers leads to only 7% increment. Adding 0.2% acrylic and 0.4% sisal fibers in the mix reduces the drain down of binder less than 0.3% which satisfy the specified criteria. Blending of fibers improves the Indirect Tensile Strength of mix which inturns improves the moisture susceptibility. Sisal fibers results in better performance against resistance to moisture damage than acrylic fiber. One of the main advantage of using natural fibers in bituminous mix is that it can lead to green technology and brings economy in pavement technology. Hence adding fibers in the mix results in higher stability and durability which increases the service life of pavement.

Keywords: Stone Matrix Asphalt, Rutting, Acrylic fiber, Sisal fiber, Indirect Tensile Strength, Marshall Stability.

Artificial Ground Water Recharge Planning using Geospatial Techniques in Hamirpur

Himachal Pradesh, India

Preeti Bisht and Vijay Shankar

Civil Engineering Department, NIT Hamirpur, Himachal Pradesh, India

Email:preetibisht840@gmail.com

Groundwater is a precious natural resource of limited extent, however the over exploitation has depleted its availability. Since it is always not possible to recharge the groundwater naturally by rainfall, great attention is being directed towards artificial recharge to fulfil the domestic, agricultural and industrial requirements. Any man-made activity which makes an easy access of surface water into groundwater is referred as Artificial Recharge. The objective of this study is to develop a methodology for the delineation of potential recharge zones and to identify the suitable site for the artificial recharge structures in Hamirpur, Himachal Pradesh using geospatial techniques. Geospatial techniques such as Geographic Information System (GIS) and Remote Sensing are used in this study. Factors affecting groundwater recharge are used as the input for the analysis. The factors considered in the present study are land use land cover, geology, geomorphology, slope, drainage density,

lineament density and soil texture. Toposheets of Survey of India, remotely sensed satellite images and some field data of the study area is used to prepare the thematic maps in GIS environment using ArcGIS 10.3.1 Software. These thematic maps are converted into raster format before their application in GIS software. A proper ranking and weightage is given to each parameter of the thematic layer on the basis of their influence on groundwater recharge using Multi Influencing Technique (MIF). Weighted index overlay tool in GIS software overlays all the thematic layers to obtain the required map of groundwater recharge zones. After analysis Hamirpur is divided into different zones depending upon the ability of recharging the groundwater. Better planning and administration of the groundwater resources can be done using the results. Percolation tanks are suggested for the areas having very good and good recharge zones. Similarly for zones of moderate potential check dams and for zones of poor recharge potential sub surface dykes are provided.

Keywords: Artificial recharge, Groundwater potential zones, Geospatial techniques, Geographic Information System

Reference:

1. Magesh, N. S., N. Chandrasekar, and John Prince Soundranayagam. "Delineation of groundwater potential zones in Theni district, Tamil Nadu, using remote sensing, GIS and MIF techniques." Geoscience Frontiers 3, no. 2 (2012): 189-196.
2. Raviraj, A., N. Kuruppath, and B. Kannan. "Identification of Potential Groundwater Recharge Zones Using Remote Sensing and Geographical Information System in Amaravathy Basin." J Remote Sensing & GIS 6, no. 213 (2017): 2.
3. Thapa, Raju, Srimanta Gupta, Shirshendu Guin, and Harjeet Kaur. "Assessment of groundwater potential zones using multi-influencing factor (MIF) and GIS: a case study from Birbhum district, West Bengal." Applied Water Science 7, no. 7 (2017): 4117-4131.

Analysis of Intelligent Transport System and its application in improving the traffic condition of Guwahati city

PradyumnaKalita,Abhishek Goswami, Manab Jyoti Adhikary

Department of Civil Engineering, Jorhat Engineering College,India

E-mail:pradyumnakalita98@gmail.com

Intelligent Transport System (ITS) is the application of sensing, analysis, control and communications technologies to ground transportation in order to improve safety, mobility and efficiency. With the conception of smart city transmuting cities into digital societies, making the life of its citizens easy in every facet, Intelligent Transport System becomes the indispensable component among all. It aims to achieve traffic efficiency by minimizing traffic problems.

Guwahati is one of the most developed cities in north-eastern region. With the development in technology, economic conditions, there are also problems rising. One of biggest problem in Guwahati city is traffic related problems. With increase in population the problem of traffic congestion is arising. Many of us are quick to blame traffic congestion on the drivers. But there are many factors that are out of hand. With increase in the no. of cars, motor vehicles, the parking spaces around the city in malls, roadside, and other institutions are gradually decreasing. Peoples spend a lot of time and fuel looking for parking spaces in streets and economical institutions.

In our present work we have analysed different techniques and methods to lower the rate of traffic problems of Guwahati city. Real time traffic monitoring system can be put to work to control the traffic congestion. There has always been the necessity of accurate and real time traffic information among the commuters and drivers. In present time with the increased use and availability of GPS enabled smartphones, a traffic monitoring system based on cell phone GPS data is highly practical. Vehicles equipped with a GPS system driving through the traffic of different roads can generate useful information like vehicle speed, geo location and information regarding the road. So an application can be developed using these data and give information about the real time traffic condition of a city at any given time to any user. Moreover cameras can be placed at several traffic points of road segments at some intervals to monitor the vehicular activity on the roads, rate of traffic congestion, its cause and send the information to proper authority to work on it at the right time. For the parking space availability problem smartphone application can be developed that will give us the information about the availability of parking at various institutions, malls etc. Through the app people will also be able to book their parking space for a specific time, on a specific date without facing any problem. These things will deliver proper contribution in transforming cities like Guwahati to a smart and efficient city for its peoples greater good.

Key-words: intelligent transport system, road traffic, smart city, GPS, smartphone app

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An Empirical Study on Signal Decomposition Techniques for Baseline Wander Removal in ECG Signals

Deepankar Nankani

Department of Computer Science and Engineering, IIT Guwahati, India

E-mail: d.nankani@iitg.ac.in

Automatic recognition of abnormal heartbeats from Electrocardiogram (ECG/EKG) signal is an important and essential task as it is used to diagnose heart diseases like arrhythmia clinically. To analyse the ECG effectively, it needs to be preprocessed to remove embedded low frequency noise such as Baseline Wander (BW) and high frequency noise such as power line interference. This work particularly focuses on removing the BW using the signal decomposition techniques such as Empirical Mode Decomposition (EMD), Ensemble Empirical Mode Decomposition (EEMD), Complete Ensemble Empirical Mode Decomposition using Adaptive Noise (CEEMDAN), Variational Mode Decomposition (VMD) and also filtering techniques such as Median Filter and Mean Median Filter (MMF). The performance is measured on the basis of Pearson Correlation, Maximum Absolute Error, Percentage root mean square difference and execution time. From the analysis we found that VMD removed the BW efficiently without disturbing the signal in a very short duration. As VMD focuses on high frequency component we still obtained the first mode as a low frequency mode which is equivalent to the BW.

Cost-aware Deployment of Enterprise Applications in Federated Cloud Data Center

Moustafa Najm and Venkatesh Tamarapalli

Department of Computer Science and Engineering, IIT Guwahati, India

E-mail: {Moustafa.najm, t.venkat}@iitg.ac.in

Nowadays, many enterprise applications with a global coverage and a huge volume of data communication are deployed on the cloud, such as social media, e-commerce, and online games. When a single data center (DC) is unable to satisfy the requirements of such applications, the federated paradigm where multiple cloud providers can share their resources presents a scalable and flexible platform to serve these applications. Federation has many features which benefits the cloud providers and the user, such as high availability, profit maximization, improved QoS and avoiding vendor lock-in for the user.

The main goal of each cloud provider (CP) is minimizing the operating cost. Energy consumption contributes a major fraction of DC's operating cost. NRDC has expected that U.S. DCs will consume 140 billion (KwH) by 2020 which costs CPs $13 billion. Further, enterprise applications contain large number of virtual machines (VMs) with complex communication among these VMs. A recent study has predicted that the annual DC traffic will reach up to 20.6 ZB by 2021 costing CPs $ 4.45 billion. Subsequently, energy and bandwidth are essential factors that affects the cost of CPs, and they must be considered during VM placement to minimize the operating cost.

This work is motivated by the following observations from the literature. First, the requirements of enterprise applications make the federated cloud as the most suitable platform for deploying such applications. Second, Although the problem of VM placement has been widely explored within a single DC, federated DCs pose new challenges such as spatial and temporal cost diversity, possibility of sharing resources with other CPs and inter-DC communication. Third, WAN communication used between DCs in the federation is costly. While previous research focus mainly on optimizing energy consumption, we argue bandwidth cost should be taken into account also to minimize the total cost. Fourth, most of the works in literature place individual VMs. However, VMs of an application need to communicate with each other to perform a particular task, e.g. multi-tier applications. Because of this,

it's useful to allocate groups of correlated VMs together to improve the performance and reduce the bandwidth usage.
The problem addressed in this work is the placement of enterprise applications in federated DC with the objective of minimizing energy and bandwidth costs simultaneously by allocating groups of VMs and leveraging the variation in electricity price across DCs in the federation.

2. PROPOSED METHOD
Towards solving this problem, we propose a heuristic based algorithm for VM placement which allocates clusters of VMs that are highly correlated in terms of communication. The algorithm includes two tasks; grouping and allocation. Grouping creates clusters of VMs based on the density of traffic among the VMs by removing lowest weight links recursively keeping the high communicated VMs in one cluster. This task aims to reduce the bandwidth cost associated with the communication between DCs. Allocation task maps the clusters of VMs that are created by the grouping task to the DCs in the federation starting with the DC having minimum electricity price. This task aims to minimize the cost of energy. Instead of allocating individual VMs, the proposed algorithm allocates clusters of correlated VMs. It reduces the costs of energy consumption and bandwidth together in simple steps.

3. RESULTS AND CONCLUSION
We have evaluated the proposed algorithm using different real scenarios, and comparing it with common bin backing methods; first fit, worst fit and best fit. We have also implemented first fit with electricity price awareness. The simulation platform is a federated cloud composed of eight DCs belongs to three CPs in different areas. We have studied the impact of application size on the costs. Simulation results show that the proposed method reduces the cost of energy up to 40% comparing to other methods. It also reduces the cost of bandwidth significantly; that is up to 70% for applications with large size. The reason behind that is that the proposed algorithm keeps the dense communication within a DC and it tries to minimize the traffic between DCs. We have also demonstrated the advantage of the federation by testing the proposed algorithm with federated and non-federated setup. Simulation results showed that the proposed algorithm obtains lower costs in the federated setup compared to non-federated scenario. Accordingly, our algorithm performs better than others in all scenarios, especially for large applications, and it achieves superior results in federated setup. We can conclude that the proposed algorithm fits perfectly for deployment of enterprise applications in the federated cloud.

REFERENCES

[1] P. Eugster, C. Jayalath, K. Kogan, and J. Stephen. 2017. Big Data Analytics beyond the Single Data center. Computer 50,6(2017),60- 68. [2] Z. Li, J. Ge, H. Hu, W. Song, H. Hu, and B. Luo. 2018. Cost and Energy Aware Scheduling Algorithm for Scientific Workflows with Deadline Constraint in Clouds. IEEE Transactions on Services Computing 11, 4 (2018), 713–726. [3] G. Venkatesh and K. Arunesh. 2018. Map Reduce for big data processing based on traffic aware partition and aggregation. Cluster Computing (05Feb2018).

Unsupervised Pre-training on Improving the Performance of Neural Network in Regression

Pallabi Saikia

Department of Computer Science and Engineering, IIT Guwahati, India

E-mail: pallabi.s@iitg.ac.in

The work aims to empirically analyse the performance of the prediction capability of Artificial Neural Network by applying a pre-training mechanism. The pre-training used here is same as the training of

Deep Belief Network where the network is formed by stacking Restricted Boltzmann Machine one above the other successively. A different set of experiments are performed to understand in what scenario pre-trained ANN performed better than randomly initialised ANN. The results of experiments showed that pre-trained model performed better than randomly initialised ANN in terms of generalised error, computational units required and most importantly robust to change in hyperparameters such as learning rate and model architecture. The only cost is in additional time involved in the pre-training phase. Further, the learned knowledge in pre-training, which is stored as weights in ANN, are analysed using Hinton diagram. The analysis could provide a clear picture of the pre-training that learned some of the hidden characteristics of the data.

Agriculture and rural development

Team Name: Mighty_Coders

Team Leader Name: Harshita Paliwal

Idea/Solution: India is an agriculture based country and farmers are backbone of our country but unfortunately many farmers (nearly 5650 per year) are committing suicide due to crop destroy or loan sharks. To decrease these suicides, we need to convert cultivation into a profitable job, our idea is a step in this direction. In our country all the farmers are not capable to purchase tractors, costly machineries and other equipments which are used for better and effortless cultivation by which productivity of farming is also increases, therefore we want to develop an mobile application for poorer or economically weaker farmers by which, that farmers who are having costly machines and tractors for cultivation in better way and currently that machineries are not in use for them (or some merchants who want to buy machines for giving on rent) can also earn money by giving their machineries on rent. Our idea is predominantly rooted on the hiring of mechanism for cultivation.
We are endeavouring to procreate a solution, in our solution we will include following factors (features):-

➢ In our proposed solution there is a GPS (Global Positioning System) facility available by which we can know about merchants who wants to rent their machines near us.

➢ There are also many farmers in our country who do not know English so, this application will also be available in many regional languages.

➢ It will be helpful for those persons who want to give his available machineries on rent and farmers will able to hire machines directly through this solution and if they want to buy it then also they can ask the merchant to buy it.

➢ By the use of this app we can also chat, call or contact to the merchant so communication becomes easier.

➢ There is a section also available in which this application teaches how to use these machineries.

➢ Facility of the rating is also available in this app by which the farmer's profile and real condition of the machine can be known.

➢ Machineries will be available at nominal cost by direct hiring.

➢ Rent will be calculated automatically on days or hours basis.

➢ There is a payment gateway by which online payment can be done easily and transparency in payment process is increased.

➢ An administrator will monitor farmers, merchant, and machines to reduce the chances of fraud.

➢ Through this application, we can take the information of the nearest soil testing centre with the help of GPS and seek help from technical experts.

We are trying to develop a mobile application by which the farmers which are unable to buying machineries can hire it from the Persons who want to give their machineries on rent, through this app the farmers will directly hire machineries from that persons on nominal charges.

In our proposed solution there will be a mobile application by which the poor farmers will be able to hire their required machine and machine will return and rent will be paid on the completion of their work. `Whenever farmers need a tractor or any farm equipment, they can simply use its mobile application, and place their order. They will receive a well-maintained tractor and machineries. Not only they can get their work done in a stress-free manner, with consistent use of mechanisation, their productivity increases too.

It aims to raise the level of mechanization in farming through the power of technology and a strong franchisee network to make farm mechanization easily accessible, affordable and reachable to farmers across India

Merits of this application:

➢ Only one-time registration is required for both the parties. There is no need to login every time.

➢ Poor farmers can get expensive machineries at nominal rental charges.

➢ Productivity of farmer's is also increases by this application.

➢ Farmers who are having machineries can get side income by this application.

➢ This is a good opportunity for merchants to start their business by this application.

➢ This application may generate employment opportunities.

➢ This will reduce the human effort and mechanization will increase.

Technology Stack

Required Hardware Specifications for create this application:

• Processor : core i3, 2.66 GHz or higher
• RAM: 4GB or more
• Storage: 6 GB Space Required in HDD

Required Software for create this application:

• IDE: Android Studio, SQL
• Database: Mysql5.1\ Oracle 12 C
• Server: Apache Server and GlassFish server
• Technology Used: Android

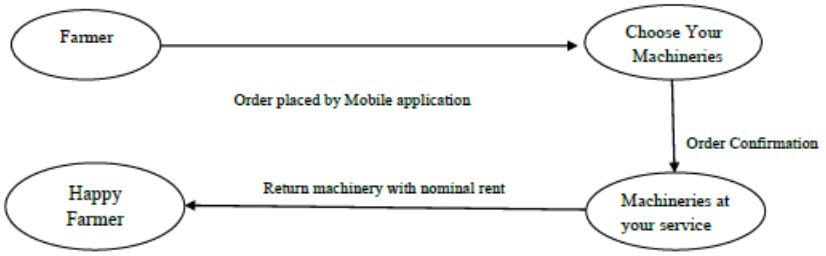
Required Hardware Specifications for run our application:

• Processor : ARM Version 7 processor or higher
• Random Access Memory: 32MB or more
• Storage: at least 35 MB required for better working.

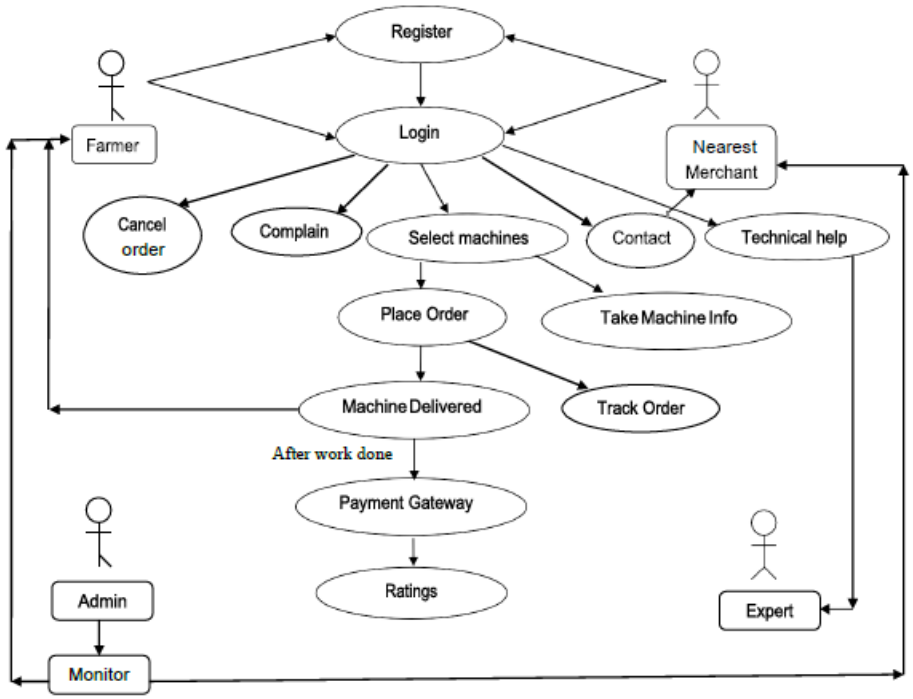
Required Software for use this application:

• Android version 4.1 (Jellybean) or higher version

Functional Diagrams:



Use Cases:



Limitations :

➢ Internet connectivity is required.

➢ All merchants and farmers give their information at the time of registration.

➢ All machineries and rental rates must be updated.

➢ Contact information of farmers and merchants must be right and up to date.

Comparative Analysis of Recent Encoding Techniques for Scalable Image Retrieval

Dave Gangte, Parmod Kumar Shrestha, Paul Nehminthang Haokip, Alexy Bhowmick
Department of CSE & IT, School of Technology, Assam Don Bosco University, Guwahati, Assam, India
E-mail: davethe46@gmail.com

We study three recent feature encoding methods Bag-Of-Visual Words (BOVW), Vector of Locally Aggregated Descriptors (VLAD), and Fisher Vector (FV) in the context of image retrieval and present results on benchmark INRIA Holidays dataset.

Keywords: Feature vector, descriptors, codebook, centroid, retrieval.

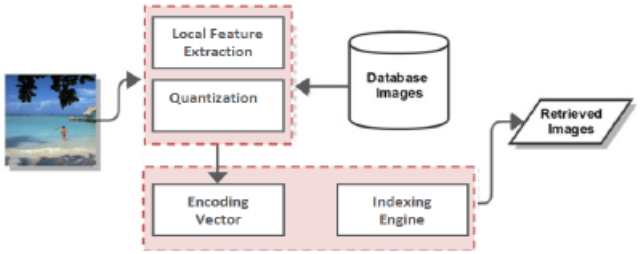


Fig 1: A typical pipeline for image retrieval using compact discriminative vectors.

Problem:

Given a query image,the scene retrieval problem involves finding "semantically" similar images for the query image.

This involves various stages: local feature extraction, codebook quantization, feature encoding, indexing and retrieval.(Fig 1).

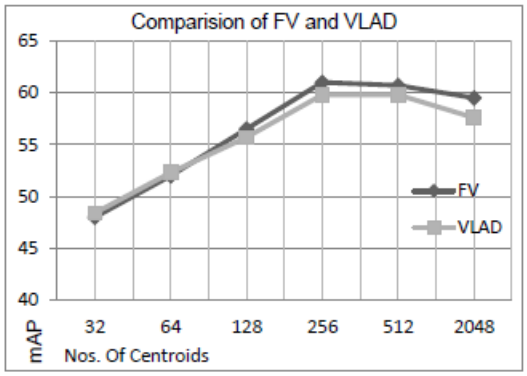
Challenges:

Scene retrieval involves the joint optimization of multiple constraints: accuracy (quality), efficiency (speed), and memory usage (footprint) [2].Other challenges include retrieval under occlusion, background clutter, variations in viewpoint and illumination.

Methodology:

We implemented three state-of-the-art feature encoding techniques: BOVW [1], VLAD [2], and FV[3] for image retrieval.

INRIA Holidays [2] (1491 images) and mean average precision (mAP) was used for performance evaluation.



Result:

FV attained a mAP score of 61. VLAD attained a map score of 59.8. BOVW attained a mAP score of 45.2. Fig. 2 shows the comparison between FV and VLAD. BOVW requires extremely large codebook size (20,000).

Discussion:

A systematic break down of steps helped us to understand the encoding techniques.

• The encoding of first-order statistic (residual) in VLAD and second-order statistic (covariance)in FV benefits retrieval performance.

Conclusion:

In a systematic comparison, FV outperformed BOVW andVLAD on standard benchmark. The use of higher-order information in encoding process improves image retrieval.

References:

1. J. Sivic, A. Zisserman, " Video Google: A text retrieval approach to object matching in videos," in: Proceedings Ninth IEEE International Conference on Computer Vision, 2003, pp. 1470–1477 vol.2.

2. H. Jegou, M. Douze, C. Schmid, P. Prez, Aggregating local descriptors into a compact image representation, in: 2010 IEEE Computer Society Conference on Computer Vision and Pattern Recognition, 2010, pp. 3304–3311.

3 Perronnin, J. Sanchez, T. Mensinsk, "Improving the Fisher kernel for Large-Scale image Classification,"in: ECCV(2010), Part IV, LNCS 6314, pp. 143-156, 2010.

Proactive Disaster Detection

Kaustubh Hiware, Ritam Dutt, Sohan Patro

Department of Computer Science and Engineering, IIT Kharagpur

Email: hiwarekaustubh@gmail.com, ritam.dutt@gmail.com, sohanpatro2014@gmail.com

Epidemics are Disasters can refer to any unforeseeable situation or crisis which results in a huge damage or loss to life and/ or property. The broad spectrum of disasters encompasses natural calamities like earthquakes, floods, disease outbreaks and even anthropogenic incidents like terrorist attacks. Online Social Media (OSM) sites, especially microblogging sites like Twitter and Weibo, have been shown to be very useful for gathering situational information in real-time [1].. Previous work on real-time earthquake detection in Japan was deployed by [2] using Twitter users as social sensors. The work demonstrated that social media was able to detect earthquakes faster than conventional seismographic sensors.

However, merely detecting the onset of a disaster is not sufficient. It is also essential to gather other vital situational information pertaining to the disaster, such as the regions which are presently affected and those prone to future risk. This would assist in post-disaster relief operations. Consequently, an important component of this task involves accurately extracting geographical locations from the tweet texts and associate the information available online with the physical location. We specifically seek to infer the location from the tweet text as opposed to geotagged information, for two important reasons.

i) Geotagged tweets are very sparse in number, especially in developing countries and accounts for only 0.36% of the tweet traffic.

ii) The tweet's geo-tagged location is not always a valid representative of the incident mentioned in the tweet text. For instance, the tweet "Will discuss on TimesNow at 8.30 am today regarding Dengue Fever in Tamil Nadu." clearly refers to Tamil Nadu, but the geo-tagged location is New Delhi.

We thus propose an automated, real-time location inferencing tool with the overarching goal of developing an early-warning system that can be used to identify disasters. Although there exists several methodologies such as Stanford NER [3], TwitterNLP [4], for extracting locations from the texts, they are not fast enough to deployed on a real-time setting. Moreover the existing Information Systems which are used for disaster relief operations such as Ushahidi [5] and Mapbox [6] require users to explicitly specify the location. Our proposed system intends to tackle both these issues.

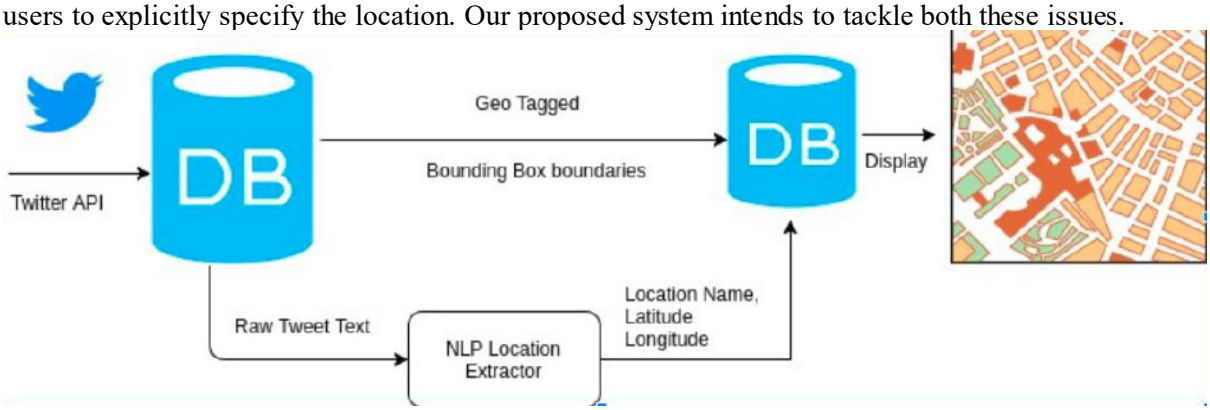


Figure : The working methodology of our proposed system

References:

[1] Muhammad Imran, Carlos Castillo, Fernando Diaz, and Sarah Vieweg. 2015. Processing Social Media Messages in Mass Emergency: A Survey. Comput. Surveys 47, 4 (June 2015), 67:1–67:38

[2] Takeshi Sakaki, Makoto Okazaki, and Yutaka Matsuo. 2010. Earthquake Shakes Twitter Users: Real-time Event Detection by Social Sensors. In Proc. International Conference on World Wide Web (WWW). 851–860.
[3] Jenny Rose Finkel, Trond Grenager, and Christopher Manning. 2005. Incorporating Non-local Information into Information Extraction Systems by Gibbs Sampling, In Proceedings of the 43rd Annual Meeting on Association for Computational Linguistics (ACL '05). Association for Computational Linguistics, Stroudsburg, PA, USA, 363–370.
[4] Alan Ritter, Sam Clark, Mausam, and Oren Etzioni. 2011. Named Entity Recognition in Tweets: An Experimental Study. In Proceedings of the Conference on Empirical Methods in Natural Language Processing (EMNLP '11). Association for Computational Linguistics, Stroudsburg, PA, USA, 1524–1534. http://dl.acm.org/citation.cfm?id=2145432.2145595
[5] 2008. Ushahidi. https://www.ushahidi.com/. (2008). Accessed: 2018-01-2
[6] 2015. Chennai floods map: Crowdsourcing data and crisis mapping for emergency response. (2015)

A New Local Thresholding Technique with Type-2 Fuzzy Set Based Pre-Processing for Plasmodium Vivax Thresholding

Mahmood Hussain1, Dr. Dibya Jyoti Bora2 1School of Computing Sciences,

The Assam Kaziranga University, Jorhat, India 2School of Computing Sciences, The Assam Kaziranga University, Jorhat, India

Email: mahmoodhussain544@gmail.com

Malaria is an extremely dangerous disease affecting the humans with a very high mortality rate. Plasmodium vivax is the most common parasite for the cause of malaria. In the current time, the people affected by this parasite globally. Generally, the detection of malaria parasite is very time consuming, subjective, error-prone. So an automatic or semi-automatic technique to detect the Plasmodium Vivax infected cell is utmost required for timely detection and thereby treatment of the same to eradicate the disease breakout. In this technique, a new local thresholding based approach for the detection of the malaria parasite is introduced. The inclusion of a type-2 fuzzy set based technique for pre-processing of the input P.Vivax infected image is one of its strong point. And, a new and very easy method of calculating threshold value on local window basis is proposed. The results of the proposed technique are found quite satisfactory and better than the other traditional techniques. In image segmentation process the gray level of a pixel belonging to an object are completely different from the background gray level pixels. So, thresholding becomes a simple but effective tool to separate those foreground objects from the background. In global method one threshold value apply the entire image while local method used different threshold value.
The final result is compared with other traditional and recent techniques and found our results superior to them. So, the proposed technique can be adopted for any P.Vivax image thresholding task. Future research work, in this case, will mainly focus on the development of an advanced fuzzy technique for color thresholding of P.Vivax images.

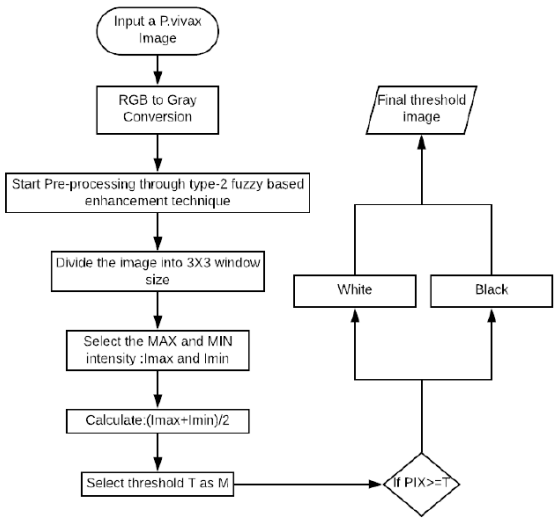


Fig 1: flow chart of the Proposed Technique

References: 1.Bora,Dibya Jyoti."An Efficient Innovative Approach Towards Color Image Enhancement." International Journal of Information Retrieval Research (IJIRR) 8, no. 1 (2018): 20-37
2.R.C. Gonzalez,R.E.(Woods)2008,Digital Image Processing, Prentice-Hall,Englewoods Cliffs,Nj

LAN CONNECTED DENSITY BASED SMART TRAFFIC SIGNAL WITH PROTITY SUPPORT FOR IMPROVING TRAFFIC DISCIPLINE

Prof. M.Ramalingam, S.Ramesh Kumar
Department of Information Technology
Kongu Engineering College,Erode ,Tamil Nadu,India

E-Mail : snehanram@gmail.com, Kumar52ramesh005@gmail.com

Today's traffic is the most challenging problem in major smart cities. Smart traffic controller is more necessary to provide effective handling of this issue to avoid waiting in signals and also to provide pollution less life to people. Current system is completely operates on static timer with no inter connection and priority support. Our proposed LAN connected traffic signal is widely implemented in various countries for providing well known purposes such as congestion prevention, augmenting efficiency by minimizing travel times. In this project work, we proposed a smart traffic signal control method with LAN connected which can able make analysis, develop and deploy monitoring and information system jointly with the help of state of the art traffic equipment, to provide the safe and effective handling of traffic movement in all road users. The main goal of this work are improving safety, minimizing travel time and also prioritizing emergency vehicles. This system is made up with hubs and central server with can control the signal based on real traffic analysis data provided. This system highly helps in handling today traffic within effective response time.

A comparative analysis of text classification techniques to detect and measure ambiguity in Requirement Engineering documents using WEKA classifier

Shilpi Singh1 and C. L. P. Saikia1 1

Department of Computer Science & Engineering, Assam Downtown University, Guwahati 781026, India

E-mail: shilpi24_singh@yahoo.co.in

The Requirement Engineering (RE) documents are always written in natural language and thus are prone to ambiguity. An “Unambiguous” document is needed to avoid software crisis in software development process. The study here mainly focuses on approaches to handle textual ambiguity in any RE documents, which indicates the importance of manual detection process and use of some formal specification language to reduce ambiguity in RE document. Our study recommends both the inspection technique and use of some formal methods to write an “Unambiguous” RE document. In this regard, we performed a comparative analysis of various formal methods and depending on the various project attributes a particular formal method can be used to write a RE document. Further, our study also reveals the importance of some semi–automatic tools using machine learning in association with experts experience to detect and reduce ambiguity in RE document. The sample dataset is created from the published studies in the past and is analyzed using the WEKA classifier. A comparative analysis was done using different text classification techniques like Naïve Bayes, Decision tree, and Support vector machine. The data set is simulated using the WEKA classifier and the average kappa index generated from the selected algorithms indicates the substantial quality of dataset. On the basis of other statistical parameters like Precision, Recall, Error rate and time the C4.5 decision tree algorithms is considered to be more suitable for the purpose of classifying a text as “Ambiguous” or “Unambiguous”.

Keywords -
Formal Methods, Inspection Techniques, Text Classification, Kappa index, Recall, Precision

Object Sequences: Encoding Categorical and Spatial Information for Visual Question Answering

Shivam Garg , Rajeev Srivastava
Department of Computer Science and Engineering, IIT (BHU) Varanasi, India

E-mail: sgdpsi@gmail.com

The task of Visual Question Answering (VQA) is to understand an image and answer open-ended textual questions related to it. This project is based around "Object Sequences": a novel approach of encoding the visual information (categorical and spatial information) about all the objects present in the image as a sequence. This sequence is formed out of the object feature vectors ordered by the spatial location of their respective bounding boxes as shown in Fig. 1. The motivation behind this structure was that sequences explicitly provide an order to the image objects (e.g.: Sequence: <vase> <table>; Question: "Is the vase on top of the table?") and are readily processed by existing models like Recurrent Neural Networks.
To test this approach, we implemented neural network models in PyTorch and experimented with different techniques of obtaining joint embedding from the visual features of the image (in form of object sequences) and the language based features obtained from the questions. We also conducted ablation experiments to validate all the components of the sequencing method. The most important consequence of this sequencing approach, which we confirmed by an error analysis, was that it reduced the effect of bias in the dataset on model performance. Consequently, the model is more likely to consider the placement of the objects in the image while answering a question, rather than

overfitting on say, the co-occurrence of the word <vase> with <top> in the question. All the experiments were performed on the Oracle task of GuessWhat dataset (a Yes/No VQA task).
VQA leads to better integrated language-vision systems, since in order to solve VQA a model needs to learn language, object identification, common world knowledge. Also, there exist direct applications of VQA algorithms to real world systems such as intelligent robots, visual chatbots, cyber-physical systems interacting with humans and each other, etc

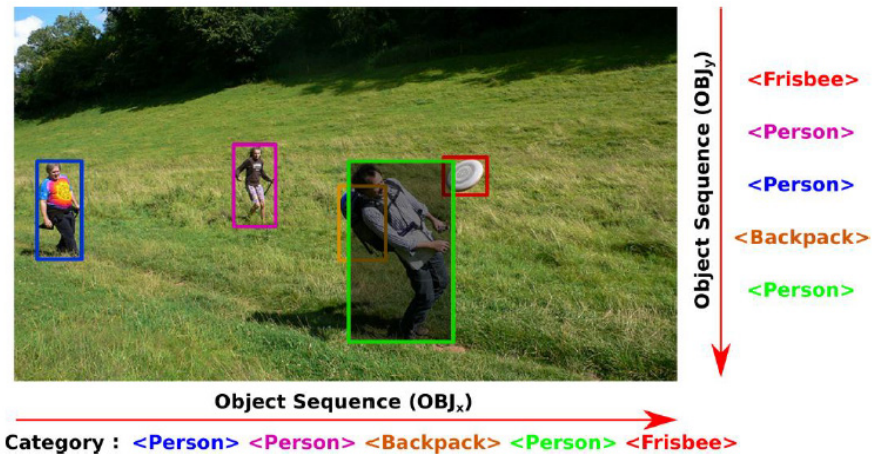


Figure 1: Object sequences, along *X* and *Y* axes, for an image (Figure taken from [1]).

Publication:

[1] Shivam Garg and Rajeev Srivastava, Object Sequences: Encoding Categorical and Spatial Information for a Yes/No Visual Question Answering Task, IET Computer Vision, 2018, 12, (8), pg. 1141-1150, DOI: 10.1049/iet-cvi.2018.5226.

IoT Based Prepaid Electricity

R.THILAK CHAKRAVARTHI

Email: **thilakchakravarthi1@gmail.com**

This paper presents a novel design method of minimizing the queue at the electricity billing counters and to restrict the usage of electricity automatically, if the bill is not paid. The project also aims at proposing a system that will reduce the loss of power and revenue due to power thefts and other illegal activities. The work system adopts a totally new concept of “Prepaid Electricity”. The IoT based concept is used so that we can continuously monitor the consumption of power (in watts) and if it reaches the minimum amount, it would automatically alert the consumer to recharge through internet. In this Ardiuno processor is used to monitor and control the entire system model. This technology holds good for all electricity distribution companies, private communities, IT parks and self-containing housing projects. The implementation of this project will help in better energy management, conservation of energy and also in doing away with the unnecessary hassles over incorrect billing. The automated billing system will keep track of the real time consumption and will leave little scope for disagreement on consumption and billing.
Keywords: Prepaid, Electricity, Arduino Controller, Constant Update through GSM and Internet.

Yunus Khan and Sunita Varma

Ph.D. Scholar, Shri G.S. Institute of Technology and Science Indore M.P. India (RGPV Bhopal)
Professor and Head, Shri G.S. Institute of Technology and Science Indore M.P. India

Now a days cloud computing is one of the popular and widely used concepts in information technology paradigm. It is committed to improving the IT business technically and economically. On the other hand, digital forensic is the process of collection, identification, preservation, examination and analysis of data or information for the proof in the court of law as an evidence. It is very difficult and challenging to apply digital forensic operation in a cloud environment because CSP's are dependent on each other either they provide IaaS, PaaS or SaaS. So the cloud forensic is one of the applications of digital forensic in a cloud environment is just a subset of network forensic. It's a cross-field of digital forensic and cloud computing. In this paper, we investigate all the research issues, problems and implementation ethics of cloud forensic from the initial level. We found that lots of issues and challenges are remaining to address in this domain. Some major research domains are architectures, data collection and analysis, anti-forensic, incident first responders, roles and responsibilities, legal, standards, and some learning issues. In our research work we mainly focus on the data collection, cloud forensic architectures and also implement a cloud forensic framework in the context of cloud service models. This research work is tested using different private cloud solution such as eucalyptus, Open Nebula, VMware, vcloud and Hadoop platform. In our research work we implement pattern search facility using the proposed approach in open source software called digital forensic framework. We also implement in near future digital forensic triage using Amazon elastic map reduce. In this research we also implement designed and development of forensic method for the PaaS and SaaS delivery model of cloud computing. Also apply machine learning principles to design and develop new digital forensic methods, improve the efficiency of investigation using machine learning algorithms for future extraction priority of evidence classification of evidence in virtual machines.

Index Terms: Digital Forensic, Data Collection, Evidence Segregation, Dependency Chains, IDS, Multiple Jurisdictions and Tenancy, and VMware.

References:

[1] Saad Said Alkahtny, Thesis On "A Forensically Enabled Iaas Cloud Computing Architecture", University Of Plymouth, Http://Hdl.Handle.Net/10026.1/9508. Jan 2017.

[2] Mark Tangiwai Mathew Piwari, Thesis On "Digital Forensics In The Cloud: The Reliability And Integrity Of The Evidence Gathering Process", Auckland University Of Technology Newzeland 2016.

[3] Almarzooqi, A. And Jones, A., 2016, January. A Framework For Assessing The Core Capabilities Of A Digital Forensic Organization. In IFIP International Conference On Digital Forensics (Pp. 47-65). Springer International Publishing .

[4] Almarzooqi, A., Jones, A. And Howley, R, 2016 May. Applying Grounded Theory Methods To Digital Forensics Research. In The 11th Annual Adfsl Conference On Digital Forensics, Security And Law.

[5] Alecsandru P˘Atra¸Scuand Victor Valeriu Patriciu, "Implementation Of A Cloud Computing Frameworkfor Cloud Forensics", Proceedings Of The 18th International Conference On System Theory,Control And Computing, Sinaia, Romania, October 17-19, 2014978-1-4799-4601-3/14/$31.00 ©2014 IEEE.

[6] Victor R. Kebande & H.S. Venter, "Novel Digital Forensic Readiness Techniques In The Cloud Environment", In Australian Journal Of Forensic Sciences, Published In January 17, 2018.

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ProximiTREE: Enhancing Gestalt Perception in Cerebral Palsied Children

Abhishek Kanthed - a.kanthed@iitg.ac.in
Ashutosh Agrawal - ashutosh.des@iitg.ac.in
Arpit Mathur - arpit.mathur@iitg.ac.in
Harshit Sharma - harshit.sharma@iitg.ac.in

Cerebral palsy (CP) is a permanent disorder that primarily affects motor control[1]. Children diagnosed with CP often show additional disturbances of sensation, perception, behavior, and communication. Additionally, there is a high prevalence of arithmetic learning problems including numerical capacity in children with hemiplegic CP. These children do not spontaneously use subitizing to evaluate small quantities[2]. The low subitizing limit of CP children stems from a lesser capacity to perceive patterns (dot configurations) as a gestalt. The aim of this paper is an attempt to develop gestalt perception of proximity in children with CP using a tangible user interface. This study aims at designing a tangible user interface[3] solution to enhance the gestalt perception of proximity in children with CP. The interface includes a vertical interactive surface with audio and visual feedback to assist children's learning of numerical quantities. Tangible designs, combined with digital effects have shown to support learning opportunities owing to the manipulative nature of physical objects.

REFERENCES

[1] Bax, M., Goldstein, M., Rosenbaum, P., Leviton, A., Paneth,N., Dan, B., Damiano, D. (2005). Proposed definition and
classification of cerebral palsy, April 2005. Developmental Medicine & Child Neurology, 47(8), 571-576.
doi:10.1017/S001216220500112X

[2] Arp, S., & Fagard, J. (2005). What impairs subitizing in cerebral palsied children?. Developmental psychobiology, 47(1), 89-102.

[3] Manches, A., O'Malley, C., & Benford, S. (2009, February). Physical manipulation: evaluating the potential for tangible designs. In Proceedings of the 3rd International Conference on Tangible and Embedded Interaction (pp. 77-84). ACM.

Supporting learning issues in high school students by augmenting educational content specifically for chemistry

Abhishek Narayan Singh and Debayan Dhar

* Dept. of Design, IIT Guwahati, Guwahati – 781039, Assam, India

E-mail: ab.narayan@iitg.ac.in debayan@iitg.ac.in

Chemistry is perceived to be a difficult subject to teach and learn all over the world at both secondary and tertiary level. Following the literature review, it was observed most of the studies on the learning difficulties of science have been done in the domain of physics with very few in chemistry. Moreover, In the Indian context, no substantial studies have been done on learning difficulties of high school students. To address the aforesaid gap this paper tries to investigate the various learning difficulties prevailing in science and how it is affecting the teaching and learning of chemistry specifically in the Indian context. Another objective of this paper is to understand the pre-instructional conception of students and how it is affecting the learning process particularly in the case of chemistry. Further, researchers try to investigate why Indian high school students find chemistry a difficult subject to learn and what are the key topics/chapter in high school chemistry textbook which they found most difficult and why.

Finally, this research paper focuses on conceptualizing different ideas to encounter these learning difficulties keeping in mind the Indian context and the economic factors. The research is still going on

and the researchers are currently involved in augmenting the available educational content so that learning difficulties can be reduced and greater learning experience can be delivered to the students.

Assessment of Body Mass Index (BMI) and Depression among Indian elderly having difficulty in sit stand transfer

Charu M Maurya and A. K. Das

Department of Design, IIT Guwahati, India

E-mail: mauryacm@iitg.ernet.in

Objective: The paper is a part of study where an assistive aid for sit stand transfer for Indian elderly will be developed. Present paper focuses on assessment of BMI and depression among older adults having difficulty in sit stand transfer.

Methods and Material: The study was undertaken in 2018 on 200 elderly respondents having difficulty in sit stand transfer. Convenient sampling method was adopted for selection of the respondents based on following selection criteria:

- Age should be more than 60 years of age
- Not bed ridden or extremely frail
- Should have intact cognitive function
- Should have certain difficulty in sit stand transfer

(Difficulty in STS transfer was defined as person needed some kind of support i.e. armrest, nearby furniture, wall etc. for standing up from a sitting posture)

Self- structured questionnaire was prepared to assess health status of the elderly and pilot tested on 20 respondents before applying for field survey. BMI was calculated using standard formula height (cm) 2 /weight (kg). Height and weight of individual respondent was measured using measuring tape and weighing scale respectively. Geriatric Depression Scale (Yesavage, 1988) was applied for assessing depression. Statistical processing of data was made using SPSS v. 25.0

Results: The results showed 36.5 % respondents were in the normal category of BMI where as 30 % respondents were in overweight category. Sixteen (16%) per cent respondents were obese (class I), followed by 4.5 % were obese (class II) and 3% were in obese (class III). BMI was observed to be high among females and vegetarian as significant differences (ANOVA) was observed for sex ($p<.05$) and food habit ($P<.001$). Regarding depression only 31.5 per cent respondents shown symptoms whereas 68.5 per cent respondents scored less than 5 on Geriatric Depression Scale (GDS). Scores of more than 5 on a 15 point Geriatric Depression Scale indicate person having depression. GDS was found to be significantly associated (ANOVA) with marital status ($p<.05$).

Conclusion: High BMI was commonly observed among respondents having difficulty in sit stand transfer. More females were found to be either in overweight or obese category which causes impairment in sit stand transfer. Depression was not that much prevalent among respondents. The above data will be helpful in designing sit stand transfer assistive aid for the Indian elderly that will make them more independent in daily life.

Reference:

Yesavage, J. A. (1988). Geriatric Depression Scale, Psychopharmacology Bulletin, 24, (4) 709- 711.

Ergonomic Design Intervention in Traditional Jewellery Manufacturing Workstation

M.S. Alam and U.R. Salve

Department of Design, IIT Guwahati, India

E-mail: sarfaraz8665@iitg.ernet.in

The production of jewellery is one of the largest employment sectors in the global and Indian economy. Jewellery manufacturing activity involves precision designs, setting the metal as well as the stones, polishing and filing. From the observation, it was clear that the jewellery workers were suffering from musculoskeletal disorders such as neck pain, low back pain, wrist pain and the posture were discomfort. The present study is seven designs conceptualized and concept scoring method was used to calculate and compare with each other and with the existing workstation design. After the concept scoring method and the expert's recognition, the best concept design model was selected for the development and posture assessment of the CAD model using DHM software. In RULA analysis, it is revealed that the virtual assessment of the model acceptable for all percentiles Indian body dimension i.e. 5th P, 50th P and 95th P. So, working posture and arm reachability of the jewellery manufacturing workers are comfortable in new workstation design

Development of Range of Motion Database for Young Adult Male Indian Population

Chirag Agarwal , Naveen Kr. Chaurasia and Sougata Karmakar*

Dept. of Design, IIT Guwahati, Guwahati-781039, Assam, India.

E-mail: chirag.agarwal@iitg.ernet.in, naveen.2015@iitg.ernet.in, karmakar.sougata@gmail.com

Over the past few decades, there have been great efforts towards improvements in the lives of human beings by designing ergonomic products/workstations. Application of anthropometric and biomechanical data is inevitable for successful design. In reality, the database for range of motion (ROM) is not available/developed for the majority of countries across globe. Following literature review it was observed that there is no reported research concerned with development of ROM database for Indian population. Moreover, there are no well depicted guidelines/readily available manual for physical measurement of ROM using Goniometer. To address the aforesaid research gap, researchers firstly attempt to design and develop a manual that would guide the engineers/designers in measuring the ROM and thereafter creating the database for ROM for young adult male Indian population. manual was developed based on study of existing body of knowledge available for literature. During measurements of ROM, accuracy and repeatability of data collection process was carried out by minimizing intra and inter-observation variability. Mechanical Goniometer set of varying sizes were used during data collection (28 ROM variables) from 96 student participants/volunteers from a premiere higher education institution in India. The sample was cosmopolitan in nature as the students were from different states in India. At first body landmarks were identified to know where the fulcrum of goniometer should be placed followed by identification of degree of freedom of various body joints in different body planes. Further, the ROM was calculated by correlating the body landmarks and the axis about which the joint is moving. A 31 page manual was designed in which different colours are used to signify different body joints and images clearly depicts the body landmarks and the posture that would help the engineers/designers in measuring the ROM. Measuring the 28 ROM variables from each volunteers was a tedious job requiring approx. 30 minutes. Collected ROM data were analysed to find the Descriptive statistics and were tabulated for database generation. It was observed that there is notable difference in ROM in left and right side of the body for same individual. Although the sample size is very less, the development of ROM database of young adult Indian male population is first of its kind attempt. It is expected that the

developed database would help the designers/engineers to get fair idea about ROM of various body joints and using the same in their design process to ensure user centric product/facility design.
Keywords : Ergonomics, Biomechanics, Goniometer, Design

Factors influencing the successful adoption of "WhatsApp" by the low-income urban population in India!

Raman Saxena,
PhD Student, Dept. of Design, IIT, Guwahati,

raman.saxena@iitg.ac.in

Among the social networking applications, WhatsApp has become the most popular messenger application among all sections of the society. The widespread adoption and use of WhatsApp across the socio-economic classes and age group across the globe including India is seen as a success story of a successful technology adoption.

Objectives: The aim of this study is to explore WhatsApp usage behavior among low-income urban population in India and to understand the factors at the product and user end, which adds to the successful adoption of the same. The study also focuses on various stages of usages, (from introduction, to registration, to sending messages, to receiving messages and replying or forwarding of received messages), also how the users comprehend during the various stages of using WhatsApp service. The study also examines the usage and adoption from the gender perspective.
Sample: This study was conducted on 31 men and 23 women among low-income urban population in Delhi and NCR Region (Delhi and Noida). The sample was selected using random sampling with two screening questions to confirm that they own a phone with proper Internet access and using WhatsApp from their phone. Out of a total sample of 54 people, 40 were engaged in some or the other kind of economic activities mainly employed in an informal sector, including housemaids, rickshaw pullers, watchmen, E-Rickshaw drivers, small business owners (tailors, potters, food cart, vegetable/fruit sellers, roadside barbers etc.), factory workers/laborers, small kiosk owners etc..
Research Methodology and Approach: A Qualitative research approach including un-structured interview and observations (contextual enquiry) was used as a methodology for this study. Observation and contextual enquiry (including asking them to do the task) were used to capture some insight in relation to the usage and behavior related to mobile devices and services. Taking the Technology Adoption (TAM) into consideration, the questions were asked to understand the "perceived usefulness" and "perceived ease of use" of WhatsApp service among the targeted users.
Findings: The study found out that even though the sample of people used in the study was actively using the WhatsApp, yet except few, everyone had taken help for installing and registering to WhatsApp service from their relatives/friends or local mobile shops. Sharing photos seems to be the most important "perceived usefulness" of the factors influencing the motivation to join the service. Social/peer influence plays an important role in influencing the perceived usefulness and perceived ease of use of this service.
Low literacy level of the target users leads to the limited use of words and sentences as they have problem in writing and texting. Many people just prefer sharing the photos, receiving the messages, and forwarding the messages and photos/videos etc. The users were found using minimum text or no text (due to no or limited knowledge of script and constructing the words/sentences with the help of the keypad). Usage is limited to existing photos, images and icons available within the WhatsApp's User Interface or images/videos received by them.
The study also found the use of WhatsApp as a business tool by many of the people of the sample engaged in some kind small businesses who are have been using the WhatsApp for sharing photos of their products, work etc. or receiving the photos/design from their customers. This is also adds to the perceived usefulness of this service by many other people.

One of the sample users (working as a housemaid) was found using the photos/images to communicate with her employers when she was sick, needed to visit her child's school, etc. Considering the limited use of WhatsApp for sharing images and videos due to limited literacy and writing skills, there exists a potential for development of some kind of visual repository/aid to help the people with limited literacy especially writing) for communication using the visual elements. Audio messages can also be another way such users can be helped but need further exploration as it will require use of features including recorders, and file management.
Keywords: Urban Poor, TAM, WhatsApp Features, Adoption, Usefulness, Ease of use, Mobile phones, Social media, Script, Visual Language, Storyboard, Social influence, Business, Literacy, Script, Internet.

Framework for Product Service System Design for Organized Plumbing in Domestic Sector

Sachin Shivaji Jadhav, Pratul Ch. Kalita and Amarendra Kumar Das

Department of Design, IIT Guwahati, India

E-mail: sjsachin@iitg.ac.in, pratulkalita@iitg.ac.in, dasak@iitg.ac.in

The aim of this study is to develop a conceptual framework for Product Service System (PSS) design for plumbing services in domestic sector. The prime objective of this study is to develop a Product Service System design model incorporating plumbing tools and plumbing related services in households and apartments. The PSS design methodology framework developed for plumbing services in domest ic sector could effectively establish value exploration, creation and delivery. The methodology framework consists of design process, design methods and actors for plumbing services in different contexts viz. society, university and government/ companies. We conducted in-depth interviews and surveys with structured questionnaire. Prime focus of the survey was to study the plumbing tools and service aspect in domestic plumbing. During the survey, we critically observed the possible requirement and relationships of plumbing tools, service providers and customers/users. Structured questionnaires were developed to study various aspects of stakeholders of the system viz. plumbing service provider, plumber and customer. The study revealed aspects of customer service requirements and related components viz. corrective maintenance, preventive maintenance, operation time, service frequency, replacement of spare parts, consumables, fittings and pricing. Inferential statistical tests were conducted to analyse the primary data. From the analysi s of primary and secondary data, a conceptual design framework of PSS for plumbing services was developed. The study provides a design management strategy for PSS implementation in plumbing services in domestic sector. The PSS framework proposed in the paper c an contribute innovation in business models in plumbing services in domestic sector.
Keywords: product service system, design framework, design management, plumbing

Communication Barriers

Arzoo Khare, Soumya Mukund

IIT Guwahati

Indian Institute of Technology Guwahati is a national institute which sees an influx of students of linguistically diverse backgrounds from all over India and abroad every year. The most commonly spoken languages are Hindi, Bengali and Assamese. For students who do not know these common languages, every activity turns into a hassle in their day-to-day lives owing to the communication barriers. They face trouble in settling down during the initial days and in developing meaningful

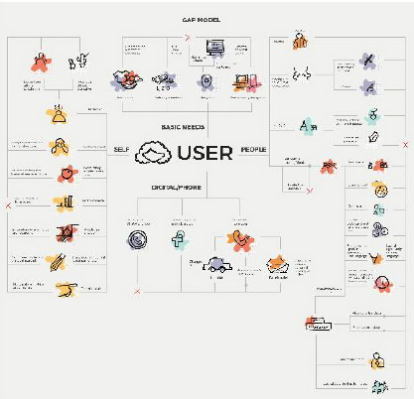
relationships with their peers in the long run. Thus, a design intervention was needed to facilitate better and more effective communication thereby easing the students' problems.

Problem statement How might we help users learn a language that will aid them in going about their daily lives and help forge bonds in the long run?

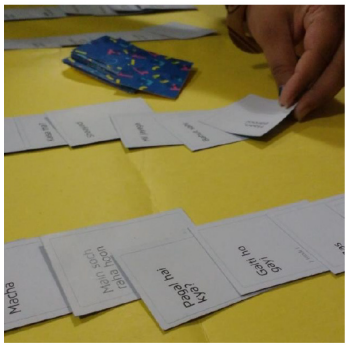
Methodology

Secondary research A trends expert interview with Linguistics Professor revealed that immersion was crucial to facilitate effective communication and better language learning. We conducted a PEST analysis which helped us discover the initiatives taken by the government to promote content in regional languages. An Innovation Sourcebook was compiled to understand the existing technology available in overcoming language barriers.

Primary research We conducted interviews with foreign students and local students from various parts of India. One of the key insights was that the student was interested in learning the commonly spoken language, but not like a course subject. We devised a Gap Model to highlight the major pain points faced by the students in and outside of campus while going about his daily chores.



Proposed solution We observed that the student undergoes these 5 stages of new language acquisition: Denial to learn a new language - Non-verbal/gestural communication - Learning numbers via transactions - Picking up phrases - Saturation. Whether by choice or otherwise, learning eventually takes place. It is a necessity more than anything else. We chose to gamify the language learning experience and came up with a multiplayer card game. We took a scenario and phrased questions such that their responses led to a meaningful, cohesive conversation. The Hindi sentences were written in bold and the corresponding English translation was written upside down at the bottom in a smaller font.



Conclusion User testing enabled us to refine our first prototype. We plan on making potential additions like sound-based cards, incorporating expressions, tips/hints on use of phrases, incorporating Hinglish to make the game more fun, adding game levels, incorporating different scenarios. Acknowledgement We would like to thank Dr.Pratul Kalita for his valuable guidance throughout the project. We would also like to extend our gratitude to all our fellow students for their valuable feedback.

Evaluating Building Aesthetics using Gestalt Analysis

-Avanika P. Yammiyavar avanipy@gmail.com
School of Architecture,
KLE Technological University, Hubballi, Karnataka- 580031

From an Architecture point of view, the main question being addressed in this paper is - when does one cross the visual line between under-design and over-design especially in the frontage of a building's Form? The visual clutter is probably due to improper applications of proportions, ratios and transitions of sub-forms resulting in an over decked up cluttered look. Research done on historical and modern buildings has indicated that the usage of certain specific Design Elements, Ordering Principles, Rules of Composition and specific Proportions, makes a design more appealing. The

challenge for an Architect lies in achieving a balance between simplicity and complexity, order and chaos, composition and clutter, symmetry and asymmetry, beauty and beast, over design and under design. This paper proposed an experiment involving the conduct of a questionnaire cum visual evaluation experiment of 16 selected building frontages.
In the experiment thirty-three (33) respondents were asked to rate building elements in the buildings they liked and disliked. These buildings were then subjected to a Grid analysis using Gestalt principles. Analysis of the results indicated that two hypothesis proposed were upheld.
The first hypothesis stated that- more the prevalence and adherence of the design elements in the frontage to Gestalt Principles, higher is the chance of a building's Form being liked. The second hypothesis stated that the degree of Symmetry is significant in the building being liked or disliked.
The inferences in this paper in terms of the upheld hypothesis can act as guidelines for an Architect to decide upon the thin line between – under design and over design of a building Form mainly expressed through its frontage.
KEYWORDS: gestalt, visual perception, facade, frontage, proportion, composition, design, architecture

The depth of type: A case study on engraving letterforms in Indian cultural context and how it will evolve as display type for modern day use.

A. Pooja Singh1 , B. Abhay Verma1 1
Department of Multimedia, Communication and Design, Central Institute of Technology, Kokrajhar.
E-mail: singh.98.pooja@gmail.com, vabhay7070@gmail.com

In India engraving letterforms on various materials such brass, bronze, copperplate, gold, stone, wood etc. for various kind of uses is an ancient practice. People used to inscribe their names, their village names, caste etc. on various utensils. Artisans engraved various text on their stone statues and buildings. A lot of historical articles have been found with different engraving styles of various letterforms all over India. Primarily inscription on rock blocks and copper plates were used by kings and the royal officials for public declarations and other official purposes. Engraving on utensils and other similar products such as jewellery, brass metal products etc. were mostly used by individuals and families for social rituals and personal purposes. Hence engraving or inscription of letterforms on various materials is an ancient art-form found all over India. Earlier this art form of engraving letterform had been practised by skilled people or craftsman either appointed by royals or the craftsman who crafted the materials or utensils as family tradition, or for engraving on artwork patronised by the royals. These craftsmen follow their tradition of letter engraving generation by generation. They usually develop unique letter crafting style for different types of materials based on the tools they use. The engraving of letterforms by the craftsman usually follow unique style which actually resemble with historical letterforms of a particular script based on places they were found. In many cases these inscriptions or engraving of letterforms create beautiful patterns and styles.
This case study tried explore the style and pattern of letterforms engraved by various craftsman in different places of India in the context of Indian history, culture and society. Furthermore this case study also tried to explore the future prospect of application of this letter writing style emerges from engraving as an experimental type design for display purpose, which focuses on creating texture manually using experimental tools and then digitalizing it as opposed to creating texture using digital tools, as an attempt to bring back the ancient art of engraving to the modern world of digital media.
Keywords: experimental typography, engraving letterforms, texture, inscriptions

Designing a mobile based application to tackle the problem of depression for diploma students studying at Central Institute of Technology, Kokrajhar.

Rosaline Regon, Upasana Baruah and Abhijit Padun
Department of Multimedia Communication and Design, Central Institute of Technology Kokrajhar, Assam, India

E-mail: rosaregon@gmail.com, upasana.baruah12345@gmail.com. a.padun@cit.ac.in

Depression is a serious mental problem that erodes the well-being and gives a feeling of hopelessness that can lead to unfavourable outcomes. It is a common and serious illness that negatively affects how we feel, the way we feel and how we act but it can also be alleviated through the passage of time. Depression can lead to a variety of emotional and physical problems and can decrease a person's ability to function at work and at home. It is seen that the students pursuing engineering education often face the problem of depression and it appears that this mental health problem is growing. It can be due to academic pressure or expectations from family or other personal reasons. In Central Institute of Technology, Kokrajhar (CITK) a multi-level academic structure has been followed from diploma to graduation (B. Tech.) to upcoming master degree and Ph.D. Hence students have different types of problems and depression at different levels. Also they face difficulties in counselling due to lack of appropriate accessibilities. The challenging part is to tackle the diploma students as they are in a very tender age susceptible to depression. Thus, to address this grave issue, a mobile based application has been conceptualized focusing the diploma students of Central Institute of Technology, Kokrajhar (CITK) to counter the problem of depression and escape from the emotional pain. The concept behind this mobile app tries to explore the areas of problems usually faced by the diploma students during their stay at college and come up with a suitable suggestive solution which can help them tackle the problem of depression. The concept also tries to address the critical areas and suggest from where a student should go for further medical help.

Keywords: Mobile application for Depression, Problems of diploma students, solution for depressed students, diploma students of CIT Kokrajhar, depression in engineering students

References:

1) Gineers Now, blog on student's mental health. Available from: https://gineersnow.com/students/engineering-students-suffer-mental-health-problems-heres accessed on 10-10-2018.

2) Zee news "Depression among youth". Available from: https://zeenews.india.com/health/depression-rising-among-youth-engineering-students-worst-hit-says-report-1993657 accessed on 01-02-2019.

3) National Institute of Mental Health/Depression. Available from: https://www.nimh.nih.gov/health/topics/depression/index.shtml accessed on15-11-2018.

4) "Depression Test" mobile app developed by Japps Medical. Available from: https://play.google.com/store/apps/details?id=nl.japps.android.depressi ontest&hl=en accessed on 14-01-2019.

A Study on Logo Design: Understanding of value and meaning.

Sandipan Bhattacharjee, Arunabh Choudhury

Central Institute of Technology, Kokrajhar, Assam, India.

sandipan.bhattacharjee15396@gmail.com, arunabh.cgfx@gmail.com

In contemporary to the present times of numerous upcoming brands and organizations, logos and their impression has emerged from being a symbol to an identity of a brand in an Indian or a global platform. It is a trust factor for the people to recognize and differentiate a brand from another. A logo can have various aspects as it comes to its creation and it has become the essential measure to give recognition to a brand or an organization. As of present situation, numerous logos are being created every day. In this research, various logos are collected from a local area and experimented and studied from a crucial design perspective by design based students and taken their inputs and views about the aesthetic and ethnic existence. A logo should meet all the terms and principles that it should be perceived in a generalized manner. In this paper, we tend to look into the present situation in the field of logo generation and how they align along the guidelines of it and on those crucial factors and principles that should be kept in mind before opting for a logo creation and also how impact efficient a logo can be if followed the guidelines before creating a logo.

Keywords: Logo generation, Design perspective, Aesthetic, Ethnic existence.

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Surface Acoustic Wave (SAW) Device

Rahul Sharma

Surface acoustic wave (SAW) device finds its applications in electronics components, radios, television, microfluidics, flow measurement and for designing various blocks in communication system. Filter is one such popular block with its advantages as compare to other technologies. The main problem with SAW device is its fixed frequency characteristics. SAW filter is also restricted to be designed for one centre frequency. Tuning of this filter is the major challenge with this device because its frequency of operation depends on the parameters such as velocity of the wave in the piezoelectric material and pitch of inter digital transducer (IDT). Therefore, variable velocity or variable IDT pitch is required to make a tunable SAW device which can be achieved by techniques such as - biasing the substrate to change velocity, photoconductive property for IDT implementation and external programming of IDTs. This photoconductive technique is not much explored with latest available materials and projection techniques. Using this technique with advance projection setup and suitable photoconductive material, a fully programmable and tunable SAW device can be achieved. The objective of this research is to explore various possible ways to make SAW device tunable.

Text-Dependent Speaker Verification Using DTW-GMM Based Two-tier Authentication

Ramesh K. Bhukya and S.R. M. Prasanna

Electro Medical and Speech Technology Laboratory,
Department of Electronics and Electrical Engineering,

Indian Institute of Technology Guwahati, Guwahati-781039, India.
Email: r.bhukya, prasanna@iitg.ac.in

This work proposes a two-level authentication to improve the performance of the text-dependent speaker verification (TDSV) under varied data conditions. For this, in the first level, conventional dynamic time warping (DTW) is used to generate scores by matching the test phases utterances with the enrollment phase utterances. The generated DTW scores from enrolled speakers are then passed as features to Gaussian Mixture Model (GMM) learned from the DTW scores obtained by intra-template matching of the enrollment data. To evaluate the performance of the two-tier system, two databases - the RSR2015, and the IITG- are used. The DTW-GMM two-tier authentication improves the system performance for both the databases, compared to the baseline DTW system. Finally, these results are compared with i-vector and Gaussian posteriorgram (GP) state-of-the-art methods.

Denoising of MRI images using Deep Convolutional Networks

Aiman Farooq1, A.H Mir2 1

Department of Electronics and Communication, NIT Srinagar, India

E-mail: aimanwn19@gmail.com

Identification of tumor in MR images is pivotal for correct diagnosis, noise corrupted images often lead to faulty results. Spatial domain, waverly filtering techniques are used for noise removal, but while denoising they alter the area of interest (tumor) in image. Deep convolutional networks have been known to show a significant improvement in terms of removal of gaussian noise in images. Using a large dataset of MR images of brain tumor and GPUs, a deep convolutional network was

trained for removing rician, speckle and gaussian noise from images. The model shows a compelling improvement in denoising without altering with the area of interest. The performance improvement is seen in terms of both peak signal to noise ratio and taking clinical expertise in to account, leading to a correct diagnosis.

Modeling a Novel Nanophotonic Photo-Activated Modulator

Ananya Hazarika and Subhash C. Arya

E-mail: ananyahazarika1995@gmail.com

Lightwave Communication System Laboratory, Department of Electronics and Communication Engineering, North Eastern Hill University, Shillong, Meghalaya, India

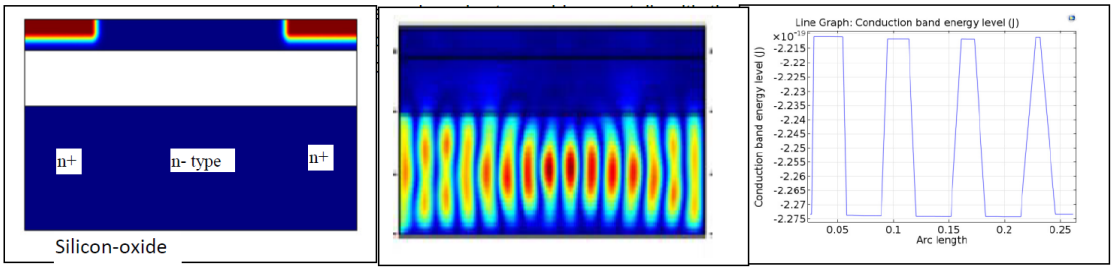
Abstract: Modeling of a novel nanophotonic photo-activated modulator based on silicon-on-insulator compatible with CMOS technology has been done using COMSOL Multiphysics. It uses semiconductor and wave-optic physics for device modelling and characterizing its behaviour.

1.INTRODUCTION

In traditional silicon based optical modulator, the optical signal characteristics are varied in according with the electrical signal, however, in proposed novel nanophotonic silicon -on- insulator phot-activated modulator(SOIPAM), the electrical signal is switched on or off based on pulsating optical signal. The interaction between optical signal field and electrical signals fields are captured by applying semiconductor and wave optic physics in COMSOL Multiphysics with finite element method to solve the coupled EM wave equations. The doping concentrations, dimensions, biasing voltages of the modelled devices have been referred from [1].

1. RESULTS AND DISCUSSION

The basic SOIPAM structure is similar to traditional MOSFET, however, the channel is separated from the silicon



p- type

gate

Fig.1 (a): SOIPAM structure (b): Optical signal propagation through SOIPAM (c): Conduction Band energy across the device length

Under the proper biasing of SOIPAM i.e. Vgate= -2V, Vd= 3V and Vs = 0V, the device is in closes (OFF) state under illumination condition. In that case photo-generated electron concentration has been increased instantly until the inversion state is reached which leads voltage drop on the p-type and voltage drop at n-type is increased. Consequently, the depletion layer in the n-type channel is widely extended and finally closes the channel. Under these conditions, the inversion layer is sustained by applying external optical signals. That inversion layer is sustained until positive voltage is applied on the gate contact.

ACKNOWLEDGMENT
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REFERENCES

[1]. D. Abraham, Z. Zalevsky, A. Chelly and J. Shappir, " Fabrication of vertically positioned silicon on insulator photo-activated modulator", Photonics and Nanostructure-Fundamentals and Applications, vol. 7, pp. 190-197, 2009
[2]. Ariel Zev, Avi Karsenty, Avraham Chelly, Zeev Zalevsky, "Nanoscale Silicon-on-Insulator Photo-Activated Modulator Building Block for Optical Communication", Photonics Technology Letters IEEE, vol. 28, pp. 569-572, 2016

Cable fault location sensor for underground cable faults

B. Rynjah1, F. Lyngdoh2 and M. Sun3 1

Department of Electrical & Electronics Engineering, Assam Don Bosco University, India

E-mail: baskrynjah@gmail.com

The aim of this project is to design a cable fault location sensor for underground cable faults, from transmitting or receiving station in meters using an Arduino based kit. Underground cable-based supply system is a common practice in urban areas. Even if a failure occurs for some reason, at that time the locating the fault location for repair process becomes a challenging task. This project will use the principle of a Varley loop to determine the exact distance of the fault in the underground cable up to the accuracy of a meter. When any fault like short circuit and earth fault occurs, the length of fault of the cable can be determine from the resistance in this method, and the fault is detected by detecting the change in resistance using analog to digital converter and an arduino microcontroller is used to make the necessary calculations so that the fault distance is displayed on the LCD display. The necessary calibration and testing for the accuracy would be a part of the project work.

KEYWORDS: Varley loop, Underground Cable Fault, Arduino, ADC (Analogue to Digital Converter), LCD (Liquid Cristal Display).

Network Dissensus via Distributed ADMM

Chiarg Kumar1 and Ketan Rajawat2

SPiN Lab, Department of Electrical Engineering, IIT Kanpur, India

E-mail: {chiragar1,ketan2}@iitk.ac.in

In the scenarios of big data, it is important to have distributed systems[1,2] which reduce the dependence on the centralized systems not only for storage but also the computation load. For networks where each node is observing some kind of phenomenon and aim is to find overall optimal in the distributed manner. In distributed computation scenarios, most of the works focus on the consensus-based approach[3]. According to consensus, nodes in the network will either cooperate in achieving the optimum or agree to a common optimum through coordination.
However this is not the case always as in the case of sensors, a diverse set of sensors form a complete network where every sensor is observing the corresponding process. So, the optimal corresponding to every node or some set of nodes is bound to differ which gives rise to the need of dissensus. Dissensus implies that the optimal points of certain nodes are required to have a disparate relationship. For the sake of clarification, let us consider the example of movie rating example as

shown in Figure 1, where users are grouped in accordance with their rating patterns. Each rating group differs from the rest so optimal is also required to be different.
Here we propose the general dissenus framework for the networks and how the antagonistic relationship between the nodes can be incorporated. Dissensus framework is then extended to group dissensus which is the combination of agreement and disagreement at the same time. The nodes in a particular group will have consensual relationship and groups assume dissensus. The implementation of group Dissensus is the combination of centralized as well as distributed optimization along with fully distributed systems. In the last, dissensus framework is used for distributed discriminative dictionary learning which is then applied for various applications such as human activity recognition, seizure detection, and indoor localization.

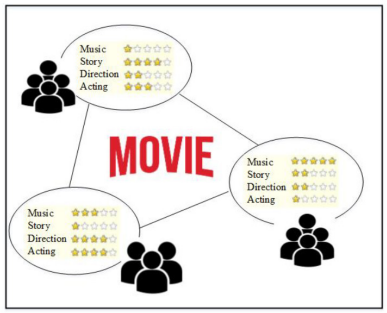


Figure 1: Rating for a movie where group of users consent to similar ratings which are different from the rest of the group.

References:
[1] S. Wang, T. Tuor, T. Salonidis, K. K. Leung, C. Makaya, T. He, and K. Chan, “When Edge Meets Learning: Adaptive Control for Resource-Constrained Distributed Machine Learning,” in Proc. of the IEEE INFOCOM, Honolulu, HI, USA, April 2018.
[2] A. Nedic and A. Ozdaglar, “Distributed subgradient methods for multiagent optimization,” IEEE Trans. Autom. Control, vol. 54, no. 1, pp. 48–61, 2009.
[3] S. Zhang, C. Tepedelenlioglu, A. Spanias, M. Banavar, and W. Tranter, “Distributed Network Structure Estimation Using Consensus Methods”, Morgan & Claypo

Ingenious Shoe Chamber

K. Kanke1, R. Lodaya1, R. Kadam1, D. Ingale1, P. Bobade1, V. Borde1, A. Kore1, S. Vaidya1, S. Mahadani1, A. Mirashe1, R. Kawale1, S. Dongare1, N. Pawar1, P. Tupkar1, P. Tayade1, Dr. Lenina SVB2
Student1 Faculty2

Department of Electronics & Tele-Communication Engineering, Shri Guru Gobind Singhji Institute of Engineering and Technology, Nanded, India

E-mail: 2016bec032@sggs.ac.in; 2016bec066@sggs.ac.in; 2016bec046@sggs.ac.in; 2016bec038@sggs.ac.in; 2016bec052@sggs.ac.in; 2016bec044@sggs.ac.in; 2016bec064@sggs.ac.in; 2016bec028@sggs.ac.in; 2016bec036@sggs.ac.in; 2016bec062@sggs.ac.in; 2016bec040@sggs.ac.in; 2016bec042@sggs.ac.in; 2016bec034@sggs.ac.in; 2016bec048@sggs.ac.in; 2016bec030@sggs.ac.in; lvbirgale@sggs.ac.in2

The proposed method gives a smart solution to the day to day problem of footwear management at public places. This is a type of chamber or cabinet that can load and unload the footwear. The proposed method is less complex and reduces manpower. It is user friendly and capable to operate on biometrics. It can be used at places like temples, mosque, research labs and places of heritage and other public places, where foot-wear is prohibited. History of shoe rack goes back long ago. From developing new shoe patterns and to manage them properly, many changes have occurred till date.

Wherever one goes one has to carry the footwear. At public places one has to keep those pair of shoes or footwear properly without making the place untidy.
There are counters installed in public places to manage the shoe keeping activity. Currently manual lockers are in use for the same. Tokens are issued to the public, giving unique token number of that locker. The user has to be very careful with the token to get back the footwear. Also other person has to touch the footwear while reciprocating the pair of shoe. This process is hectic. In places where such management system are absent the devotees has to leave their footwear at their own risk. In such system footwear are mixed-up causing inconveniences in finding them. This is the case at many places. This leads to the need of the proposed, Ingenious Shoe Chamber. The system comprises of, biometric sensor module, proximity sensor, liquid crystal display(LCD), light emitting diode(LED) board and processor, as shown in figure 1.
The working of the Ingenious Shoe Chamber is as explained below:
First fingerprint module takes the fingerprint that will be stored in data base of the system with a unique one cycle usable ID. After the storage of fingerprint data in database the person is allotted an empty drawer in rack to keep the belongings and the allotted drawer number will be displayed on a LCD display with the location of drawer on a separate LED board. After allotment the drawer will open and placement will be detected by a sensor module. On storing the belongings like shoe the drawer will close.

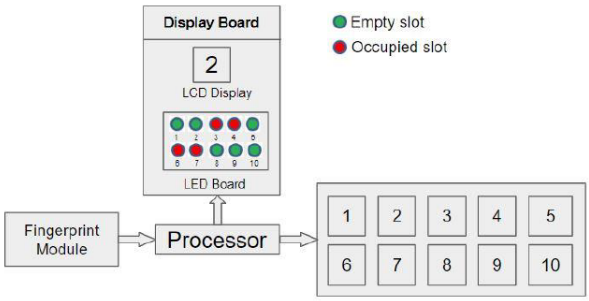


Fig. 1. System architecture of Ingenious Shoe Chamber.

Further when the belongings are to be taken out, the user will have to use the fingerprint module, if the user's fingerprint matches with the fingerprint stored in the temporary database, the pre allotted drawer will open for the user to take out his/her belongings and with this one cycle is completed and the database is reset.

FISH HEALTH MONITORING SYSTEM

Piyush Kabra 1 , Nikita Sanghi 1 , Anirudh Komre 1 , Alok Singh1 1

Department of Electronics Engineering, RCOEM, India

E-Mail: pkabra96@gmail.com

In Aquaculture, the yields (shrimp, fish etc.) depend on the water characteristics of the aquaculture pond. For maximizing fish yields, the parameters which are to be kept at certain optimal levels in water are dissolved oxygen, temperature, salinity, turbidity, pH level, alkalinity and hardness, ammonia and nutrient levels. These parameters can vary a lot during the period of a day and can rapidly change depending on the external environmental conditions. Hence it is necessary to monitor these parameters with high frequency, if not continuously, for timely analysis and action. This need accurate real- time information system and performance in order to maximize their potential. Sensor networks are used to monitor aqua farms for relevant parameters, such as pH levels, humidity, turbidity, dissolved oxygen levels, water temperature, ammonia levels etc. This system consists of two modules which are transmitter station and receiver station. The transmitter station consists of sensor

nodes such as pH, humidity, and temperature inside and outside of water, and also microcontrollers, GSM, analog/digital converters. The receiver station consists of GSM module for receiving the sensing data from transmitter through GSM network. The receiver station receives data through the com port and stores in PC in order to achieve human-computer interface. The graphical user interface was designed, so that farmers and investigators can observe, investigate and analyze the related data. The user interface allows us to convey the analyzed data in the form of a message to the farmers in their respective local languages to their Mobile Phones and alerts them in unhygienic environmental conditions. With this even semi-literate farmers can interact with the system and can understand the information in order to take suitable actions.
Investment and operating costs are the biggest obstacles in modernizing fish ponds in an otherwise very lucrative industry i.e. food production, in this region. Small-scale farmers running on small ponds could not afford to hire workers to man daily operations which usually consists of monitoring water levels, temperature and feeding fish. Bigger scale enterprises usually have some kinds of automation for water monitoring and replacement. These entities have to consider employing pH and dissolved oxygen (DO) sensors to ensure the health and growth of fish, sooner or later as their farms grow. In this project, water, temperature, pH and DO levels are measured and integrated with aerating and water supply pumps using Arduino. User could receive information at predetermined intervals on preferred communication or display gadgets as long as they have internet.

Energy Harvesting Through Speed Breaker: Case Study at Samdrup Jonghkhar Check Post

Prakash Bhattarai1; Thinley Choden2; Phub Gyeltshen3; Tandin Wangdi4 B.E Power Engineering Student [3rd Year]

Department of Electrical Engineering Jigme Namgyel Engineering College Samdrup Jongkhar, Bhutan

jnec05160014@jnec.edu.bt 1; jnec05160024@jnec.edu.bt 2; jnec05160012@jnec.edu.bt 3; tandinwangdi@jnec.edu.bt 4

This project introduces a new way of generating electrical energy using the potential and kinetic energy of a moving vehicle. It can be described as harvesting electrical energy with the use of a speed breaker combined with rack and pinion mechanism. This project focuses on designing the model and subjecting it to simulation. Under simulation, the model will be subjected to various forces. Based on the result obtained, the applicability of this model in everyday life can be analyzed. Rack and pinion mechanism for harvesting the traffic energy through speed breaker was proposed. It generates electrical energy that is proportional to the density of vehicles passing through it. It details the impact study and simulation model for the generation of electricity.
Key words- Energy, Speed breaker, Rack and pinion mechanism, Designing, Simulation.

Dynamic Low Rank Matrix Completion

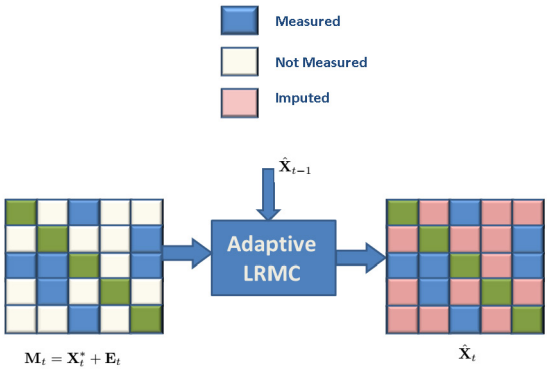
Ruchi Tripathi1 and Ketan Rajawat2

SPiN Lab,
Department of Electrical Engineering, IIT Kanpur, India

E-mail: {ruchi1,ketan2}@iitk.ac.in

Recovering low-rank matrices from missing and noisy observations is a fundamental task in network monitoring [1], video denoising [2], image processing [3], recommender system [4], and

dimensionality reduction [3]. A large number of low-complexity static matrix completion algorithms have already been developed, and applied to various high dimensional problems. However, most of the existing methods do not take into account the temporal correlation between two consecutive measurements. Given a sequence of incomplete and noise-corrupted matrices, the goal is to recover and track the underlying low rank matrices. The system model is motivated from time varying low rank structure which is fundamental to diverse applications such as network latency estimation, video denoising, device to device latency estimation, subspace tracking, video surveillance etc. The key idea is to use the past estimate, which allows improvement in prediction accuracy even when very few measurements (in comparison to existing static frameworks) are available. This property is important since sampling may induce high cost to the system if too many measurements are performed. The advantage of the proposed framework is that the computational complexity grows only linearly with the number of observations [2]. The problem at hand can be categorized as, first when the optimal is static and second when optimal is dynamic/time varying. Both these categories address different applications. We have considered both the problems, and efficiency is showcased via theoretical guarantees and simulation results.



[1] Ruchi Tripathi and Ketan Rajawat. “Dynamic Network Latency Prediction with Adaptive Matrix Completion”. In: 2018 InternationalConference on Signal Processing and Communications (SPCOM) (SPCOM 2018). Indian Institute of Science, Bangalore, India, July 2018.
[2] R. Tripathi, B. Mohan, and K. Rajawat. “Adaptive Low-Rank Matrix Completion”. In: IEEE Transactions on Signal Processing 65.14 (2017), pp. 3603–3616. issn: 1053-587X. doi: 10.1109/TSP.2017.2695450.
[3] Brian Lois and Namrata Vaswani. “Online matrix completion and online robust pca”. In: Information Theory (ISIT), 2015 IEEEInternational Symposium on. IEEE. 2015, pp. 1826–1830.
[4] Julien Gaillard and Jean-Michel Renders. “Time-sensitive collaborative filtering through adaptive matrix completion”. In: EuropeanConference on Information Retrieval. Springer. 2015, pp. 327–332.

Surface Discharge Phenomena at Solid-Liquid Interface of Power Transformer Insulation

C.Thirumurugan1 , G.B.Kumbhar2 and R.Oruganti1 1

School of Computing & Electrical Engineering, IIT Mandi, H.P. India 2
Department of Electrical Engineering, IIT Rooorkee, Uttarakhand, India

E-mail:c_thirumurugan@students.iitmandi.ac.in

Composite insulation system (liquid-solid) reduces the overall size and cost of a power transformer. Over the years, mineral oil has proven to be an excellent oil insulator and cooling medium in the power transformer and it is extracted from petroleum as a by-product. Pressboard acts as solid insulation and gives mechanical support to windings. Mineral oil is still the most popular among liquid dielectrics used in power transformers. However, due to environmental and fire safety

concerns, there has been a rise of interest in ester-based liquids (synthetic ester and natural ester). Pressboards are nothing other than thick insulation papers of the highest quality. Insulating papers are made from unbleached sulphate cellulose. The interface between the liquid and solid insulation turns out to be a weak link due to differences in the values of permittivity and various impurities. There is always an increased amount of free charged particles at the interface due to weak physical bonds. Moreover, microscopic unevenness of a pressboard surface causes local field enhancement, thereby decreasing the overall dielectric strength. Surface partial discharges (PD) over oil-pressboard interface become one of the important reasons of failure of the transformer. Therefore, Surface PD detection and measurement is a part of power transformer diagnostic studies.

In this research work, we conducted a series of experiments to observe the surface PD changes in the three different oil-Pressboard insulation (mineral oil, synthetic ester, natural ester and cellulose board, Nomex board), by measuring the PD quantities using PD detector [1]. Also the effect of electrode configurations on surface PD activity in synthetic ester-pressboard was investigated using partial discharge inception voltages (PDIV), apparent charges (pC), and phase resolved partial discharge patterns (PRPD). Further, the change in PD behaviour in the synthetic ester-pressboard deal with impurities, viz., moisture, conducting particles and bubbles have been studied. In order to compare the influence of moisture on PD, separate measurements were taken for moisture in oil and moisture in Pressboard samples (Fig.1). Another purpose of the study is to investigate the suitability of synthetic ester and/or natural ester as an alternative to mineral oil [2-3]. The measurement PD patterns in oil/pressboard with bubble are in good agreement with field results in the literature [4].

From PRPD, pC and PDIV values, it can be concluded that the Cu particles and bubbles tend to promote more surface discharges as compared to moisture-in-oil and moisture-in-pressboard samples [1]. Among all solid-liquid interfaces, synthetic esters cellulose board shows less surface PD activity. The findings of this study will aid in understanding the behaviour of surface PDs under various conditions and would be of interest to asset managers considering the effects of such conditions on the transformer insulation diagnostics.

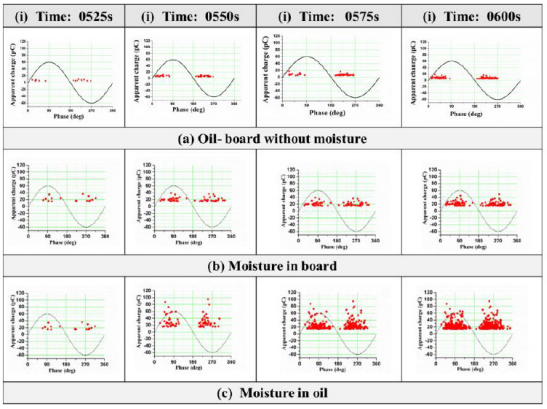


Fig.1 PRPD patterns of oil/pressboard sample with and without moisture at 70 kV

References

[1] C. Thirumurugan, G. B. Kumbhar and R. Oruganti, "Effects of impurities on surface discharges at synthetic ester/cellulose board," in IEEE Trans. Dielectr. Electr. Insul., vol. 26, no. 1, pp. 64-71, Feb. 2019.

[2] R. Sarathi and M. Archana, “Investigation of partial discharge activity by a conducting particle in transformer oil under harmonic ac voltages adopting uhf technique,” IEEE Trans. Dielectr. Electr. Insul., vol. 19, no. 5, pp. 1514–1520, Oct. 2012.

[3] M. Pompili and R. Bartnikas, “On partial discharge measurement in dielectric liquids,” IEEE Trans. Dielectr. Electr. Insul., vol. 19, no. 5, pp. 1476–1481, Oct. 2012.

[4] Cavallini, X. Chen, G.C. Montanari and F. Ciani, “Diagnosis of EHV and HV Transformers through an Innovative Partial-Discharge-Based Technique,” IEEE Trans. Power Del., vol.25, no. 2, pp. 814–824, 2010.

Zarka Bashir[1] and Farida Khursheed[1]

[1]Department of Electronics and Communication, NIT Srinagar, India

Email: zarkbasheer_2007@nitsri.net

Brain tumor has been a leading cause of death among human beings as traditional methods of detecting tumors from magnetic resonance images do not provide promising results and are time consuming, it takes an expert about an hour or more to read an MRI. Based on the literature survey we infer that detection of tumor is subjective and depends upon the experience of an expert. Also, medical images are prone to noises like gaussian noise, Poisson noise, salt and pepper noise, the most common type of noise present in MRI's is gaussian noise and its presence in MRI's can result in wrong diagnosis. So, there is a need to develop an automated system which takes less amount of time to detect tumors from MRI's and at the same time the probability of misclassifying an MRI decreases. In this paper an automated system has been developed to detect tumors from MR images by classifying the given image as normal or abnormal and the system takes less time as compared to traditional methods, which take about 1 to 2 hours to read an MRI. The system starts by filtering out noise from MR images using a high pass gaussian filter, filtering reduces the probability of misdiagnosis. Then the tumor region is segmented from these images, this segmented tumor tells about the nature of the tumor which is helpful to the doctor during a patient's treatment. To reduce the amount of data that can be used to classify these images, features are extracted from these MRI's that can very well represent the whole image. The Montreal neurological institute's brain images of tumors for evaluation (MNI BITE) database has been used for testing purpose. To test the performance of our technique an artificial neural network (ANN) has been trained on a large dataset, that is about 300 images and the results of ANN has been compared with support vector machine (SVM) using the classification learner app. After comparing these classifiers, we use the one with high accuracy rates to classify the given MR image for diagnosis. We also see if large number of images and features can improve the accuracy of these classifiers.

Perspectives on Flood Vulnerability and forms of Governance: a study of Kosi Basin, Bihar

Tulika Kumar and Dr Sambit Mallick

Department of Humanities and Social Sciences, IIT Guwahati, India

tulika.2015@iitg.ac.in

Despite the state's, Bihar, over five-decade long history of flood control management in the Kosi basin, the river continues to bring hardship onto the people living along its bank and nearby areas. Efforts have been made to reduce the vulnerability of the flood affected people as claimed by the government, but, the uncountable human, material as well as social loss is continued till date. Against this pretext, an attempt is made in this study to explore the sources of vulnerability arising due to flood disaster by examining both community and institutional values and perspectives as they relate to flood risk and mitigation in the Supaul district of Kosi Basin, Bihar. The study is purely qualitative and empirical in nature. The primary data was collected in three villages viz. Laukaha, Kodhli and Kalyanpur located within Saraygarh Bhaptiyahi Block in the Supaul district of Bihar. In-depth personal interviews were conducted with the members of the community including Mukhiya (head of local PRI), Sarpanch and other representatives of the community. Besides, Focus Group Discussion was held with SHGs members. The purpose of these interviews and discussions were primarily to assess the experience, knowledge held by flood affected communities, as well as level of awareness and their perspectives on the role and functions of the institutions related to flood mitigation in the Kosi Basin. Apart from this, to capture a broader picture of flood vulnerability and flood control management in Kosi River Basin, in-depth personal interviews were conducted with the representatives of agencies and institutions engaged in flood management issues in the Kos River Basin. The institutions included Water Resource Department (WRD), Flood Management Information System Cell (FMISC), Water and Land Management Institute (WALMI) and State Disaster Management Authority (SDMA), involved in flood control and management in Bihar. The overarching objective of interviewing experts was to holistically understand the functional capabilities of the above mentioned institutions. All the interviews were duly recorded and transcribed. Content analysis technique was used to analyse the interview materials. The findings of the study indicate that there is a weak public perception in understanding Flood risk and mitigation in terms of information, interaction, engagement in flood fighting works and flood related decisions in the Basin. One of the concrete findings of the study also suggests that hitherto structural measures such as constructing Dams, dikes, levees and embankments have failed to address the problem of flood risk and vulnerability in the Kosi Basin and there is a need to expand the use of non-structural measures such as development and redevelopment policies, restoration of riverine environments, flood forecasting capabilities, warning systems, information and education, recovery programs, or floodplain zoning and regulation by increasing the use of more diverse tools of economic and social assessment of flood risk and mitigation alternatives. There is also need to ensure long term political commitment that will provide both a vision and funding for flood mitigation and vulnerability reduction activities in the Kosi River Basin.

Key words; flood vulnerability, Flood mitigation, embankment, flood risk management.

Policy making in independent india: a recipe for ecological degradation

Chayan Poddar

MA Development Studies (First year, semester 2)
Department of Humanities and Social Sciences

Indian Institute of Technology, Guwahati

Since independence, the Indian policy-makers have paid little attention for the well-being of the country's nature. Drawing from wide-range of problems related to the questions of forests, rivers and ecological degradation, this paper tries to show the astronomically disastrous impacts on India's ecology owing to the little attention, or in some cases, no attention paid by policy makers to nature, in search of economic growth. We have looked at ecological degradation in India from different dynamics - from developing urban megacities to the consequences of extensive mining, dam building and highway infrastructure through the middle of reserved forests. We have listed out three main causes, which we believe, have significant implications on increasing environmental damage, namely, the search for GDP growth in twenty first century India, the shift of the government from being a driver of investments to being a facilitator of investments and the growth of third-world developing urban spaces with extensive population pressure.
Lastly, we have looked for solutions to the problem and have searched for new ways, through which the environmental problem can be tackled, to bring in sustainability.

Climate Change Vulnerability Assessment for the State of Manipur: A District Level Analysis

Merlyn Maria Antony1 , Tapasya Changkakati1 and Anamika Barua1

1 Department of Humanities and Social Sciences, IIT Guwahati, India

E-mail: merly172241020@iitg.ac .in

For individuals and communities living in mountainous regions and living in multidimensional poverty, the uncertain ecological resilience and their low social resilience render them as highly vulnerable to different hazards including environmental changes. Manipur, situated in the Eastern Himalayan region, with a hill cover of ninety per cent, large population dependency on agriculture, forests and allied activities and individuals living in dynamic nature of poverty, makes the state vulnerable to climate related hazards. As long term mitigation efforts are required to improve the ecological resilience, this study focuses on identifying the socio-economic factors which makes communities vulnerable to unforeseen risks including climate risks and what sort of adaptation planning is required for increasing their social resilience.

References:

Allen, Myles et.al. Global Warming of 1.5 °C. Summary for Policymakers, IPCC, 2018.
Barua, Anamika, Suparana Katyani, Bhupen Mili, and Pernille Gooch. "Climate change and poverty: building resilience of rural mountain communities in South Sikkim, Eastern Himalaya, India." Springer-Verlag Berlin Heidelberg, 2013.
Chaturvedi, Rajiv Kumar, Jaideep Joshi, Mathangi Jayaraman, G. Bala, and N. H. Ravindranath. "Multi-model climate change projections for India under representative concentration pathways." Current Science 103 No. 7 (October 2012): 791-802.
Cohen, Alasdair. The Multidimensional Poverty Assessment Tool. Rome: International Fund for Agriculture Development, 2009.

Füssel, Hans-Martin. Vulnerability in Climate Change Research: A comrehensive conceptual framework. Working Paper, Formal Appraches to Vulnerability Assessment that Informs Adaptation, 2005.
Füssel, Hans-Martin, and Richard J.T. Klein. "Climate Change Vulnerability assessments: an evolution of conceptual thinking." Climatic Change 75 (2006): 301-329.
Moss, Richard H., Jae A. Edmonds, Kathy A. Hibbard, Martin R. Manning, and et.al. "The next generation of scenarios for climate change research and assessment." Nature 463 (February 2010): 747-756.
O'Brien, Karen , et al. "Mapping vulnerability to multiple stresors: climate change and globalisation in India." Global Environmental Change 14 (2004): 303-313.
Ravindranath, N.H., et al. "Climate change vulnerability profiles for North East India." Current Science 101 No. 3 (August 2011): 384-394.
Schröter, Dagmar, Colin Polsky, and Anthony G. Patt. "Assessing Vulnerabilities to thhe Effects of lobal Change : An Eight Step Approach." Mitigation and Adaptation Strategies for Global Change (Springer) 10 (2005): 573-596.
Schröter, Dagmar, Colin Polsky, and Anthony G. Patt. "Assessing Vulnerabilities to thhe Effects of lobal Change : An Eight Step Approach." Mitigation and Adaptation Strategies for Global Change (Springer) 10 (2005): 573-596.
Sharma, Jagmohan, et al. Climate Vulnerability and Risk Assessment: Framework, Methods and Guidelines. Indian Himalayas Climate Adaptation Programme, 2018.
Wilson, Geoff A. "Community resilience, policy corridors and the policy challenge." Land Use Policy, 2013: 298- 310.

State Repression in a Democratic Regime: Arrests of Activists in India Abstract

Revati Patil1, Aishwarya Bhuta2

Department of Humanities and Social Sciences, IIT Guwahati, India

E-mail: 1revati@iitg.ac.in 2bhuta@iitg.ac.in

State repression refers to acts such as surveillance, censorship, imposition of bans, harassment, and detention by government actors (Davenport, 2007). Althusser (1970) explains how any challenge to the hegemony of the dominant classes is suppressed through repressive state apparatuses such as police, court, and prisons. Further, Foucault (1975) elaborated upon Bentham's 18th century model of a 'panopticon', analysing how the state uses surveillance as a mechanism to discipline as well as punish. This panopticism of the state is in opposition to its democratic character, as dissent becomes synonymous to sedition. Democratisation and increased participation are important for political development. The nature of the Indian state is however complex, characterized by both participation and repression. There are periods in history when the state was dominant and ruled by one party (1980s); whereas in the 1990s, the Indian state allowed democratic spaces. In recent times, the nature of the Indian state is undergoing certain transitions, particularly in terms of shrinking spaces for democratic debate and participation. Media and other modes of knowledge production and dissemination are being regulated and manipulated in many ways. In such a scenario, individuals and civil society who question the authority of the state are perceived as a domestic threat. The spate of arrests of human rights activists, lawyers, and public intellectuals in 2018 is an alarming example of persecution of non-conforming elements of civil society. On August 28, 2018, five notable rights activists namely Varavara Rao, Arun Ferreira, Sudha Bharadwaj, Vernon Gonsalves, and Gautam Navlakha were arrested on several charges under UAPA (Unlawful Activities Prevention Act, 1967). These arrests were strongly condemned by civil society groups, opposition parties, human rights organizations. Civil society groups play a significant role in democracies by resisting repressive regimes, mainly through political mobilization and collective action. According to Tilly (2006),

government uses repression as one of the strategies for raising the cost of collective action and controlling/influencing those within its territory. Why do we experience different kinds of behaviour of democratic states? What determines the coercive power of the state? Why do states use repression as a response to dissident mobilization? The paper will examine these questions on the basis of primary research (interviews) as well as secondary research methods (newspaper and academic articles). It attempts to analyse how democratic regimes vary and change in order to curb dissent and resistance. The paper argues that one of the important factors that determine state behaviour is the nature of political leadership at the national level.

Work Related Musculoskeletal Disorders in Brass Metal Workers in Assam, India

Brass metal handicraft is an important and one of the oldest cottage industries in Assam, India. Being labour intensive artisans working in these industries usually suffer from health related ailments. The study reported in this paper investigates the prevalence of musculoskeletal disorders in brass metal workers from the perspective of ergonomics. Nine brass metal artisans were randomly selected and studied using data collected through modified Nordic musculoskeletal disorder questionnaire. The questionnaire consisted of two segments. Firstly, part-A that captured demographic data such as age, height, weight, work experience, duration of work and no of working days and part-B noted with discomfort/pain in different body regions such as neck, shoulder, elbow, wrist/hands, upper back, lower back, hip/thigh, knee, and ankle/feet. The results revealed that at least one worker among the group were suffering from body discomfort. Most commonly reported discomfort is lower back followed by shoulders, neck, upper back and wrists/hands. It is important to highlight that the extent of musculoskeletal disorders was moderately higher and as such demands ergonomic interventions to help relieve the situation. The paper thus proposes solutions that can help reduce musculoskeletal disorders among the artisans and help improve the existing practice.

Culture and Malnutrition: An Examination of the Socio-Cultural Determinants of Child Malnutrition in Rural India

Pragati Dubey.

Department of Humanities and Social Sciences, IIT Bombay, India, School of Social Sciences, Monash University, Australia

E-mail: pragati.dubey@monash.edu

India, being the second fastest-growing economy in the world along with its record in pioneering democratic government in the non-Western world still occupies a low rank when it comes to social indicators like child undernourishment. Despite the high economic growth in the past two decades, the high rate of child malnutrition in India indicates that the problem is not simply of availability but also the accessibility of resources at a micro level. In this paper, I present the analysis of the socio-cultural determinants of child malnutrition (rural India) using the concepts and framework of the social theory of practice. This study explores the culturally induced practices that are socio-culturally embedded within institutions/structures and family relations. The term socio-cultural is used to capture the social structure/institution, relationships and the norms, beliefs and values that operate within these structure/institutions and relationships. I argue that the analysis of the everyday practices within the household and the element of structure and agency within it can help to identify the mechanisms through which socio-cultural factors influence the nutritional well-being of the child. The prime aim is to problematize and analyze the cultural processes and mechanisms through which these practices contribute to influence the interplay of power dynamics, accessibility and consumption of resources

within the household and therefore, the nutritional status of the child. Such, factors are deeply ingrained in our everyday life and are not easily or directly visible. Hence, ethnographic techniques involving thick fieldwork, participant observation, narrative interviews will be helpful to investigate the cultural morphology and functioning of social institutions like gender, family, marriage, kinship and religion. This will facilitate in presenting a qualitative analysis of the socio-cultural determinants of child malnutrition in rural West Bengal.
Keywords: Culture, Malnutrition, Gender, Kinship, Practice

Impact of Seed Industry on Economic Development of Indian Agricultural Sector with a special reference to North-Eastern states

Prithviraj Pegu1 (corresponding author) & Sharmila Dutta Deka2

1 M.Sc. Scholar, Seed Technology, Dept. of PBG, Assam Agricultural University, Jorhat, Assam
2 Principal Scientist, National Seed Project (Crops), Assam Agricultural University, Jorhat, Assam

Phone: +91-8638120437 E-mail id: prithvirajpegu007@gmail.com

Over the years, the seed industry of India has evolved side by side with the Indian Agriculture. Indian Seed industry is the 5th largest in the world in terms of market size and production. It has also observed a good growth rate after the post-green revolution era. The Seed Replacement Rate (SRR) improves with the raising farming income and profitability. Also New Biotech traits boost the Seed Market Value.
Public, Private and other seed firms like National Seed Corporation, Mahyco, Syngenta, Ankur seeds, Namdhari Seeds etc. and sub-systems owned by those seed firms constitute the structure of the giant Indian Seed Industry and contributes to the economic development of Indian Agriculture. It mainly consists of the field crop seeds and vegetable seeds, which are also exported to other countries and thus contribute a lot to India's economy. Growth of the seed industry of a country is dependent on Seed Replacement Rate (SRR). The SRR for almost all the crops in India have improved in the recent times. From 2002-2010, the SRR of key cereal crops have more than doubled, with that of Rice experiencing a 111% jump, Wheat increasing by 154% and Maize 238%.Also Revenue of Indian Seed Industry through export of various crops are $12.34 M in Rice,$29.1M in Corn,$8.2M in Soybean,$11.58M in Tomato etc.
The present marketing trends and government policies of seed marketing are shaping its future towards glory. Moreover, a flawless supply chain and its proper management is going to help India's seed industry to achieve its goals to establish. Marketing-mix like Product, Pricing, Distribution and promotion are the most important features of seed marketing in India. The Strength, Weakness, Opportunity and threats (SWOT) to the Indian Seed Industry are also mentioned and analyzed properly. Also, Development of Seed industry in the North-Eastern region is at a very nascent stage because of factors like absence of big/private companies and due to lack of skilled labour & research. Thus a lot of things are to be done for its growth. Various marketing strategies like good inventory management system, excellent post-sales service etc. and most importantly increased investment in R&D are followed in Indian Seed Industry.
The role of seed sector has been decisive in securing food security in India and thus, Indian seed industry continues to explore further and conquer newer heights, for the overall economic development of Indian Agriculture.
Keywords: Seed industry, marketing-mix, flawless supply chain, SWOT, food security, North-Eastern region

A Study of Maternal Health Care Services Utilization in Different Geographical Regions of Maharashtra

Mr. Rushikesh P Khadse

Department of Public Health and Mortality Studies
International Institute for Population Sciences, Mumbai

Email: - rushikeshkhadse@gmail.com

Introduction: Maternal and health care consists of two domains of health services availability and utilization that include antenatal care, care at delivery and postnatal care. Inadequate availability and lack of utilization of maternal and health care services lead to a high risk of maternal mortality and adverse pregnancy outcomes and complications. Two decades after the launch of the Safe Motherhood campaign, India still accounts for at least a quarter of maternal death globally. Maharashtra is one of the most economically developed states of India, but progress in the social sector has not been commensurate with economic growth.

Aim: To understand the geographical variation in utilisation of Maternal health care services and determine the factor affecting maternal health care in different geographical regions of maharashtra.

Data and Methodology: study base on the Fourth Round of National Family Health Survey (2015-16) data. Bivariate and decomposition techniques were used to examine the geographical variation in utilisation maternal health care services across the state of Maharashtra.

Results: The utilization of full ANC, Institutional delivery and PNC is 32.42 percent, 90.29 percent and 79.63 percent respectively. There is also a large significant variation in utilization of ANC services in different geographical region. Households' socio-economic status, mother's education, caste and birth order was the most-important determinants associated with the use of any ANC, PNC and institutional delivery. Konkan region more likely to have utilisation of maternal health care services compare to rest of the region.

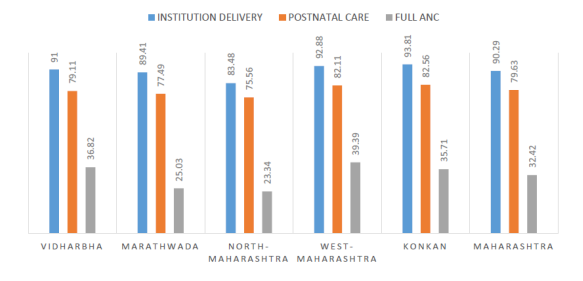


Figure 1

Influence of Functional Network of Parental Neurocognitive Skills on Their Children's Functional Network

Dr. Shraddha Basu
Guide: Dr. Manidipa Baruah

Department of Psychology
Gauhati University, Assam 781014, India.

Email: basu.shraddha88@gmail.com

Introduction: Parental influence on children's neurocognitive development can be genetic and can also be an outcome of learning and social interactions. Parents, being the child's first acquaintance, has a major role to play in any kind of neurocognitive development of their sibling. Therefore, every relevant trait of the child is expected to have a strong correlation with the same for at least one of the parents. However, corresponding functional network is yet to be explained fully, making it near-impossible to identify the dominating parent in relation with a particular neurocognitive trait of the child. The correlation between the mental functions of either of the parents and the child may be positive or negative, and that characteristic can dwindle wildly across different sets of skills. That creates the backdrop for the present study. Here the functional networks for parents and their siblings will be explored for a few selected neurocognitive skills and effort will be made to shed some light on the gray area mentioned above.

Utility: The goal is to identify the functional networks present in the left and right cerebral hemisphere for four specific neurocognitive domains, and compare the parents' traits with that of their children and also within the siblings. A complete description of the interlinkages between the functional network of both parents and their children may provide an insight into children's future direction in terms of their neurocognitive skill development and training. The child can also be allowed to be groomed by the most suitable one among either of the parents in any specific domain.

Objectives of the study:

To identify the functional relationship in four different neurocognitive domains, namely, reasoning, verbal working memory, creativity and emotional intelligence, between parents and their children, and among siblings.

To compare male & female siblings in terms of the same neurocognitive skills.

To identify the parent playing a dominating role in determining the child's skill set in each of these domains.

Method: Adolescents (age range of 15-19) and their parents (30 families), capable of communicating in common languages (Hindi & English) and local language, having no history of neuropsychological disorder, will be recruited for this study. The researcher will try to select families having one male and one female adolescent child. Each sample will be tested twice on two different scales on each dependent variable for high predictive validity of the findings. All tests having both adolescents and adult version.

Research Design: The parents who have two children, i.e., one male and one female will be selected. A 2X2 Factorial design will be followed for each of the dependent variables.

		Children	
		Male child	**Female child**
Parents	**Mother**		
	Father		

(**Key words**- Functional network, Cerebral hemisphere, Abstract reasoning, Verbal working memory, Creativity, Emotional intelligence).

DEVELOPING SMART CITIES: A CASESTUDY OF GUWAHATI CITY

Sukanya Borkataki

MSSV, Nagaon

The Govt. of India had launched the "Smart Cities Mission" on June 25, 2015 with the ambition of creating 100 smart cities to provide the Indian cities a new look. The term 'smart city' is an unambiguous concept, it is a vision which indicates the implementation of information and communication technologies to provide the inhabitants a better quality of life, to enable the active participation of people in governance, smart mobility, smart economy and sustainability. Guwahati is included in the India's vision of creating 100 smart cities in near future. Guwahati is the economic, cultural and social hub and the gateway to North Eastern states. Due to the heavy inflow of people to Guwahati the population growth has increased from 11.1 percent in 1991, 12.9 percent in 2001 to 14.1 percent in 2011 (according to the census of 2011). Now- a -days, while this "City of Eastern Light" has restored its significance as an urban centre, but the intense population growth has created different physical, social and environmental vulnerabilities. Different official reports and literature reviews show that the decrease of the natural and artificial water bodies, natural vegetated areas while increase in build-up areas create artificial flood problem and pollution in city along with shortage of water facilities and sewage problems. At first, this study goes through a basic introduction of smart city concept and presents insight into how smart city concept will provide a new look to Guwahati along with its present city profile. This paper also covers the strategic planning of the Assam Government to transform Guwahati into a smart city and also highlights how the Master Plans for Guwahati under the Guwahati Metropolitan Development Authority (GMDA) Act, tries to comply with the problems of the city having the vision of a developed Guwahati.

Key words: smart city, smart city mission, smart governance, smart mobility, sustainability, Guwahati Metropolitan Development Authority (GMDA) Act, 1985.

Inequities in Integrated Child Development Scheme Services in Selected States of India

Dr. Trupti Patil

Humanities and Social Sciences, IIT Bombay

E-mail: truptipatil16sep@gmail.com

Development of the nation begins with the development of the children. Malnutrition debilitates tl status and makes a child more susceptible to infection, thus increasing the risk of mortality and affec future productivity and capabilities' (Gragnolati, 2006). SDG 2: Zero Hunger targets to end hunge forms of malnutrition. India has a curious position of the world's largest malnutrition program(ICDS) running for almost 40 decades and also has the highest share of undernourished children. Even staggering 38% of Indian children are stunted, the nutritional access is poorer for socially excludec Relevant study reflects inequities in program placement and utilization of healthcare services. Tl bridges the gap between the objectives of ICDS and its actual implementation through program place service utilization by comparing the expected target beneficiaries and others. The study examines wh ICDS program follows the norm of benefitting the target population or the well-off population u services thus taking away the share of the target population. The study has used National Famil Survey-4 data comprising of women (15-49 years) and children (below 5 years). The effective placement is assessed by fund allocation by the Central Govt.

The results show a moderate positive correlation between the central funds' allocated for the scheme total expected poor beneficiaries, projected SC ST Population and the HAZ scores. The per capita be varies across the state where the developed states have a high per capita beneficiary in respect of less d states. Even the states where the number of stunting cases is high especially in less developed states,

that the per capita beneficiary and the allocation of the resources were not optimizing.

Superconvergence properties of discontinuous Galerkin method with interior penalties for singularly perturbed 2D elliptic BVPs

G. Singh1 and S. Natesan1

1 Department of Mathematics, IIT Guwahati, India

E-mail:gautamsingh@iitg.ac.in

Discontinuous Galerkinmethods have widely been used for solving a large range of problems of computational fluid dynamics. These methods are preferred over the standard continuous methods because of their flexibility in approximating globally rough solutions, local mass conservation, potential for error control and mesh adaptation. In this article, We propose a dis-continuous Galerkin methods with interior penalty for a linear convection-diffusion-reaction problem in 2D. We have shown that method is uniformly convergent with the order k + 1 in energy norm, where k is the degree of piecewise polynomial in finite element space. We have presented numerical result to verify our theoretical findings.

A finite field analogoue of Appell series

M.Tripathi1 and R.Barman1

1 Department of Mathematics, IIT Guwahati, India

E-mail:m.tripathi@iitg.ac.in

We define a function F4* as a finite field analogue of the classical Appell series F4 using Gauss sums. We establish identities for F4* analogous to those satisfied by the classical Appell series F4.

Impact of Internet Usage on the Academic Performance of UG students;a study carried among the students of various Educational Institutes in Jorhat.

AsmitaTamuli Ananya Saikia

B.Sc. 4th semester(Department of Statistics) Jagannath Barooah College, Jorhat.

Email ID-asmitatamuli591@gmail.com, saikiaananya1998@gmail.com

We are entering a new era of computing technology that many are calling the Internet and being the most popular trend, it has a huge potential. Most of the students prefer internet for different purpose like academic knowledge, social connection, entertainment and also to learn the latest news all around the world as well as getting information that serves different purpose. Therefore, it can be said that the internet is the source of spreading information quickly to a large audience. Thus, the aim of the study is to look at the impact of Internet usage on Academic Performance of UG students. The study is conducted among the students of various Educational Institutes in Jorhat.

Keywords: Internet, academic, performance.

Is E-commerce ruling over traditional retail sector? : a study based on consumers' perception in Jorhat town.

Mukut Chakraborty, Pratikshya Borpujari

B.Sc 4th semester (STATISTICS) Jagannath Barooah College, Jorhat.

Email ID-pratikshyajrt@gmail.com

E-commerce or electronic commerce is a process of buying and selling of goods and services, and transaction of money through electronic medium. On the other hand, retailing is a traditional trade of buying and selling of goods via physical stores. Lots of factors affect the preferences of consumers in between E-commerce and retail sector and these involves :age-group, gender, locality, occupation, season, personal experiences, quality of products, malpractices by the suppliers, payment mode, return policies, and so on. In this study, we are having a look on whether the consumers are being satisfied by both E-commerce and the traditional retailing, or by anyone amongst them, and up to what extent, based on such factors by conducting a statistical survey in Jorhat town.

Keywords- E-commerce, retail, consumer.

Influence of applied voltage on machining accuracy and surface finish of micro-slots machined through ECMM

Abhinav kumar1 and Manas Das2

1, 2 Indian Institute of Technology Guwahati, Guwahati - 781039, India

kumar176103020@iitg.ac.in3, manasdas@iitg.ac.in4

In Electrochemical micromachining (ECMM) process, anodic dissolution is used to remove material in the micron range. With the help of ECMM process, complex contours on the work piece surface and difficult to cut materials can be machined without any stress on work piece surface and without any tool wear. This study aims to design and fabricate an ECMM experimental set up and to control the process parameters for smooth machining of miniature components. In the present study, fabrication of micro-slots is carried out on stainless steel (SS-316L) work piece with helical tungsten carbide micro-tool. The effect of machining voltage on output responses of the fabricated micro-slots is carried out with pulsed DC power supply. From preliminary experimental analysis it is observed that as machining voltage increases, width overcut and depth of cut also increases. This leads to inaccurate dimension and increased surface roughness.

Keywords: Electrochemical micromachining, process parameters, pulsed DC, micro-slots

Numerical Investigation towards the Parameters Affecting The Free Jet Boundaries

Ali Jraisheh1 and Vinayak N. Kulkarni1

1 Department of Mechanical Engineering, IIT Guwahati, Assam-781039, India

E-mail: jraisheh@iitg.ac.in vinayak@iitg.ac.in

Jet emitting from nozzles and orifices has been a rapidly growing research area for the aerodynamicists and astronomers, especially after WWII. Knowing the jet boundaries and physics of the free jet has an important role in predicting the trajectories of the rockets. Hence, the factors which affect the jet boundary and properties have been of interest for physicists and rocket scientists.
In this work, several simulations, using ANSYS Fluent, are conducted to investigate the effects of the boundary conditions and the nozzle geometry on the free jet downstream of the nozzle exit. The shape of the nozzle geometry is mathematically represented using Power-law curve or third order Bezier curve, while imposing the constraint of fixed exit and inlet radii and also the length of the nozzle. The flow properties for the corresponding nozzle is obtained using quasi 1-D gas dynamic relations(1). The flow solver is then coupled with gradient based optimisation technique named steepest descent to minimise the cost function (exit radial velocity). The total radial velocity at the nozzle exit is considered to be the objective in the optimization process to produce the most uniform flow.
The correctness as well as the utility of the reduced modelling approach is studied by employing continuum CFD based flow solver, ANSYS Fluent. The geometry is then imported to a CFD based flow solver ANSYS Fluent for a 2-D simulation and find out the flow properties inside and outside the nozzle. Contours of the results are studied. The influence of the shape profile towards the flow properties and its distribution is studied herein. The thermal and mechanical boundary conditions are found to affect the shape of the plume downstream the nozzle exit. The below figure shows the free nozzle jet properties. The purpose of the study is to maximize the uniformity of the inviscid area in the jet core (inviscid core). The shear layer surrounding the inviscid core is driven by the inlet and

outlet conditions and it is highly dependent on the boundary layer at the nozzle wall. It has been found that Power-Law geometry would lead to an internal shock within the nozzle which disturbs the inviscid core. Moreover, high inlet temperature forms a thick boundary layer at the nozzle wall which eventually forms a thick shear layer downstream the nozzle exit. It has been noted that the pressure at the exit of the nozzle should match the back pressure outside the nozzle to achieve the least expansion at the nozzle lip. The temperature, pressure, density and radial velocity are shown downstream the nozzle exit at several locations to investigate the jet boundaries and the nature of the flow within the inviscid core.

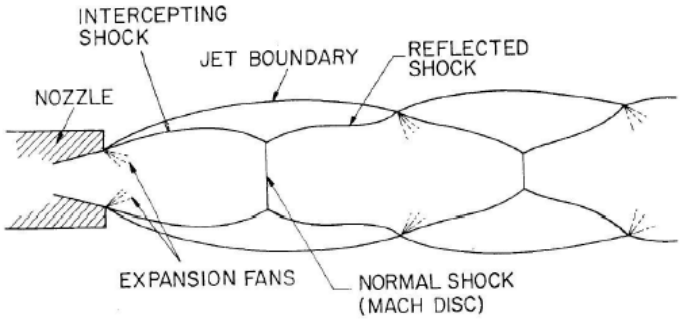


Fig. The configuration of the free jet downstream of the nozzle exit (taken from [2])

Effect of Low Profile Vortex Generators on MAV flight

Bastav Borah1 , Dr. Vinayak Kulkarni2 and Dr. Ujjwal K. Saha3 1

Research Scholar, Department of Mechanical Engineering, IIT Guwahati, India 2 Assoc. Professor, Department of Mechanical Engineering, IIT Guwahati, India 3 Professor, Department of Mechanical Engineering, IIT Guwahati, India

E-mail: bastav.borah@iitg.ac.in

Vortex Generator (VG) are invariantly used as flow control devices. The vortices generated through these devices help in maintaining the attached fluid flow over the object of interest. These devices are generally seen attached with parts of aircraft wings, automobile spoilers, wind turbine rotor blades etc. These systems or subsystems, over which fluid flows, encounter flow separation due to adverse pressure gradient. As a result of such flow separation, low pressure wake gets formed in the downstream and it leads to enhancement in form drag. Careful implementation of VGs can considerably negate such flow separation by mixing the slow moving fluid layers closer to the surface with the comparatively faster moving or high energy outer layers. Such VGs come in various types or shapes, such as doublets, wishbones, counter-rotating rectangular vanes, counter rotating delta vanes etc. (**Fig. 1**) [1]. Low profile VGs have a maximum device height of around 10% - 50% of the boundary layer thickness [2]. Doublet and wishbone types of VG fall under the category of low profile VGs. The doublet VGs have height of only 10% - 20% of the boundary layer thickness. Drag reduction of up to 38% was observed using wishbone VG devices for a low Reynolds number flow [3]. These VGs can be thought to be integrated with Micro Air Vehicles (MAV) since reduction of induced drag is particularly very important aspect of studies for a fixed MAV. As per the classification, MAVs are low powered unmanned autonomous flying vehicles, having a linear dimension of around 15cm, gross take-off weight of approximately 100g with a payload of 20g. Fixed wing MAV flights are also in the low Reynolds number regime (<105) [4] (low Reynolds number

range). In their flights, even a minor reduction in drag forces can bring a considerable improvement in MAV durability and range. Although VGs improve lift force by reducing or delaying flow separation, they also induce a minor drag force owing to their form factor. A thorough investigation of the effects of implementing these low profile VGs in a fixed wing MAV needs to be carried out to understand the benefits it can offer. Multi staging of VGs with time bound actuations can be studied to understand their influence on flight dynamics of a fixed wing MAV. Initially, numerical simulations are planned on S5010 airfoil section wing with different VG profiles. These simulated results will be analysed along with the wind tunnel experiments.

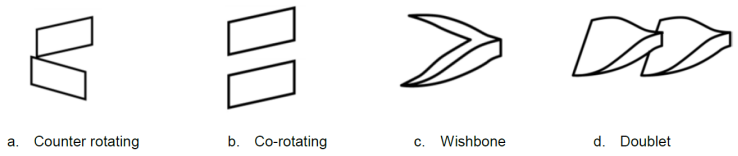


Figure 1: Different types of Vortex Generator

References:

1. Lin, J. C., Howard, F. G., and Bushnell, D. M., 1990, "Investigation of Several Passive and Active Methods for Turbulent Flow Separation Control," AIAA 21st Fluid Dynamics, Plasma Dynamics and Lasers Conference, Seattle, WA, June 18-20, 1990.
2. Lin, J. C., 2002, "Review of research on low-profile vortex generators to control boundary-layer separation," Progress in Aerospace Sciences 38, pp. 389-420.
3. Lin, J. C., Selby, G. V., and Howard, F. G., 1991, "Exploratory Study of Vortex-Generating Devices for Turbulent Flow Separation Control," 29th Aerospace Sciences Meeting, Reno, Nevada, Jan 7-10.
4. Mueller, T. J., 1999, "Aerodynamic measurement of low Reynolds number for fixed wing Micro-Air Vehicle," VKI, Belgium, September 13-17, 1999.

Self-similar Temporal Dynamics of Liquid Droplets Evolving from a Yarn

B. Sarma1 , V. Shahapure1 , A. Dalal1 and D. N. Basu1

1 Department of Mechanical Engineering, IIT Guwahati, India

E-mail: s.bhaskarjyoti@iitg.ac.in

The ubiquitous phenomena of pumpless transportation of liquids in the constricted capillary of many natural structures such as bee hive, soil etc. as well as synthetic structures such as paper, and textile etc. have been receiving profound interest from the researchers and industrialists since ages [1,2]. The unique potential of these wicking flows found numerous applicability in industrial and household activities such as clothing, biomedical, drying, filtration etc. [3]. Spontaneous capillary flows of these kinds have been extensively analysed, in order to unveil the rich physics and hydrodynamics associated with them [4,5]. More specifically, wicking through capillaries of the woven and non-woven yarns or threads has been a matter of great scientific interest in the scientific horizon [4].
On the other hand, dynamics of drop formation from a variety of nozzles in dripping mode have been studied extensively, specifically in context with ink-jet printing. With the advent of high-speed experimental facilities, researchers have also been able to capture many intricate drop generation dynamics such as thinning dynamics in the vicinity of pinch-off, drop formation from as wettable nozzle etc. However, no studies till date mention about dynamics of drop formation from a yarn which can be a prototype of flexible nozzles. The present study explores the complete dynamics of the evolution of drop formation with the help of a simple experimental set-up as shown in Fig. 1(a). The experimental studies have been extended for a range of liquids with varying viscosities and surface tensions. The dynamics reveal that the drop formation period can be divided into three distinct stages

namely “radial growth”, “axial growth” and “motion stage” as shown in Fig. 1(b). Interestingly all the three stages collapse into a single non-dimensional trajectory for all the experimental conditions studied herein indicating the self-similar behaviour of the dynamics of droplet evolution from a yarn. Also, a mathematical model has been proposed which can predict the critical volume of droplet detachment for each experimental conditions. Further, we have also validated the universal scaling laws of thinning such as 2/3rd power laws in this small We regime. The present study is expected to fill the gap in the area of drop-on-demand (DoD) generation as well as encourage the researchers to take further initiatives in this area.

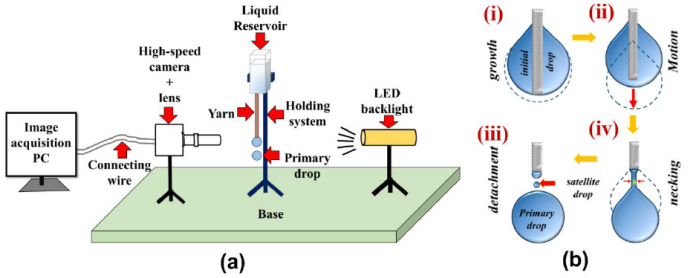


Fig. 1. (a) Schematic of the experimental set-up. (b) Different stages of droplet growth namely growth, motion, detachment and necking during the temporal evolution of a liquid droplet from a yarn.

References:

[1] E. W. Washburn, Physical Review 17, 273 (1921).
[2] L. D. Baver, W. R. Gardner, and W. H. Gardner, Soil Physics, 4th ed. (Wiley New York, 1972).
[3] T. Stoven, F. Weyrauch, P. Mitschang, and M. Neitzel, Composites Part A: Applied Science and Manufacturing 34, 475 (2003).
[4] K. Tang, K. Chau, C. Kan, and J. Fan, Scientific Reports 5, 17012 (2015).
[5] T. Liu, K. -f. Choi, and Y. Li, Journal of Colloid and Interface Science 318, 134 (2008).

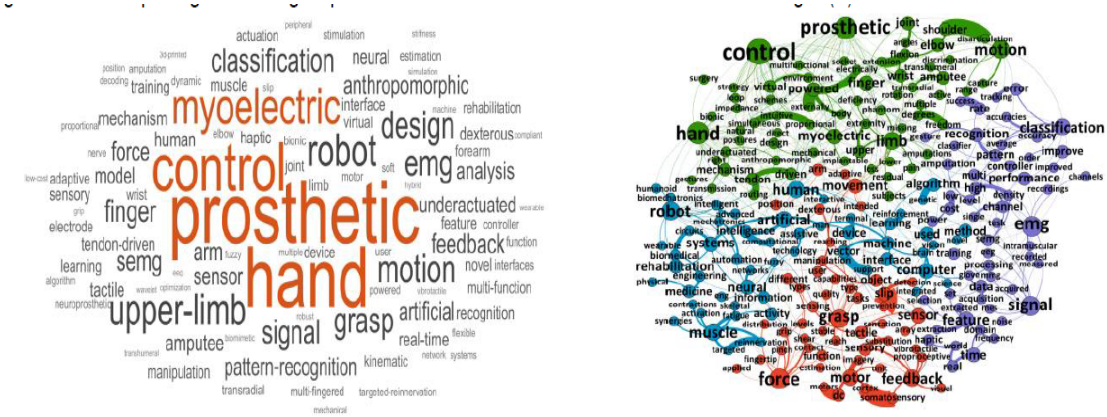
State of the art in bionic hands

Hirakjyoti Basumatary1 , Shyamanta M. Hazarika1

1Biomimetic and Cognitive Robotics Lab, Department of Mechanical Engineering, IIT Guwahati, India

E-mail: b.hirak@iitg.ac.in

Prosthetic hands have made a significant influence on the quality of life of people with upper arm amputation. Research on prosthetic hands is today focused on replicating the functionalities of the human counterpart. With a view to understand the trends and direction of research in bionic hands, an objective bibliometric survey is performed. This is done through a compilation of a scientific publications database (2886 publications) from IEEE, Web of Science, ScienceDirect and ACM spanning the last two decades (1997-2017). Using network-based information analysis, meaningful patterns were inferred and several key questions significant to bionic prosthetic hands were answered. The focus is on providing a vivid visualization of the growth, progress and the future trend in bionic prosthetic hands.

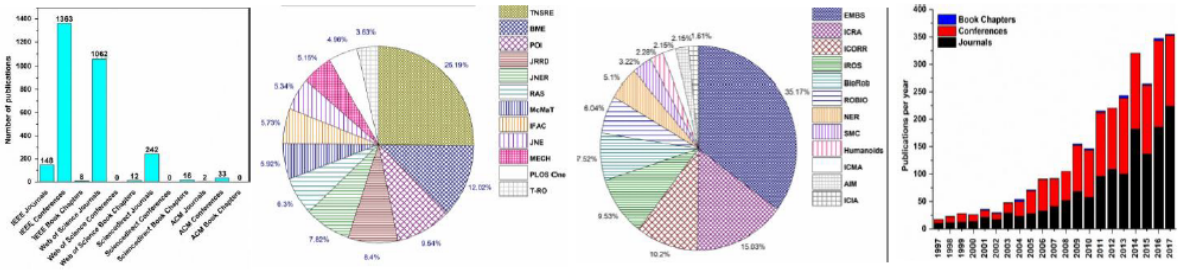


(a) (b)

Fig. 1: (a) Most popular topics (b) Graph revealing important research communities in bionic hand research.

The first question answered through information analysis was: Which subject areas is the topic of hand prostheses confined to? And how many research communities can be identified? To answer the query, we extracted the titles and abstracts of the scientific publications in our database. A word-cloud visualization was obtained. Word-cloud visualization revealed important active topics in the field of hand prostheses as shown in Fig. 1(a). Further, a word co-occurrence graph based on collocation score between terms appearing in titles and abstracts was obtained. This was used to identify research communities using a force atlas algorithm with more related words pulled together towards each other than others and a modularity analysis to detect the underlying communities by coloring the nodes depicting different groups. This revealed four communities as shown in Fig. 1(b).

The next question asked was: *Where is the research on hand prostheses published? And how rapidly is the research on bionic hand expanding?* To answer the query, we conducted statistical analysis on the database. Fig. 2(a) illustrates the bar chart of the quantity of publications in different research articles. Fig 2(b) and (c) represents the proportion of publications in leading journals and conferences respectively. Fig. 2(d) depicts the growth of research in bionic hands over the last two decades.



(a) (b) (c) (d)

Fig. 2: (a) Overall split (b) Leading journal (c) Leading conferences (d) Growth of bionic hand research

The final question was: *Where is the research on hand prostheses headed in the future?* This was answered by inspecting the above results of our analysis. Table.1 shows the trends and direction of research in bionic hands.

Table 1: Future trends and direction of research in the field of hand prostheses

Multi-modal sensor fusion	Efficient Design	Intuitive control	Miscellaneous Trends
Real-time decoding	Actuator Technology	Multi-articulated Finger Control	3D-Printing
Sensor technology	Underactuated Mechanism	Simultaneous and Proportional Control	Advanced Machine Learning
Sensor Fusion	Tendon-driven Mechanism	Bionic Reflex Control	Rehabilitation Therapy
Multi-modal switching	Tendon Routing	Online Predictive Control	
Mixing sensor fusion algorithm	Linkage Mechanism	Multi-modal Sensory Feedback	
Multi-modal signal processing	Robust Compliant Mechanism		
	Differential Mechanism		

This survey provided an information theoretic analysis of literature in the area of bionic hands. Such a survey holds promise for its objective nature.

On analytical 3D elastic deformation and stress solutions for arbitrarily supported laminated composite cylindrical shell panels

Shranish Kar1 and Poonam Kumari1

1 Department of Mechanical Engineering, IIT Guwahati, India

E-mail: shranish.kar@gmail.com,kpmech@iitg.ac.in

Purpose: Analytical three-dimensional (3D) solutions are exact and act as benchmark solutions for other theories being developed for structural mechanics problems. In that context, for the problem of bending of a composite laminated cylindrical shell panel having arbitrarily end-support conditions an analytical 3D elasticity solution is proposed which are scarce due to their mathematical complexity.
Methodology: Partial differential equations (PDEs) governing the mentioned problem are obtained by the application of the Ressiner mixed variational principle in cylindrical coordinate system. Those equations are solved after reducing them to sets of non-homogeneous ordinary differential equations (ODEs) by employing the extended Kantorovich method. Further, the set of ODEs along the radial axis involve variable coefficients which are solved utilizing a new modified power series method and the set of ODEs obtained along the circumferential axis are solved using the Pagano's approach.
Findings: Accurate solutions for displacements and stresses arising upon bending of shell panels composed of different material, orientation, laminate scheme and arbitrary boundary conditions are obtained. Crucially the edge effects and stress concentrations pertaining to the laminated composite are accurately predicted.
Value: Exact, faster computation and benchmark solutions can be obtained owing to the 3D analytical method as compared to other numerical techniques.

Numerical results:

Numerical results showing exact prediction of edge effect through the presently developed technique for a 4 layer cross-ply laminate of [00/900/900/00] stacking sequence is shown for a cylindrical shell

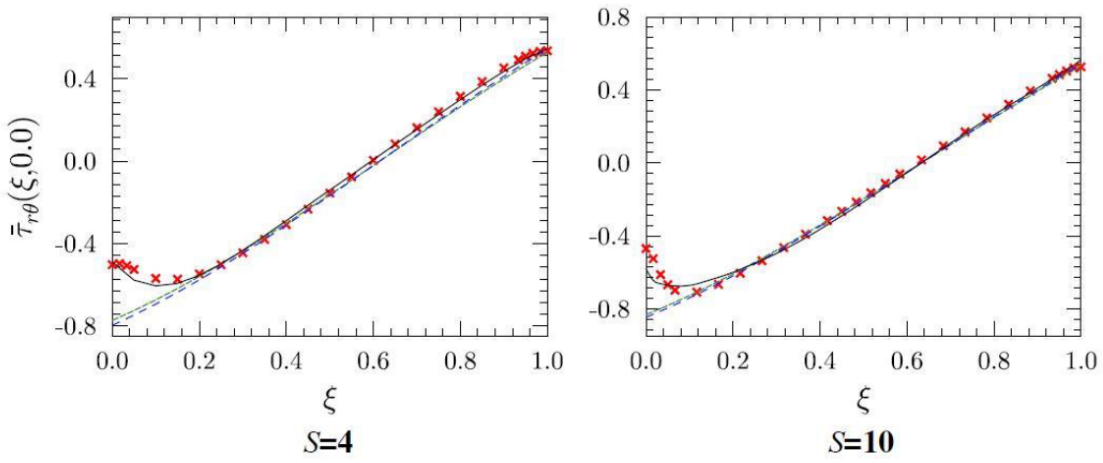


Fig.1: Circumferential variation of deflections and stresses in a multi-layered laminated cylindrical shell panel of span 60^0 with CS boundary condition [1].

panel which is clamped at one edge and simply supported at the other edge in Fig.1.

The figure shows the stress ($\tau_{r\theta}$) developed at the mid span of the shell panel. The edge effect can be seen at the clamped edge of the cylindrical panel which is clamped at ξ =0 and simply supported at ξ =1. The edge

effect can be seen to extend up to ξ =0.25 and ξ =0.1 for a thick shell panel of S=4 and moderately thick shell
panel S=10 respectively, where S=mid surface radius (R)/total thickness (h) of the shell panel.

References:

[1] Kumari, P., & Kar, S. (2019). Static behavior of arbitrarily supported composite laminated cylindrical shell
panels: An analytical 3D elasticity approach. Composite Structures, 207, 949-965.

Formulation of a Novel Image Processing Technique for Transient Dynamics of Droplets and Bubbles and Jets

V. Shahapure1,, B. Sarma1, A. Dalal1 and D. N. Basu1

1 Department of Mechanical Engineering, IIT Guwahati, India

E-mail: s.bhaskarjyoti@iitg.ac.in

The study of the formation of droplets, jets, and bubbles and their transient dynamics in the presence or absence of numerous external stimuli such as aerodynamic drag, electric filed, is of high practical interest and finds a plethora of applications in industries including ink-jet printing or DNA printing [1]. High-speed imaging and subsequent analysis of these fast paced events, in order to resolve their underlying physics, has emerged as one of the most relevant tools among the scientific community
However, the image processing methods available currently and applied to the domain of droplet and bubble dynamics appears to be insufficient specifically in those situations wherein the object of interest has a central bright regime. In the present study, we have developed a new image processing techniques which can tackle the aforementioned criticality without losing any pixels near to the droplet edge or providing any false or improper boundary of the object of interest. The current methodology embraces an already available a set of commands from the open source imaging software ImageJ [3] and coupling it to an in-house C++ code. Also, we have debarred ourselves from using the image thresholding directly on to the raw image. The current methodology initially employs the popular “Unsharp Mask” command to generate an image having sharp contrast out of the raw image. In the next set of commands, we subsequently use the “make binary” and “fill hole” commands which further helps in removing the central bright region from the object of interest. After this, an indigenously developed algorithm is used to extract the data from the image which further helps in obtaining a series of quantitative information about the object of interest such as length, radius, motion and position of the centroid, important to various industrial processes such as ink-jet printing, drying etc. As an example, we are showing the analysis of a drop-on-demand system that elucidates the potential of the developed method and in-house code.

References:

[1] O.A. Basaran, Small-scale free surface flows with breakup: Drop formation and emerging applications, AIChE J., 48 (2002), 1842.
[2] I. Hutchings, G. Martin, S. Hoath, High speed imaging and analysis of jet and drop formation, J. Imaging Sci. Technol., 51 (2007) 438-444.
[3] C.A. Schneider, W.S. Rasband, K.W. Eliceiri, NIH Image to ImageJ: 25 years of image analysis, Nat. Methods, 9 (2012) 67.

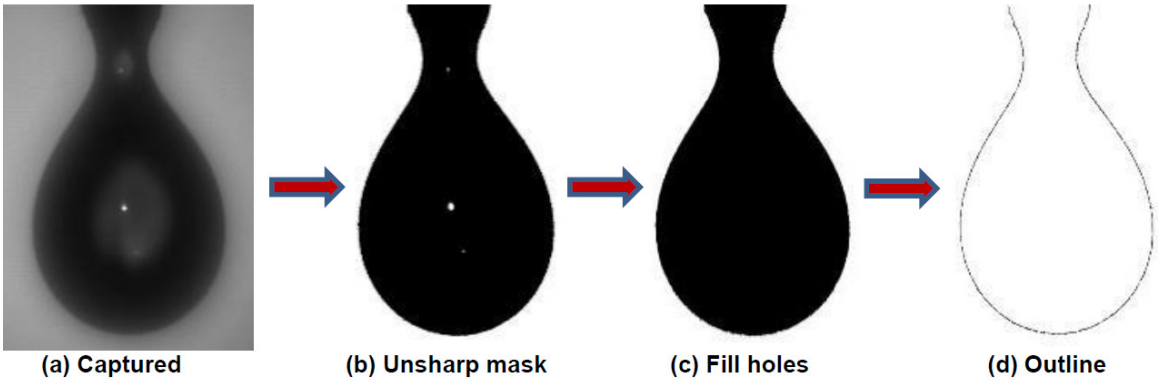


Fig. 1 Sequence of Image processing by using ImageJ.

Stability Analysis of Base Excited Journal Bearing

D. Das , J. Chowdhury and P. Kakoti
Department of Mechanical Engineering, Assam Engineering College, Guwahati, India
E-mail: debajit2016@gmail.com

Impact of base excitation has always been a significant aspect of bearing study. This project aims at studying the performance of journal bearings under the base excitation mode. The study incorporates the effects of base excitation on the safe designing of journal bearings. The case of base excitation however, has been overlooked during the study of bearings for simplicity. Using numerical methods, the maximum force in the bearing, under several operational conditions, can be calculated by solving the Reynolds' equation. In this study, the force due to the base excitation is coupled to the maximum force experienced by the journal bearing during its operation. Central differentiation method is incorporated to solve the Reynolds' equation. Further the use of Runge-Kutta's method of successive iteration is applied to study the stability of the bearing.
Keywords: Journal Bearing, Base excitation, Reynolds' equation.

A numerical study on mixed convective heat transfer from a shrouded vertical double-height non-isothermal fin array

Kankan K. Pathak1, Rajat K. Kakoti1 and A.Giri2

1 Department of Mechanical Engineering, GIMT, Guwahati, India 2 Department of Mechanical Engineering, NERIST, Itanagar, India

E-mail: kankan_me@gimt-guwahati.ac.in

The enthrallment to miniaturize the engineering components to occupy less space and to become handy usually results in higher heat flux, which is to be carried away for the proper functioning of the system by keeping the temperature of the same below a definite value. Examples of such devices are cooling of electronic equipment, transformer, solar cell, nuclear power plant, and car radiators etc., in which rapid removal of heat makes the system more efficient. After the inception of fins, in the school of augmented heat transfer, researchers keep on exploring all the possibilities for its use and suitable design. Blowing air at moderate velocities results in the enhanced heat transfer from the equipment in many cases. Shrouded vertical fin array has been investigated by many researchers in recent time

because of its extensive applicability in engineering/industrial uses. Natural convection is restricted due to the paucity of heat transfer, while the forced convection provides some additional support over natural convection. However, systems undergo natural convection inherently. Therefore, studies of mixed convection are appropriate and reasonable. It is realized that the shrouded fin array has been investigated in most of the cases to show the effects of the geometric parameters on the heat transfer under the condition of single-height fin array. In this on-going research, a numerical experiment has been conducted through an in-house numerical code developed in FORTRAN 90 to predict the possible enhanced heat transfer through shrouded vertical double-height non-isothermal fin array undergoing mixed convection. Results indicate that induced velocity increases with decreasing reduced-height of fin for smaller fin spacing which enhances the heat transfer rate. Variation of the product of friction factor and the Reynolds number (fRe) show lower value for the case of double-height fin array while investigated under different geometric conditions. Overall heat transfer coefficient shows improved results for the double-height fin array involving lower Grashof numbers at different inlet velocities. But, for higher velocities, better results are noticed only in the case of larger clearances. The axial variation of temperature and velocity profiles is also reported. The thermo-hydrodynamic performance parameter is found to be greater for the double-height fin array than that of the single-height fin array.

Keywords: mixed convection; double-height fin; single-height fin; induced velocity; overall heat transfer coefficient.

Sintering studies of boron carbide (B4C) with oxide additives

A. Pinaki Pal1 and P.K.P Rupa1

1 Department of Material Science and Engineering, Tripura University (A Central University), India

E-mail: pinakipal.tu@gmail.com

Boron carbide (B4C) is characterized by a unique combination of properties that make it a material of choice for a wide range of engineering applications. Boron carbide is used in refractory applications due to its high melting point, it is used as abrasive powder and also as coatings due to its extreme abrasion resistance. B4C is also used in ballistic applications due to its high hardness and low density. It is also commonly used in nuclear applications as neutron radiation absorbent. [1-5].

In the present work, we are investigating the effect of oxide additives such as SiO2, Al2O3 and MgO on the sintering behaviour of B4C below 1500oC for different holding time. Effect of 0.5 wt % of the oxide additives on the structure and phase formation is reported. X-ray diffraction studies of the glass forming additives as shown in figure.1, that the initial powder and also after sintering at 1000oC for 1 hour is amorphous. As the temperature increases, there is a marked amorphous to crystalline phase transition of the glass mixture. Further, it has been observed that as the holding time of the glass mixture is increased at 1350 oC, the peak intensity was observed to decreases. This shows that the glassy phase formation is taking place. It is also observed that the additives (0.5 wt %) are influencing the mechanical properties of B4C sintered at 1350 oC for different sintering temperatures

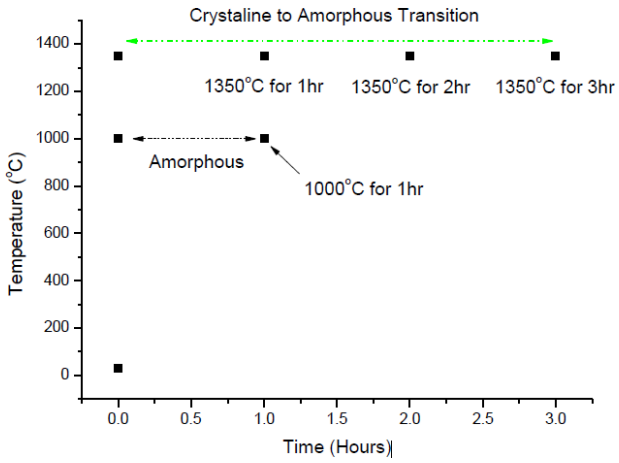


Figure-1: Time vs Temperature plot showing the transition temperature from amorphous to crystalline structure of the glass forming additive

Key Word: B4C, additive, temperature, hardness, oxide

Reference:

1) Mina Saeedi Heydari , Hamid Reza Baharvandi, Int. Journal of Refractory Metals and Hard Materials 51 224–232 (2015)

2) A. Alizadeh, E. Taheri-Nassaj, N. Ehsani and H. R. Baharvandi Advances in Applied Ceramics VOL 105 NO 6 291-296 (2006)

3) Vladislav Domnich, Sara Reynaud, Richard A. Haber, and Manish Chhowalla J. Am. Ceram. Soc., 94 (11) 3605–3628 (2011)

4) Y. Q. Tan, C. Chen, F. Z. Li, H. B. Zhang, G. J. Zhang and S. M. Peng RSC Adv., , 5, 76309–76314 (2015)

5) Mehri Mashhadi, Ehsan Taheri-Nassaj, Vincenzo M. Sglavo, Hossein Sarpoolaky, Naser Ehsani Ceramics International 35 831–837 (2009)

EXPERIMENTAL AND SIMULATION STUDIES ON PERFORMANCE AND EMISSION CHARACTERISTICS OF ETHANOL FUELED DIRECT INJECTION HIGH COMPRESSION CI ENGINE

S. Praveenkumar1 , S. Mohit vishnu2 and V.D. Tamilarasan3 1,2

Department of Mechanical Engineering, Bannari Amman Institute of Technology, Tamilnadu, India 3 Research Associate Cum Assistant Professor, Centre for Mechanical Engineering, Bannari Amman Institute of Technology, Tamilnadu, India

E-mail: praveenkumarsv.me16@bitsathy.ac.in , tamilarasan@bitsathy.ac.in

Intense competition and worldwide regulation of emission has placed unprecedented demands on the execution of today's IC engine. Stringent emission legislation has been levied on NOX emissions emitted from automotive diesel engines worldwide over the past few years. The Exhaust pollutants emitted to the atmosphere by automobiles are the main source of air pollution and impose a serious hygienic and an environmental risk. In the internal combustion engines, NOx formation is a temperature dependent phenomenon and emits particulate matter due to diffusion combustion. The

use of bio-fuels (Bio-Diesel, Bio ethanol, Bio Methanol) for CI Engines have been a subject of study for quite some time as an alternate to diesel. Bio-fuel lacks sulphur, better blending and lubrication properties relative to diesel. Ethanol octane rating, cetane number and self-ignition temperature are the major problems in normal compression ratio CI engine. Hence a suitable method of ignition improver for ethanol, as an alternative fuel for high compression ignition (HCI) engines is the objective of the current research.

The ethanol fuel cetane number can be easily improved by blending with polyethylene glycol (PEG), which is an excellent ignition improver for bio-fuels. Ethanol fuel mixed with 4% of Methyl Tetra-Butyl Ether (MTBE) to inhibit corrosion, Isobutyl alcohol to increase viscosity and PEG varying from 0 to 7.5% wt to increase the cetane number, were used in a high compression-ignition (HCI) engine. In the present work an ethanol fuel direct injection high compression ignition (EDIHCI) with and without EGR mode for single cylinder, four stroke CI engine was developed. Initially, experimented were conducted with standard piston bowl chamber to calculate performance parameters and emission characteristics. Brake Thermal Efficiency (BTE) was increased with increasing a load range of 0 to 3.99 kW at an engine speeds of 1500 rev/min. EPEG 7.5 fuel mode operation BTE was slightly higher than other test Fuels. It was observed that all test fuels had higher specific fuel consumption (SFC) compared to base fuel engine, due to 1.6 time lower heat energy compared with diesel fuel. The brake specific fuel consumption of the modified high compression ratio (CR 28.5:1) ethanol engine fuel energy, converted to diesel equivalent was generally lower than that of diesel throughout the operating load. Exhaust gas recirculation (EGR) system was used successfully to achieve the highest in-cylinder gas temperatures before injection, for a spontaneous ignition of ethanol in a high compression engine and 83% reduction of NOx emission. All test fuels SFC decreased with an increased BP from 0.56 kW to 3.89kW and also NOx, HC and CO emission were lower compared to diesel fuels. The research and findings concluded that EPEG 7.5 was a desirable ignition improver for ethanol in high compression CI engine.

Reference -

1. Jindal S, Nandwana B P, Rathore N S & Vashistha V, 2010, 'Experimental investigation of the effect of compression ratio and injection pressure in a direct injection diesel engine running on Jatropha methyl ester ', Applied Thermal Engineering, Vol-30, No-5, pp-442–448.

2. Vressner A, Egnell R & Johansson B, 2008, 'Combustion Chamber Geometry Effects on the Performance of an Ethanol Fuelled HCCI Engine', SAE Technical Paper 2008-01-1656.

3. Schaefer A & Hardenberg H, 1981, 'Ignition Improvers for Ethanol Fuels,' SAE Technical Paper 810249.

Effect of prior cold working on the microstructure & mechanical properties of quench and partitioned (Q&P) steel

U. Thendralarasu1, N. Maheswari1, S. Sankaran1

1 Department of Metallurgical and Materials Engineering, IIT Madras, India

E-mail: thendraltec@gmail.com

In the present work, the effect of prior cold working on the quench and partitioned (Q&P) steel microstructure and mechanical properties were studied. The designed steel was cold worked with reductions of 20% & 50% and then subjected to Q&P process as follows:(i) austenitization (at slightly above Ae3 temperature); (ii) quench to a temperature between MS and Mf; (iii) reheat to a

temperature above the quench temperature and (iv) final water quench. Prior cold working and austenitization at slightly above Ae3 temperature has helped to achieve refined prior austenitic grain size. Thus, the final Q&P processed microstructure has shown the presence of refined martensite (with high dislocation density, lower colony size) and retained austenite. The volume fraction of retained austenite was calculated by Rietveld refinement method on X-ray diffraction data. Grain orientation and morphology of phases after Q&P process was identified using electron back scattered diffraction (EBSD). The refinement in microstructure has led to achieve tensile Strength of 1300MPa with 14% of total elongation. The observed results were compared with Q&P steels without prior cold working.

References:

1. Li Wang, J.G. Speer; Quenching and Partitioning Steel Heat Treatment. Metallogr. Microstruct. Anal. (2013) 2:268–281
2. N. Maheswari, S.Ghosh Chowdhury, K.C.Hari Kumar, S.Sankaran; Influence of alloying elements on the microstructure evolution and mechanical properties in quenched and partitioned steels. Materials Science&EngineeringA600(2014)12–20
3. Eun Jung Seo, Lawrence Cho, Yuri Estrin, Bruno C. De Cooman; Microstructure-mechanical properties relationships for quenching and partitioning (Q&P) processed steel. Acta Materialia 113 (2016) 124e139
4. R. Parthiban, S. Ghosh Chowdhury, K.C. Hari Kumar, S. Sankaran; Evolution of microstructure and its influence on tensile properties in thermo-mechanically controlled processed (TMCP) quench and partition (Q & P) steel. Materials Science & Engineering A 705 (2017) 376–384
5. M.J. Santofimia, R.H. Petrov, L. Zhao, J. Sietsma; Microstructural analysis of martensite constituents in quenching and partitioning steels. Materials Characterization 92(2014) 91 – 95

Compositional Analyses of Copper alloys using Single Line Transition via Calibration Free Laser Induced Breakdown Spectroscopy (CF-LIBS) in air

E Mal[1] and A Khare

Department of Physics, Indian Institute of Technology Guwahati, Guwahati

E-mail:[1] m.eshita@iitg.ernet.in

Laser-Induced Breakdown Spectroscopy (LIBS) is an optical emission spectroscopic technique which can be used for qualitative and quantitative analysis of any kind of sample. In (LIBS), a high power pulsed laser is focused on to the surface of the sample under consideration resulting into evacuation of the small amount of material within the focal volume and produces its transient inhomogeneous high density and high temperature laser induced plasma (LIP). The LIP expands in the surrounding medium, cools down and emits characteristic line radiations originating from atomic and ionic species of the constituent elements present in the sample, thereby the constituent elements of the target sample are identified. By careful analyses of LIBS spectrum the concentration of the constituent elements can also be determined. In comparison with other spectrochemical analytical technique, the LIBS has many advantages such as, it is applicable to any kind of sample irrespective of its physical state (i.e. solid, liquid and gases), free from sample preparation and thus contamination free, nearly non-destructive, simultaneous detection of multi-element sample, applicable over wide spectral range, simple, inexpensive, compact, portable and single shot measurement allow for quick and rapid analysis. In the present study, a second harmonic of a Q-switched Nd:YAG laser of pulse width 7ns and repetition of 1 Hz was focused on to three different copper alloys to generate the plasma. The emitted spectra from the laser induced plasma (LIP) from these copper alloys were recorded using a spectrometer attached with an ICCD detector. The LIBS spectrum of sample1 (commercial brass) comprised of copper (Cu) and zinc (Zn) as the major constituent elements along with the trace elements aluminium (Al), iron (Fe), lead (Pb), tin (Sn) and nickel (Ni) while sample 2 comprised of Cu, Zn and Ni and sample 3 contained only two elements; Cu and Ni. The Calibration Free LIBS (CF-LIBS) requires the plasma temperature and electron density which were assessed via Boltzmann plot method and Stark-Broadened profile (of CuI line at 510.55 nm) respectively. The estimated plasma parameters were plugged in the single line CF-LIBS (Calibration Free-LIBS) algorithm to finally estimate the concentration of each and every identified element in the copper alloys. The estimated concentrations of all the elements in these copper alloys show good agreement with EDX results.

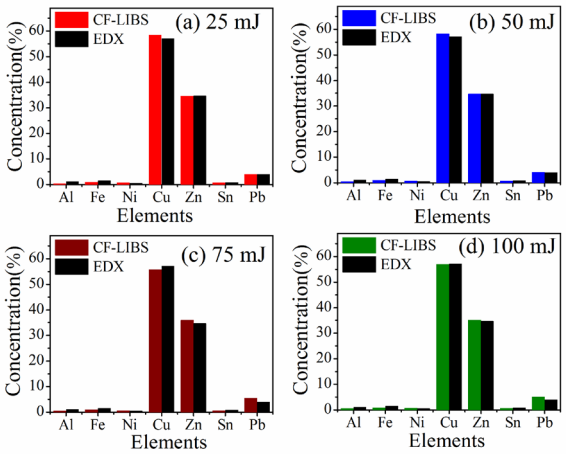


Figure 1: Comparison between CF-LIBS results and EDX analysis at different incident laser energies

References:

1. Ciucci, M. Corsi, V. Palleschi, S. Rastelli, A. Salvetti, E. Tognoni, New procedure for quantitative elemental analysis by laser-induced plasma spectroscopy, Applied spectroscopy, 53 (1999) 960-964
2. S. Zhang, X. Wang, M. He, Y. Jiang, B. Zhang, W. Hang, B. Huang, Laser-induced plasma temperature, Spectrochimica Acta Part B: Atomic Spectroscopy, 97 (2014) 13-33
3. S. Harilal, C. Bindhu, R.C. Issac, V. Nampoori, C. Vallabhan, Electron density and temperature measurements in a laser produced carbon plasma, Journal of applied physics, 82 (1997) 2140-2146.
4. http://physics.nist.gov
5. Eshita Mal, RajendharJunjuri,Manoj Kumar Gundawarand AlikaKhare, Optimization of temporal window for application of calibration free-laser induced breakdown spectroscopy (CF-LIBS) on copper alloys in air employing a single line, Journal of Analytical Atomic Spectrometry,2019.

Structural and optical properties of Pervoskite thin films fabricated by Pulsed Laser Deposition technique

SasmitaBehera*, AlikaKhare

Department of Physics

Indian Institute of Technology Guwahati, Guwahati, 781039, India
Email: behera.s@iitg.ac.in

Pulsed laser deposition (PLD) is a versatile technique for the deposition of high quality thin films. PLD technique possesses significant advantages over other film deposition techniques, such as the capability for stoichiometric transfer of material from target to substrate, relatively high deposition rate at moderate laser fluences, precise control over film thickness and laser being used as an external energy source, the interaction of radiation along with a target an extremely clean process [1]. The deposition is achieved in both inert and reactive background gases. In present work, a Q- switched Nd-YAG (2^{nd} harmonic) laser with pulse duration 8 ns and repetition rate 10 Hz was focused onto a Pervoskite ($BaTiO_3$, $SrTiO_3$, $Ba_{0.5}Sr_{0.5}TiO_3$) target to deposit thin films in two different substrates on fused silica and Si (100) substrates with substrate temperature 700^0C with oxygen pressure 0.1 mbar [2,3]. The target was continuously rastered and rotated so as to provide a fresh surface for every shot to shot variation of target. The structural properties of these thin films were characterized by X-Ray Diffraction and Atomic Force Microscope images and Raman Spectroscopy and linear optical properties were characterized by UV–Visible-NIR Spectroscopy. Nonlinear optical properties of these thin films were characterized by Z-scan technique using Ar-Ion Laser (488nm). More details of the work will be discussed in the conference.

References:

[1] R. Eason, Pulsed laser deposition of thin films: applications-led growth of functional materials, John Wiley & Sons, 2007.

[2] X. Wu, D. Wu and X. Liu, "Negative pressure effects in $SrTiO_3$ nanoparticles investigated by Raman spectroscopy ", Solid state communications **145**, 255-258 (2008).

[3] W. Wang, Z. Dai, Y. Sun,Y. Sun and D. Guan, "Picosecond nonlinear optical response of $Ba_{0.5}Sr_{0.5}TiO_3$ thin films fabricated by pulsed laser deposition ", Applied Surface Science **250**, pp. 268-272 (2005).

MoS_2 quantum dots shape and size modulation by pulsed laser ablation in liquid

Gobinda Pradhan* and Ashwini Kumar Sharma

Department of Physics, Indian Institute of Technology Guwahati, Guwahati-781039, India

E-mail:p.gobinda@iitg.ac.in

In recent year, MoS_2, a transition metal di-chalcogen (TMDC) material has emerged as an alternating 2D material of graphene for optoelectronics devices like transistor, MOSFET, photovoltaic cell etc. with great efficiency like high mobility, high on/off switching ratio and lower power consumption. It shows also an immense possibility as a catalyst for hydrogen evolution reaction (HER), photosynthesis etc. Recently along with the 2D layered structure, zero-dimensional MoS_2 i.e. MoS_2 QDs has drawn tremendous attention with its additional unique properties compared to the MoS_2 bulk counterpart. By synthesizing MoS_2 QDs of different sizes one can tune the band gap of the QDs which results in PL emission of different Wavelength. As most of the existing QDs like PbSe, PbS, CdAs contains heavy metal which increases the risk of toxic hazards so alternative high efficient nontoxic QDs are in high demand. Hence, MoS_2 QDs which are nontoxic, band gap in the visible region, chemically and thermally stable with a noticeable high efficiency seem to be a good alternative. Among other tedious and time-consuming processes pulsed laser ablation in liquid (PLAL) technique shows a great possibility as an efficient, single step, chemical free simple physical process to synthesis MoS_2 QDs. In PLAL technique one can tune parameters like laser fluence, laser wavelength, ablation time, liquid medium etc. Hence a systematic study on the parameters effect on the shape and size, concentration of the generated MoS_2 QDs is in scarce. In the present work, MoS_2 QDs are synthesized by PLAL technique with a nanosecond pulsed laser at various laser fluence and ablation time. The effect of laser fluence and ablation time on QDs size and their structures are investigated systematically. The shape and sizes of the QDs are characterized by TEM and AFM images. All the samples are subjected to Raman spectra and XRD pattern analysis to identify the crystalline properties. Further, the optical properties are investigated by recording the Photoluminescence and UV-vis spectra of the respective MoS_2 QDs samples.

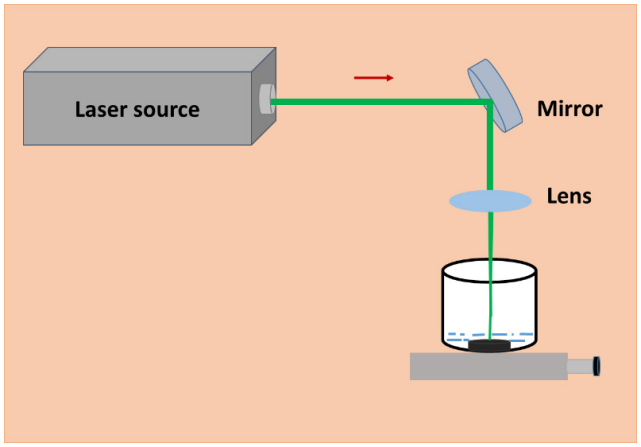


Figure 1. Schematic diagram of pulsed laser ablation of the MoS_2 target in liquid.

Crystal structure and Magnetic Properties of Germanium doped $MnCo_2O_4$

M. Sehrawat[1], B.Yadav[1], S.Ghosh[1], S.Singh[1],P.Pramanik[1],S.K.Jena[1], D.C.Joshi[2] and S. Thota[1]*

[1]Department of Physics, Indian Institute of Technology Guwahati, Guwahati-781039, Assam (India),
[2]Ångstrom Laboratory, Department of Solid State Physics, Uppsala University, Lägerhyddsvägen 1, 75237, Uppsala (Sweden)

*Corresponding Author Email:subhasht@iitg.ac.in

We present the synthesis, crystal structure and magnetic properties of Germanium (Ge) doped $MnCo_2O_4$ polycrystalline bulk compounds of different compositions (x) between x = 0 and 0.6 ($Mn_{1-x}Ge_xCo_2O_4$). For the synthesis of these compounds a typical solid-state reaction method has been employed using the standard binary-oxides GeO_2, Co_3O_4 and MnO_2 as precursors. High temperature sintering (at 1200ºC for 8 hours in air) of the mixed powders yields desired composition and phase of the compounds without any secondary phase. The powder x-ray diffraction measurements performed using Cu K_α radiation of wavelength (λ~1.5406 Å) confirms the inverse cubic spinel crystal structure of these compounds with space group Fd-3m (227). The low-temperature ($5K \leq T \leq 300K$) magnetization measurements (M(T)) performed using Physical Property Measurement System (PPMS) with VSM option under both zero-field-cooled (ZFC) and field-cooled (FC) conditions. These results reveal that for x = 0.4, the ferrimagneticNéel temperature (T_N) decreases significantly to 156 K as compared to the undoped case 184 K. Interestingly, below T= 100 K, the M_{ZFC} exhibits negative magnetization (3.16 emu/gram at T = 5 K) with a cusp in M_{ZFC} at 128.4 K (T_P). Due to very high magnetocrystalline anisotropy of these compounds we noticed a giant bifurcation between the M_{FC} and M_{ZFC} magnetization curves below T_P. At T = 5 K the difference between the M_{FC} and M_{ZFC} values is ΔM = 19.73 emu/g. Such anomalous magnetic properties in these spinel compounds will be discussed in detail.

Photoluminescence in semi-transparent nanostructured Cu thin film fabricated via PLD

Rahul Kesarwani and AlikaKhare*

Laser and Photonic Lab, Department of Physics, IIT Guwahati, Guwahati

*Corresponding author: alika@iitg.ac.in

Nanostructured copper (Cu) thin film exhibits photoluminescence (PL) property due to the direct radiative recombination of electrons near the Fermi level with holes in the first d-band. The semi-transparent nanostructured Cu thin film were grown onto glass (coverslip) substrate via pulsed laser deposition (PLD) technique at a laser fluence of ~ 3.5 J/cm^2 under vacuum. The film was deposited at room temperature (RT) for deposition time of 6 and 8 minutes. All these films were gradually annealed up to 400ºC in a step of 100ºC for 4 hours at each temperature, under the base pressure of ~10^{-5} mbar. The RT PL spectra in the Cu thin films were recorded by Flouromax spectrometer (Edinberg Instruments, Model No. FS920) equipped with Xenon lamp. The samples were illuminated at an excitation wavelength of 300 nm. The multiple PL peaks were observed in the nanostructured Cu thin films. The deconvolution of the PL spectra of all the films, as-deposited as well as annealed films, exhibited six peaks in the spectral range of 390-450 nm, 450-495 nm, 495-570 nm, 570- 595 nm, 595- 620 nm and 620- 665 nm. All the PL peaks were due to the presence of the interband transitions of the Cu nanoparticles (NPs) which were also confirmed by ellipsometer analysis.

References

1. A. Mooradian, Photoluminescence of metals, Physical Review Letters, **22** (1969) 185.
2. P. Apell and R. Monreal, PhysicaScripta. **38** (1988) 174.
3. Y.Suresh, S. Annapurna, G.Bhikshamaiah, A.K.Singh, IOP Conf. Ser.: Mater. Sci. Eng., **149** (2016) 012187.

Non chiral bosonization of a Luttinger liquid

Joy Prakash Das &Prof. G. S. Setlur

Dept. of Physics, IIT Guwahati

In this work, the powerful Non-chiral bosonization technique (NCBT) is introduced, which is a non-trivial modification of the standard Fermi-Bose correspondence in one spatial dimension made in order to facilitate the study of strongly inhomogeneous Luttinger liquids (LL) where the properties of free fermions plus the source of inhomogeneities are reproduced exactly. The formalism is applied to obtain the correlation functions of translationally non-invariant systems like LL with a cluster of impurities (barriers/wells) around an origin, a one step fermionic ladder, slowly moving impurities in a Luttinger liquid, etc. The obtained correlation functions are used to study various physical phenomena like Friedel oscillations, resonant tunneling, dynamical density of states, conductance, mobility (in case of mobile impurities) and so on. The results are validated using the Schwinger Dyson equation and perturbative methods. The present method is superior to the conventional bosonization methods (g-ology methods) which requires additional tools like re-normalization, etc. to deal with impurities.

Investigating interaction of single photons produced by Spontaneous Parametric Down-Conversion (SPDC)

SPDC is a nonlinear instant optical process that converts one photon of higher energy (namely, a pump photon), into a pair of photons (namely, a signal photon, and an idler photon) of lower energy, in accordance with the law of conservation of energy and law of conservation of momentum. It is an important process in quantum optics, for the generation of entangled photon pairs, and of single photons.I have found a way to collide the single photons produced by SPDC at a particular point in space. This interaction will help us to know and clarify our understanding on the origin of our universe and also how all of it is going to end. The presentation will involve the procedure to collide the single photons and also to determine the happenings at the collision point and the main motive behind doing this experiment.

Morphology Tuning of BiOCl nanocrystals by Citric Acid variation: Application in visible light assisted dye degradation

Ratna Sarkar[1#], Dimitra Das[2], Anuradha Mitra[1], Subrata Sarkar[1], Kalyan Kumar Chattopadhyay[1,2*]

[1]Department of Physics, Jadavpur University, Kolkata, India [2]School of Materials Science and Nanotechnology, Jadavpur University, Kolkata, India

Bismuth oxyhalides (BiOX, X= Cl, Br, I) are well known highly efficient photocatalysts for the degradation of toxic organic pollutants. They exhibit different types of crystal structures along with unique electrical and optical properties. These materials can efficiently degrade different types of textile dyes and pharmaceutical products. Among the different oxyhalides, BiOCl is a p-type indirect band gap semiconductor with band gaps lying in the range of 3.2 ~ 3.5 eV.

In the present work, a simple and efficient synthetic strategy has been followed to prepare nano-disk like BiOCl samples with prominent growth along the {00l} planes. The precursors {$Bi(NO_3)_3$, $5H_2O$} and HCl in appropriate molar ratio along with the capping agents citric acid and PVP are subjected to hydrothermal condition for 3 hours at 160˚C. Variation in the molar ratio of the citric acid during the synthesis procedure resulted in subsequent variation in the morphology of the as-prepared samples from nanodisks [1] to nanosheets. The samples were characterized in details by several techniques to have a proper insight into the phase formations, chemical bonding, morphology and electronic band gaps. The X-Ray diffraction (XRD) analysis revealed the preferential growth in the {001} direction whereas the Fourier Transform Infrared (FTIR) analysis and Raman spectra analysis confirmed the presence of all the respective chemical bonds. The morphology of the samples was revealed from the Field Emission Scanning Electron Microscope (FESEM) and Transmission Electron Microscope (TEM) images. The band gaps of the as-synthesized samples varied from 3.2 to 3.5 eV with change in the morphology from disk to sheet as obtained from diffuse reflectance spectra (DRS) analysis. The samples were further exploited for effective degradation of toxic Rhodamine B (RhB) dye under visible-light irradiation. The variation in citric acid resulted in changes in the morphology which in turn led to the variation in the photocatalytic dye degradation efficiency of the as-prepared BiOCl samples.

Keywords: Bismuth oxyhalides, citric acid, photocatalysis.

References:

1. X. Zhang, X.B. Wang, L.W. Wang, W.K. Wang, L.L. Long, W.W. Li & H.Q. Yu. ACS Appl. Mater. Interfaces 2014, 6, 7766−7772.

Observation of coherent phononic frequency combs and manifestation of tunable non-linearity in a Graphene-Silicon Nitride (SiNx) hybrid MEMS-NEMS resonator

Rajan Singh[1], ArnabSarkar[1], ChitresGuria[1], RyanJ.T.Nicholl[2], SagarChakraborty[1], KirillBolotin[3], SaikatGhosh[1]

[1]Department of Physics,IndianInstituteofTechnology-Kanpur,UP-208016,India

[2]DepartmentofPhysics andAstronomy,VanderbiltUniversity,Nashville,Tennessee37235,USA

[3]DepartmentofPhysics,FreieUniversitätBerlin,Arnimallee14,Berlin14195,Germany

E-mail: chitres@iitk.ac.in

Studies on micro (MEMS) and nano (NEMS) scale mechanical resonators have garnered universal attention from various fields of interest because of several aspects such as experimental observation of quantum ground states with further promises quantum regimes at room temperature. In this experimental work we observe coherent phononic frequency combs and demonstrate tunable induced mechanical non-linearity in Graphene-Silicon Nitride (SiNx) hybrid MEMS-NEMS resonator system. SiNx resonators are known to have high quality factors (Q) in excess of 10^6 and relatively lower Young's modulus. This results in an intrinsic linear response of the normal vibrational modes against an external forcing. On the other hand, graphene resonators with high Young's modulus result in exceptional linear and non-linear elastic properties as well as desirable gate tunability of its normal vibrational (Brownian as well as driven) modes. Our hybrid system incorporates the desirable qualities of a high Q SiNx resonator, a dominant choice for quantum information processing at room temperature with the non-linearity of graphene which is necessary for efficient simulation and manipulation of such processes.In our system, the gate tunable modes of graphene are strongly coupled to SiNx substrate modes via Van-Der-Waals forces. When the modes of graphene resonator are tuned on resonance with a target SiNx mode, the motional back-action of a 20μm circular graphene drum induces non-linear response in a 320×320 μm^2 SiNx membrane against an external forcing. Furthermore, when the coupled hybrid mode is parametrically driven at twice its resonant frequency, spectacular coherent phononic frequency combs are generated, which shed light on the non-linear characteristics of our system. In this process, the system demonstrates parametric amplification and beyond a threshold point, the combs are generated which obey the four-wave mixing conditions. The features of the observation are well captured by our Arnold's tongue model and numerical simulations. We further observe that the target SiNx mode although linear when uncoupled with graphene, on coupling with the graphene it has a duffing like induced non-linearity in its response against equivalent external actuations in both cases. Our system shows a rich and intricate interplay of graphene non-linearity vis-à-vis duffing non-linearity and non-linear damping coupled to SiNx and its tunable characteristics induces non-linear response to SiNx on-demand. This work enables us to outline an efficient alternate platform to coherently control, manipulate and engineer resonant modes in the field of opto-electromechanics.

References

[1] Graphene induced mechanical non-linearity in SiNx resonator; Rajan Singh, Arnab Sarkar, ChitresGuria, Ryan J.T. Nicholl, Sagar Chakraborty, Kirill Bolotin, Saikat Ghosh. In preparation.

[2] Motion Transduction with Thermo-mechanically Squeezed Graphene Resonator Modes; Rajan Singh, Ryan J.T. Nicholl, Kirill I. Bolotin, and Saikat Ghosh; Nano Letters, 2018, 18 (11), pp 6719–6724 .

Vibrational Raman Excitations and Broadband Dielectric Spectroscopy of Mg doped NiO

S. Mohapatra[1], S. K. Jena[2], A. Keelu[2], S. Singh[2], P. Pramanik[2], D.C. Joshi[3] and S. Thota[1]*
[1]Department of Physics and Astronomy, National Institute of Technology Rourkela, 769008, Odisha (India),

[2]Department of Physics, Indian Institute of Technology Guwahati, Guwahati-781039, Assam (India)

[3]Ångstrom Laboratory, Department of Solid State Physics, Uppsala University, Lägerhyddsvägen 1, 75237, Uppsala (Sweden)

*Corresponding Author Email:subhasht@iitg.ac.in

Nickel Oxide (NiO) with a rock-salt type crystal structure is an archetypal wide bandgap p-type semiconductor that shows excellent stability in air with high crystallinity and transparency (transmission coefficient T = 98%). The multifunctional properties of NiO make it very useful for various applications including ultraviolet (UV) detectors, high durability hole-transport layers in organic solar cells, electrochromic devices, and UV light-emitting diodes. Such wide variety of applications of NiO makes it a promising material in applied physics. Here we present the synthesis procedure, Crystal structure, Raman spectroscopy and broadband dielectric spectroscopy results of various compositions ($0.3 \leq x \leq 0.9$) of Magnesium (Mg) doped NiO bulk polycrystalline samples ($Ni_{1-x}Mg_xO$). These compounds have been synthesized using standard solid-state reaction method by means of the precursors MgO and NiO. Crystal structure analysis carried out using the X-ray diffraction technique reveals f.c.c. type crystal structure with lattice parameters 'a_o' increases continuously from 4.1598 Å to 4.1815 Å as the Mg composition (x) increases from 0.3 to 0.9. The vibrational excitations and phonon dynamics of $Ni_{1-x}Mg_xO$ samples are investigated by means of Raman spectroscopy at Room temperature.The Transverse Optical (TO) phonon mode shifts significantly (by ~ 40cm^{-1}) towards the higher wavenumber side (k_{TO} ~ 435 cm^{-1} for x = 0.9) after the incorporation of 'Mg' inside the NiO matrix. On the other hand, Longitudinal Optical (LO) modes shifts exhibit towards the lower wavenumber side (k_{LO} ~ 536 cm^{-1} for x = 0.3) as compared to undoped stoichiometric NiO. The 'A_g' mode associated with the crystal symmetry of MgO is emerges out and dominates for heavily doped systems. Giant dielectric permittivity 'ε' (>10^4) and low-dielectric loss (Tan δ < 0.09) were observed at room temperature between the ac-frequencies 100 Hz and 20 MHz. The role of space-charge polarization and crystal defects on the global dielectric behaviour of $Ni_{1-x}Mg_xO$ will be discussed.

Monte Carlo Simulation

Upama Das

Department of Physics, Gauhati University, Assam, India

E-mail: upama.das96@gmail.com

The poster will highlight what a Simulation is and why do we need a Simulation. Any system of measurements which cannot be measured analytically uses simulation.Simulation is a process which is used to model a system
over time. Some real world problems cannot be solved by simple mathematical calculations uses Simulation.
There different ways of Simulation, some of them are: Monte Carlo Simulation, Timing Level Simulation, Discrete Event Simulation [1].

Out of these three types of Simulation the Monte Carlo simulation is discussed in details. Monte Carlo Simulation is a stochastic process which uses repeated random sampling to obtain numerical results. There are different types of Monte Carlo Method, some of The Monte Carlo methods are: Classical Monte Carlo, Quantum Monte Carlo ,Volumetric Monte Carlo,Kinetic Monte Carlo, Metropolis Monte Carlo [2].

For an example we can demonstrate the calculation of pi by using the Monte Carlo Method and we will also generate an algorithm for it.

To understand Monte Carlo method we should know about the probability distribution. It is a numerical description of the outcome of an experiment whose value depends on a chance. It is a mathematical function used to provide the probabilities of occurrence of different possible outcomes in an experiment. There are two types of Probability Distribution they are: Discrete and Continuous Probability distribution. In Monte Carlo Simulation the probability distribution is discrete [2, 3].

Monte Carlo Integration is a method that is used for computing the value of complex integrals using probabilistic techniques. While the other methods of integration usually evaluate an integrand at a regular step. Monte Carlo Method randomly chooses points at the integrand is evaluated. This method is preferred over other conventional methods, it is especially useful for higher dimensional integrals as it minimises error in larger dimensions. In other conventional methods such as trapezoidal rule, Simpsons rule etc. A deterministic approach is used to solve integration. For a input, these methods always produce the same output by passing the integrand through a number of steps. Thus, every time a function is integrated same result appears. Monte Carlo integration, on the other hand, employs a non-deterministic approach. The final outcome here is an approximation of the correct value with respective error bars. As Monte Carlo Integration uses random variables of different probability distribution hence the input value for a probability function is given in terms of random numbers. So we get different outputs for each Monte Carlo Simulation. The only difference between these two types of integration is the number of points taken, in the other methodical methods the number of points is separated uniformly where as in Monte Carlo method they are non-uniformly separated as they are selected at random [4].

To perform Simulation we must know what an importance sampling is, it is a general technique for estimating properties of a particular distribution, where the samples are generated from different distribution than the distribution of interest. It is a variance reduction technique used in Monte Carlo method [1].

The backbone of Monte Carlo method is Metropolis algorithm, which is a Markov's Chain Monte Carlo method for obtaining a random samples from probability distribution for which direct sampling is difficult. Markov's chain is a technique which depends on the transition probability. It states that the probability of occurrence of future states depends on the present states and not on the past states. A Markov chain is ergodic and irreducible Markov's Chain if it is possible to eventually get from every state to every other sate with positive probability [5,6].

Metropolis algorithm is a method for obtaining a sequence of random samples from a probability distribution for which direct sampling is difficult. It works by generating a sequence of sample values in such a way that more and more samples are produced, the distribution of values is used to approximate the probability distribution. These samples are produced iteratively, with the distribution of the next sample being dependent only on the current sample value using Markov Chain. There are two types of distribution; they are the Proposal and the Acceptance-rejection distribution [7]. For an example we can perform the Monte Carlo Simulation for a ferromagnetic material using 2D Ising Model, we have calculated the magnetisation as a function of temperature by using the Metropolis Algorithm.

REFERENCES

[1] University of Virginia, MSE 4270/6270: Introduction to Atomistic Simulation, Leonid Zhigilei

[2] Kalos and Whittlock Monte Carlo Method

[3] Dominic Marchand Department of Physics and Astronomy, University of British Columbia, Vancouver, BC,

V6T 1Z1 (Dated : November 30, 2005)

[4] Monte Carlo Integration (Wikipedia)

[5] Markov Chain (Wikipedia)

[6] Markov's Process (Wikipedia)
[7] Metropolis- Hasting Algorithm (Wikipedia)

Flexible supercapacitor using synthesized carbonaceous electrode materials from biomass for wearable energy storage

Ankit Singh1, Kaushik Ghosh2, Sushil Kumar2, Ashwini K. Agrawal3, Manjeet Jassal3, Pranab Goswami1, Harsh Chaturvedi1* 1

Centre for Energy, IIT Guwahati, North Guwahati, Assam, India 2INST Mohali, Mohali, Punjab, India 3SMITA Research Lab, IIT Delhi, New Delhi, India

(*e-mail: harshc@iitg.ac.in)

We have fabricated flexible supercapacitor having interdigitated, planar asymmetric and twisted fibre architecture incorporating carbonaceous electrode materials synthesized from widely available inexpensive biomass (banana peel) for energy storage which can be utilized for powering emerging wearable electronic devices and textiles. Activated carbon and few layer graphene were synthesized by carbonizing KOH impregnated and ethanol/acetone washed banana peels respectively at high temperature under inert atmosphere. The developed supercapacitor was fabricated using screen printing/dip coating conductive silver ink as current collector followed by sprinkling of active electrode materials. The fabricated flexible supercapacitor retains its energy storing capacity over several cycles of mechanical bending and repetitive electronic cycling tests. Locally available biomass based electrode material and low cost techniques can be used for large scale fabrication of supercapacitor. Therefore, it can be used for further developing integrated wearable and printed electronic devices.

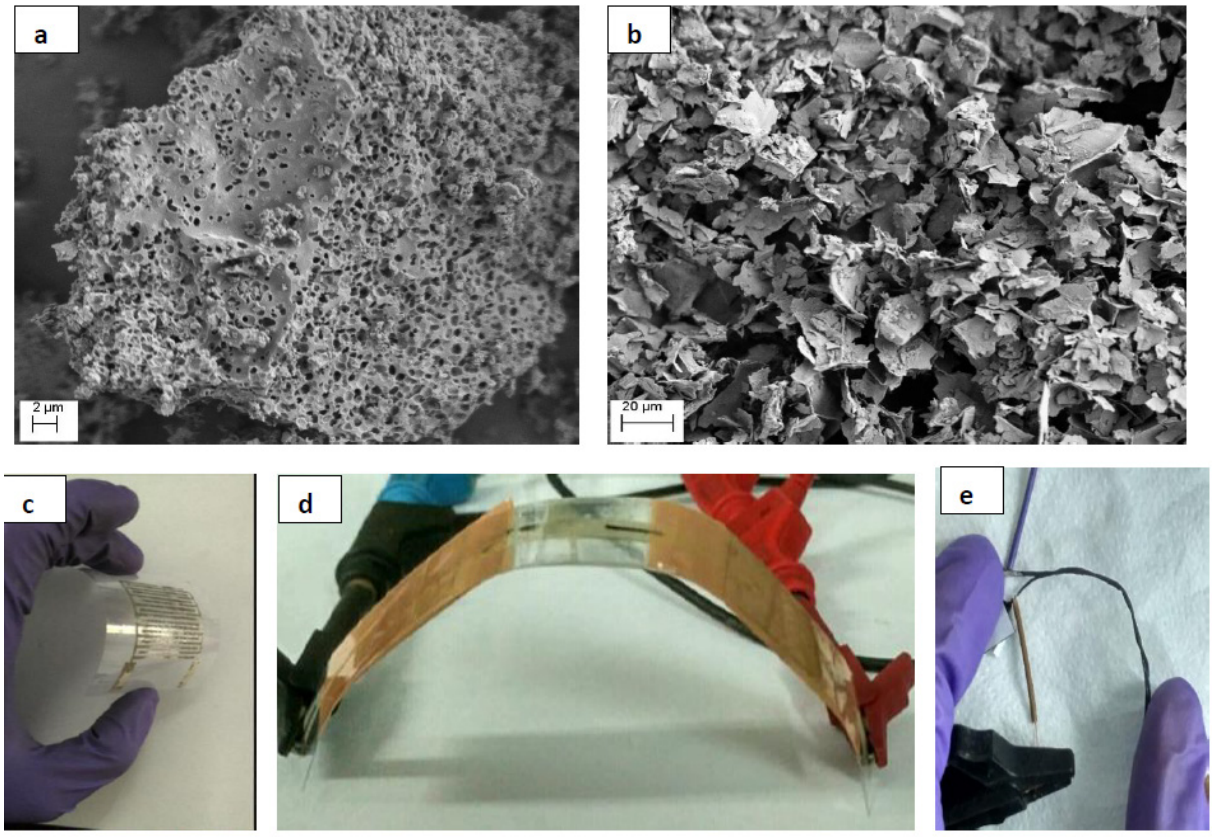


Figure 1: FESEM image of synthesized a) Activated carbon, b) Few layer Graphene, Fabricated flexible supercapacitor having c) interdigitated, d) planar asymmetric, e) twisted fibre architecture.

Kinetic study of Water Hyacinth Using Thermogravimetric Analysis

Debarshi Mallick1,2*, Rohit sarma2, Sabir Ahmed Barbhuiya2, Rajdeep Banik2, Jaanvi Garg2

1 Department of Mechanical Engineering, IIT Guwahati, India 2 Department of Mechanical Engineering, Girijananda Chowdhury Institute of Management and Technology Guwahati, India

E-mail: debarshi@iitg.ac.in

In today's era the energy security and climate degradation is a global concern and this has led to intense research in the field of alternate and renewable energy. The use of renewable energy with proper planning and strategy can serve as a potential reservoir to minimize the difference between demand and supply of energy [1]. In the aspect biomass has come out as a renowned source of energy owing to its availability worldwide in large amount. The biomass is an eco-friendly, renewable, contains low contamination and is carbon neutral [2]. Water hyacinth (Eichhornia crassipes), one such biomass is one of the important invasive aquatic species, is a free-floating perennial plant. Due to its tremendous growth and high reproducibility in both clear water and wastewater, it commonly covers the surface of rivers and lakes and causes a series of environmental problems [3]. The water hyacinth being a low cost biomass can be used for bio-energy production but its thermal conversion into exergy requires understanding its pyrolytic characteristics. An efficient transformation of the biomass to numerous products through pyrolysis reaction involves the dependence on process kinetic rates. To understand the pyrolytic conversion process, it is important to know the thermal behaviour of water hyacinth and its constituents. The contemporary study deals with pyrolysis kinetics of water hyacinth using thermogravimetric analysis (TGA). The temperature range for the TGA study was maintained at 30□C to 900□C with four different heating rates of 10□, 15□, 20□ and 30□C/min in nitrogen environment under atmospheric pressure. Nitrogen gas at the flow rate of 100 mL/min was used as the carrier gas to avoid oxygen contamination during thermal decomposition process. The study revealed that the pyrolysis of water hyacinth is characterized by three distinct stages as shown in Fig. 1 and most decomposition was observed in the second stage of pyrolysis. The kinetic parameters viz., activation energy was determined using Flynn–Wall–Ozawa (FWO) method and the frequency factor was calculated using Kissinger's equation. It was observed that the average value of activation energy of water hyacinth was obtained to be 238.75 kJ/mol at the conversion range of α = 0.1–0.8. The variation of activation energy with conversion is shown in Fig. 2. The maximum activation energy was observed at conversion 0.7. The sudden increase in activation energy is due to exothermic nature of reaction. The variation of activation energy with conversion is due to decomposition of different constituents of water hyacinth (cellulose, hemi-cellulose and lignin) with increasing temperature. With the increasing of heating rates, the frequency factor was found to decreased and maximum value was obtained at α = 0.6.

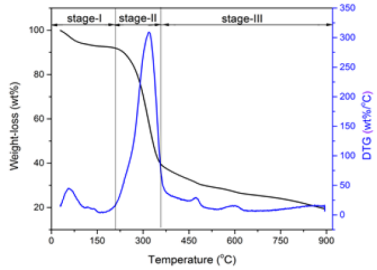
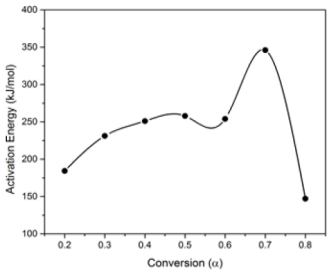


Fig.1: TGA curve of Water Hyacinth at heating rate 10°C/min



. Fig.2: Activation energy as a function of conversion for FWO method

References:

[1] .L. L. Ma, T. J. Wang, Q. Y. Liu, X. H. Zhang, W. C. Ma, Q. A. Zhang, Biotechnol. Adv. 30 (2012) 859.
[2] D. Mallick, M. K. Poddar, P. Mahanta, V.S. Moholkar, Bioresour. Technol. 261 (2018) 294.
[3] D. Mallick, P. Mahanta, V.S. Moholkar, Fuel 204 (2017)106.

A Density Functional Theory Study on Adsorption of Phenol and Guaiacol Over N-doped Graphene

K. Agrawal1 and N. Kishore2

1 Department of Chemical Engineering, IIT Guwahati, India

E-mail: a.kushagra@iitg.ac.in

With the increase in global energy demand, and polluting nature of conventional sources of energy, biomass energy has emerged as a promising alternative. However, the bio-oil obtained from biomass after thermochemical treatment is inherent with oxy-functional compounds which degrades its fuel quality. Thus, oxy-functionals need to be eliminated from the bio-oil before it can be used as a transport fuel. In this study, considering N doped graphene as a catalyst, the adsorption characteristics of bio-oil model compounds – phenol and guaiacol are studied by quantum simulations using density functional theory. Graphene sheets with single site quaternary and pyridinic doping of N atom are first optimized in a non-periodic system and the charge distribution and spin density distribution is calculated at M06-2x/6-31+g(d,p) level of theory in gas phase. Then, guaiacol and phenol are adsorbed over the high charge and high spin density region of the catalyst surface at the same level of theory. The adsorption energy is calculated after incorporating Grimme's dispersion corrections as well. The adsorption occurs via the oxy-groups and the aromatic ring of both model compounds.

Characterization of Subsonic Wind Tunnel

1Ojing Siram, 2Anand Verma

1Centre for Energy, IIT Guwahati , India 2Mechanical Engineering Department, IIT Guwahati, India

E-mail: osiram14@iitg.ernet.in

In wind tunnel research work it is always recommended to characterize flow through the wind tunnel test section. Calibration of wind tunnel includes the plotting of wind speed inside the test section with respect to tunnel RPM, turbulence intensity calculation of wind tunnel and any pressure drops. So, a systematic investigation was performed using single channel hot wire anemometer. Freestream velocity were recorded using single channel electronic manometer with sampling rate of 100 sample per sec and data were recorded for a time period of 10 sec for each flow condition. One of the most important characteristic of wind tunnel is the turbulent intensity which is expressed as the root mean square of fluctuating velocity divided by freestream velocity. And for fundamental study it is desirable to have turbulence intensity less than 0.5% and in present study various methods has been adopted other than the classical approach of finding the TI. Noise elimination in flow signal acquired through DAQ was performed and along with various filtering approach for low-pass filter and high-pass filter for finding the TI and among all the approach minimum TI of 0.2% was obtained for noise free fluctuating signal from Hot-wire anemometer All the investigation was performed on Subsonic wind tunnel facility available at Technology complex IITG, having a test section of 2000 mm X 600 mm X 600 mm with maximum velocity of 50 m/s. The basic layout of wind tunnel has been presented below fig.1.

Fig 1 Wind tunnel facility at IITG

For measurement of fluctuating velocity and changing frequency response from hot-wire anemometer a DAQ set along with dedicated user interactive LabView program was used. The probe is made of 10μm tungsten platinum coated wire and 3 mm length. The probe is mounted on a 3D traverse system using probe holder. The anemometer has been properly calibrated against known Pitot-static probe dynamic velocity for 2.5 m/s to 12 m/s at 26 ± 0.250C although our range of experimental observation is within 2.5 – 6 m/s, which give calculated correlation factor or coefficient from king's law curve give R2 of 0.9998. The hot-wire calibration and signal processing has been followed from Brown HH (1995). To reduce the error in hot-wire measurement proper calibration has been performed both before and after the calibration, calculated velocities data from hot-wire shows deviation within 1% error.

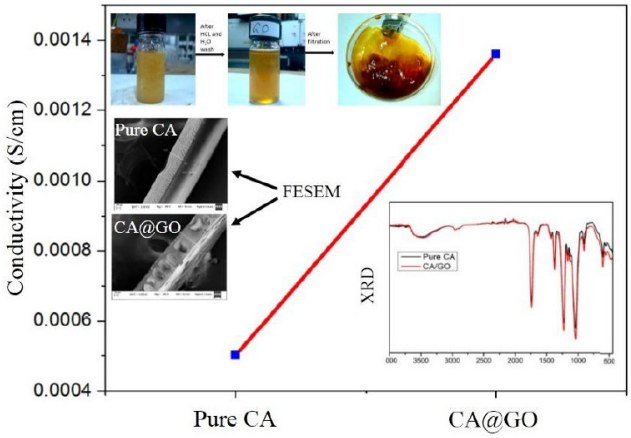
1. Brown HH. Hot- Wire Anemometry- Principle and signal analysis, New York: Oxford University press, 1995.

Graphene Oxide Modified Cellulose Acetate Membrane for Direct Methanol Fuel Cell

Pradip Das, Sasidhar Gumma and Bishnupada Mandal*

Indian Institute of Technology, Guwahati, postal code: 781039, Assam, India.

Direct Methanol Fuel Cells (DMFCs) have gained much interests in the recent past owing to their simple working principle, convenient fuel storage, low working temperature and portable in nature. DMFC typically consists of a cathode and anode with a proton exchange membrane (PEM) sandwiched in between, which allows the conduction of ionic species i.e. protons (H+), hydroxides (OH□), carbonates (CO32-) or oxides (O2-). The selectivity of a PEM depends upon the ratio of proton conductivity (σ) and methanol permeability (P). The expensive nature of PEM are the major limitation for the commercialization. In this work, a Cellulose Acetate/Graphene Oxide (CA/GO) membrane was prepared using phase inversion method. The fabricated membranes are furthur characterized by X-ray diffraction (XRD), thermo gravimetric analysis (TGA) and the high-magnification electron microscopes. The resistance offered by the membrane against methanol crossover was tested. The proton conductivity of the membrane was found to increase with an increase in the Graphene Oxide content. The pure Cellulose Acetate membrane showed a proton conductivity of 0.0005 S/cm. On incorporating Graphene oxide, the proton conductivity was seen to increase significantly. The permeability was however lowered by addition of Graphene Oxide. But the selectivity of the CA/GO membrane was seen to be higher than the pristine CA membrane. This indicated the potential of the CA/GO membranes to be used for Direct Methanol Fuel Cell applications.



Keywords: Proton exchange membrane (PEM); Graphene Oxide (GO); Cellulose Acetate (CA)

Effect of dielectric properties of carbon nanotubes on photocatalysis

Debika Devi Thongam1, Chandrama Kalita2, Harsh Chaturvedi1

1Centre for Energy, Indian Institute of Technology Guwahati, Guwahati, Assam, India
2Department of Instrumentation & USIC, Gauhati University, Assam, India

An extensive study towards photocatalyst which are used in different areas like generation of electricity, fuels, wastewater treatments, has been playing a major role in today's millenium because of the increasing concern of environment health degradation and exhausting fossil fuels. Due to the limited research on the relation between dielectricity and photocatalytic activity, different carbon nanotubes namely, pristine-CNTs, semiconducting-CNTs, metallic-CNTs; which have different dielectric properties are employed as a photocatalyst in this work. The morphological, physical, optical and chemical properties of these CNTs are characterised and analysed thoroughly by employing XRD, SEM, UV-Vis and Raman spectroscopy. As the dielectric properties and their charge generation can be affected by light, it is worth to give a profound research. The dependence of dielectric property towards charge generation, separation and electron-hole pair recombination is being studied broadly here by the means of photocatalytic degradation of methyl orange with UV light irradiation. The obtained results are compared and explored accordingly.

CLIMATE VULNERABILITY ASSESSMENT FOR THE STATE OF MANIPUR: A DISTRICT LEVEL ANALYSIS

For individuals and communities living in mountainous regions and living in above mentioned multidimensional poverty, the uncertain ecological resilience and their low social resilience render them as highly vulnerable to different hazards including environmental changes. Manipur, situated in the Eastern Himalayan region, with a hill cover of ninety per cent, large population dependency on agriculture, forests and allied activities and individuals living in dynamic nature of poverty, makes the state vulnerable to climate related hazards. As long term mitigation efforts are required to improve the ecological resilience, this study focuses on identifying the socio-economic factors which makes communities vulnerable to unforeseen risks including climate risks and what sort of adaptation planning is required for increasing their social resilience.

Wind Energy as An Alternative Resource: GIS Assessment andAnalysis

Pradhyun Kashyap*, Saikumar Rondla**, Manojkumar Gaddam***, Gajanan Ramteke****

*, ** & ***Department of Soil and Water Conservation Engineering, College of Agricultural Engineering, Kandi, Sangareddy, Telangana, India.
****Telangana State Remote Sensing Application Centre.

Being cleaner and climate friendly, wind energy has been increasingly utilized to meet the ever-growing global energy demands. In the region of Nalgonda, Telangana, India a wide gap exists between wind resource and actual energy production, and it is imperative to expand the wind energy development. Because of the formidable costs associated with wind energy development, the locations for new wind turbines need to be carefully selected to provide the greatest benefit for a given investment. Geographic Information Systems, have been widely used to identify the suitable wind farm locations. In this study, a GIS-based multi-criteria approach was developed to identify the areas that are best suited to wind energy development in Nalgonda Region. Several criteria were adopted in this method, including distance wind potential, land use, distance to cities, slope and exclusionary areas. The suitability of wind farm development was modeled by a weighted overlay of geospatial layers corresponding to these criteria. The results indicate that the model is capable of identifying locations moderately suited for wind farm development. The approach could help identify suitable wind farm locations in other areas with a similar geographicbackground.
Keywords: wind energy; GIS; multi-criteria; wind farm; Nalgonda.

Generation of Electricity From fans

A.Birendra Kumar B. Ujala Kumari

A. Department of Computer Science a & Engineering B.Department of Electronics & Electrical Engineering ,Nalanda College of Engineering, Chandi(Nalanda),India

E-mail: kbirendra848@gmail.com

Fans are used widely all over India, it can be found almost in every house, despite the widespread availability of Cooler's and air conditioners, when it comes to generate power for a domestic use and energy conservation, energy generating is a major issue for mankind.
We can renew and reuse the energy, it cannot be created or destroyed but can be transformed from one form to another form, taking fan as example, fan uses electrical energy to rotate and blow the surrounding air. What if we can use the rotational motion (mechanical energy) of fan to convert it into some electricity? We have made a working model/prototype which uses the concept of Electromagnetic induction i.e it generates alternating voltage by a rotating (changing) magnetic field within a stationary coil with the help of running fan. The generated power can be either used instantly or can be stored in a battery for powering some other devices.

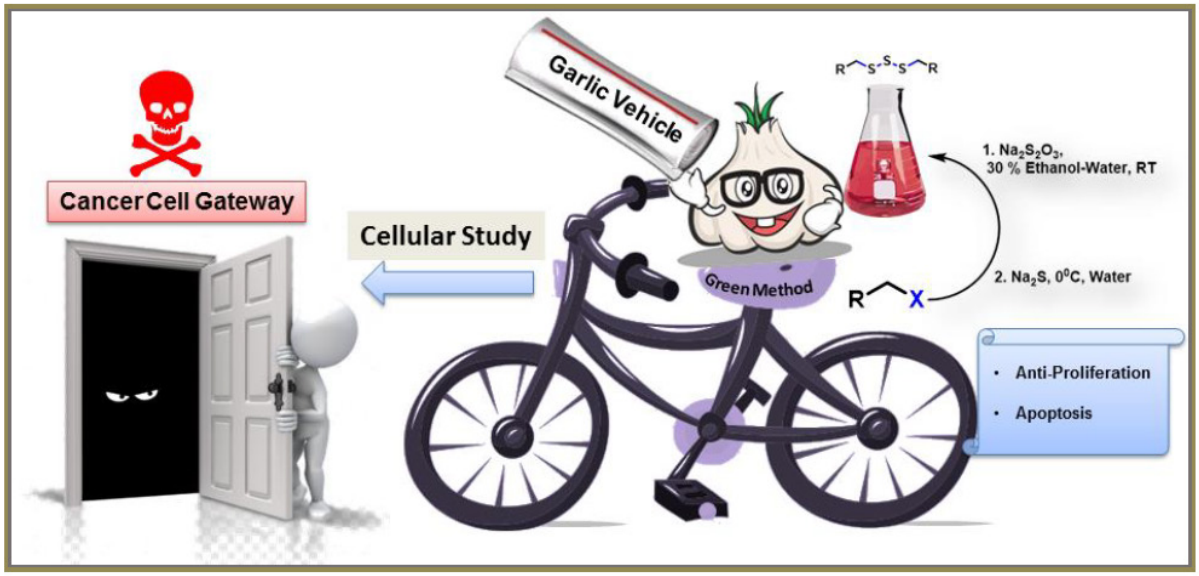
Garlic-derived Organosulfur Compounds and Analogues: An Efficient Synthetic Methodology and Anti-proliferative Activities

Debojit Bhattacherjee and Krishna P. Bhabak*

Centre for Environment, Indian Institute of Technology Guwahati, Guwahati, Assam – 781039, India

(Email: debojitb@iitg.ac.in and kbhabak@iitg.ac.in)

The organosulfur compounds, present in Garlic (Allium sativum L.) possess several important therapeutic properties, which led to their identification as traditional medicinal drugs. Garlic contains several volatile allyl sulfides such as diallyl sulfide, diallyl disulfide, diallyl trisulfide and other aliphatic symmetrical and unsymmetrical polysulfides. These species have been shown to have promising anti-cancer activities (Figure 1).[1,2,3] However, there is no effective synthetic method, reported till date, to selectively prepare them with a significantly good yield. Therefore, we have taken the initiative to synthesize a wide range of substituted alkyl, alkenyl and benzylic organosulfides using the corresponding halides as precursors and inorganic sulfur compounds such as sodium thiosulfate (Na2S2O3) and sodium sulfide (Na2S) as sulfur transfer agents under greener and catalyst-free conditions.



The new method was optimized and utilized for a wide range of substrates for the preparation of symmetrical monosulfides, disulfides and trisulfides completely in a selective manner using a single sulfur transfer agent (Na2S) with a slight variation of reaction conditions. The mechanistic insights for the selectivity has been studied and established and was further validated by computational studies. Upon the synthesis, purification and characterization of final organosulfides, they were screened for their anti-proliferative activities towards various organ-specific cancer cell lines.

References

[1] S. V. Singh, A. A. Powolny, S. D. Stan, D. Xiao, J. A. Arlotti, R. Warin, E. R. Hahm, S. W. Marynowski, A. Bommareddy, D. M. Potter, R. Dhir, Cancer Res. **2008,** 68, 9503-9511.

[2] T. Hosono, T. Fukao, J. Ogihara, Y. Ito, H. Shiba, T. Seki, T. Ariga, J. Biol. Chem. **2005,** 280, 41487-41493.

[3] S. G. Santhosha, P. Jamuna, S. N. Prabhavathi, Food Biosci. **2013,** 3, 59-74.

Dissolved methane recovery from anaerobic effluents using packed bed column

Jyoti Kaintholaa, Ajay S. Kalamdhada, b, Vaibhav V. Gouda, c, Ramesh Goeld,*

aCentre for the Environment, Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India,
bDepartment of Civil Engineering, Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India
cDepartment of Chemical Engineering, Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India
d Civil & Environmental Engineering, University of Utah, Salt Lake City, UT 84112, United States

Anaerobic digesters in municipal wastewater treatment plants discharge dissolved methane, which is usually stripped off to the environment. To prevent the emission of methane gas, we utilized a packed bed column as a post-treatment biological process. The packing in the column is enriched with methane-oxidizing bacteria which oxidizes methane in aerobic conditions to CO2. At 37˚C, the average methane oxidation rate was 0.38 Kg COD/m3/d at a residence time of 24 h. Further, on gradually decreasing the residence time to 0.5 h the average methane oxidation rate was 1.28 Kg COD/m3/d. Two methods were employed to measure dissolved methane in the samples, and they were very well correlated with an R value of 0.94. PCR results indicate that pmoA gene responsible for methane oxidation is present in the enriched bacteria.

Disinfection of Multidrug Resistant Escherichia coli by Solar-Photocatalysis using Fe-doped ZnO Nanoparticles

Sayantan Sinha1, Sourav Das2, Suraj K Tripathy2,3

1 Centre for the Environment, IIT Guwahati, India
2 School of Biotechnology, KIIT, India
3 School of Chemical Technology, KIIT, India

Email: tripathy.suraj@gmail.com; sayantan.sinha@iitg.ac.in

Spread of antibiotic resistant bacteria through water, is a threat to global public health. Here, we report Fe-doped ZnO nanoparticles (Fe/ZnO NPs) based solar-photocatalytic disinfection (PCD) of multidrug resistant Escherichia coli (MDR E. coli). Fe/ZnO NPs were synthesized by chemical precipitation technique, and when used as photocatalyst for disinfection, proved to be more effective (time for complete disinfection = 90 min) than ZnO (150 min) and TiO2 (180 min). Lipid peroxidation and potassium (K+) ion leakage studies indicated compromisation of bacterial cell membrane and electron microscopy and live-dead staining confirmed the detrimental effects on membrane integrity. Investigations indicated that H2O2 was the key species involved in solar-PCD of MDR E. coli by Fe/ZnO NPs. X-ray diffraction and atomic absorption spectroscopy studies showed that the Fe/ZnO NPs system remained stable during the photocatalytic process. The Fe/ZnO NPs based solar-PCD process proved successful in the disinfection of MDR E. coli in real water samples collected from river, pond and municipal tap. The Fe/ZnO NPs catalyst made from low cost materials and with high efficacy under solar light may have potential for real world applications, to help reduce the spread of resistant bacteria.

Role of Cover crops on physio-chemical properties of soil

Brishmrita Mahanta Das, Shivani Barman and Arpan Buragohain

Department of Soil Science, Assam Agricultural University, Jorhat-785013, Assam, India.

Email: brishmrita.m.das108@gmail.com

Sustainability in agriculture is one of the major concerns of humanity as of today. The current global scenario firmly emphasizes the need to adopt eco-friendly agricultural practices for sustainable food production. A cover crop is a crop of a specific plant that is grown primarily for the benefit of the soil rather than the crop yield (Fageria et.al 2013). They also offer a natural way to reduce soil compaction, manage soil moisture, reduce overall energy use, and provide additional forage for livestock. Cover crops are commonly used to suppress weeds, manage soil erosion, help build and improve soil fertility and quality. Besides having all these multiple benefits in the economic lives of the farming communities, the use of cover crops in actual field throughout the country is very less. Cover crops has the capability to reduce the bulk density of the soil by increasing the Carbon content of the soil as well as increasing the water holding capacity and porosity of the soil (Wayne et.al 2007). Additionally, it also helps in soil aggregation and infiltration thus reducing the runoff loss of water and nutrients (John et.al 2013). Cover crops are also efficient in making the nutrients available to the plants which are not readily available say, phosphorous (Marcelo et.al 2007). Thus, growing cover crop forms an important component for sustainability of agro-ecosystem and maintaining soil health and quality.

References:

Fageria, N. K., V. C. Baligar, and B. A. Bailey. 2013. Role of cover crops in improving soil and row crop productivity. Communications in Soil Science and Plant Analysis 36:2733–2757.

John, D. Holman, Humberto, Blanco-Canqu, Schlegel Alan J, Tatarko John, Shaver Tim,.M.2013. Replacing Fallow with Cover Crops in a Semiarid Soil: Effects on Soil Properties. Soil Sci. Soc. Am. J. 77:1026–1034 .

Marcelo, Adolfo V., José Eduardo Corá., Fernandes Carolina., Márcio dos Reis Martins., Ricardo Falqueto Jorge.2007. Crop sequences in no-tillage system: effect on soil fertility and soybean, maize and rice yield: R. Bras. Ci. Solo, 33:417-428

Wayne, F. Whitehead, Sainju U M., Schomberg H.H., Singh B. P. Singh,. Glynn Tillman G., Lachnicht-Weyers Sharon L. 2007. Cover crop effect on soil carbon fractions under conservation tillage cotton: Soil & Tillage Research 96: 205–218

Evaluation of Lime Requirement Determination Methods for the Acid Soils of Jorhat district, Assam

Lekhika Borgohain1*, Danish Tamuly2, Niloy Borah3, R. K. Thakuria4, Umesh Panging5, Hemi Borgohain6

1*Ph.D scholar, Department of Soil Science, Assam Agricultural University, Jorhat-13, Assam
2Assistant professor, Department of Soil Science, Assam Agricultural University, Jorhat-13, Assam
3Professor, Department of Soil Science, Assam Agricultural University, Jorhat-13, Assam
4Chief Scientist, AICRP on Irrigation Water Management, Assam Agricultural University, Jorhat-13, Assam
5AFO, Union Bank of India, Mathura, UP; 6Ph.D scholar, Tezpur University, Assam

*Email Id: lekhikaborgohain123@gmail.com
Contact Number- 7002837955

Liming is one of the most important and feasible management practices used to ameliorate soil acidity. Maintaining the pH of the soil is important because it ensures conditions conductive to plant growth. The amount of lime required to neutralize the soil acidity is called lime requirement (Goulding, 2016). Generally lime requirement (LR) for acidic soils are determined by buffer pH method because of their ease of implementation, simplicity and rapidity (Sims, 1996; Wolf el al., 2008).The SMP buffer test is used to determine lime requirement for Assam soils. Though this method is proven to work for Assam soils, it uses p-nitrophenol, which is very hazardous substance. Now-a-days soil-testing laboratories are under increasing pressure to reduce hazardous waste. So goal of this study was to evaluate a buffer as alternatives to the SMP buffer in determining the LR for Jorhat soils. In this study four composite soil samples from different soil series of Jorhat district having pH range 4.4 to 5.2 were collected and incubated with different doses of CaCO3 for a period of thirty days to determine lime required (LR) to attain different target pHs (6.0, 6.4 and 6.8). These LR were then regressed with the different buffer pH (BpH) of four buffer solutions [(1) Shoemaker, McLean, and Pratt buffer (SMP), (2) Sikora-II buffer, (3) Mehlich buffer, and (4) Modified Mehlich buffer] to obtain calibration equations. The LR value evaluated from Soil CaCO3 moist incubation (SCMI) method ranged from 1.69 - 5.55 tonnes CaCO3 ha-1 for four soils. The vegetable growing soil of Jorhat series (Jser1) and Mariani series (Mser) exhibited highest and lowest LR values respectively. The change of BpH was highest in Mariani series (Mser) and lowest in Jorhat series(Jser1) for all five buffers. The highest percent variation between soil BpH and original BpH was observed for SMP buffer (25.10%) followed by Sikora-II (19.90%), Mehlich buffer (9.50%) and Modified Mehlich buffer (8.40%). Among the different buffer lime requirement methods tested, all the buffer methods of LR has shown higher buffer pH variability. But, almost similar lime rate values with that of SCMI was found in four buffer methods except SMP buffer. Further, Sikora-II based on the stated parameters may be considered as an alternative to present SMP buffer lime requirement method. These findings may overcome the use of hazardous chemicals used for recommending lime rate during Soil Health Card (SHC) preparation as mandated by Govt. of India.

Keywords: Buffer pH, lime, SCMI, percent variation, LR

References:

Goulding, K.W.T. (2016). Effects of lime on effective cation exchange capacity and exchangeable cations on a range of New Zealand soils. Soil Use Manag. **32**(3): 390-399.

Sims, J.T. (1996). Lime requirement. In Methods of Soil Analysis, part 3. Soil Sci. Soc.of America Book Series No. 5, Sparks, D. L. (ed.) pp. 491–515.

Wolf, A.M.; Beegle, D.B. and Hoskins, B. (2008). Comparison of SMP and modified Mehlich buffer tests for lime requirement on Pennsylvania soils. Soil Science Society of America Abstracts, ASA-CSSA-SSSA. International Meetings, November, Salt Lake City, Utah. Pp. 6-10

Hydrothermal Pretreatment of Tender Coconut Coir and Optimization of Process Parameters Using Response Surface Methodology

Marttin Paulraj G.1, Parth S2., and Debraj B3.

1Research Scholar, Department of Civil Engineering, IIT Hyderabad, Kandi, India – 502285,
2Undergraduate student, Department of Civil Engineering, IIT Banaras Hindu University, Varanasi, India – 221005
3Assistant Professor, Department of Civil Engineering, IIT Hyderabad, Kandi, India – 502285

The world reserves of crude oil, the primary source of transportation fuel, are fast reducing due to increase in demand of fuel and energy. Development of renewable fuels has become crucial to solve the environmental disputes related to carbon emissions from fossil fuels. Focus is shifting towards second generation biofuel generated from lignocellulosic biomass, municipal solid waste and other organic waste. Lignocellulosic biomass are the next abundant source for polysaccharides namely hemicellulose and cellulose required in production of biofuel. Pretreatment is an essential step towards the development and industrialization of second generation biofuel production. During pretreatment, the lignin bonds are cleaved and the hemicellulose and cellulose are hydrolyzed to monomer units of pentose and hexose sugars. Coconut coir is a lignocellulosic biomass, with high cellulose and lignin content. India is the leading country in the production of coir contributing about 60 % of the world's production. Our study focusses on recovery of reducing sugars from tender coir using hot water pretreatment method. The tender coconut coir was pretreated under different conditions for obtaining maximum yield of reducing sugar. Reducing sugars are the monomers of hemicellulose and cellulose, a source for biofuel generation. For pretreatment, three independent factors - biomass (X1, mg/ml), time (X2, min) and temperature, (X3,°C) and one dependent factor - reducing sugar (Yrs, %), were considered. These conditions were optimized by multiple regression analysis of second order model using response surface methodology. Response Surface Methodology is a statistical tool for optimizing and screening design parameters. Central composite design was employed for determining experiments to be run and optimization of design parameters. ANOVA and optimization were done using Statistica, a statistical software. The second order model obtained after multiple regression analysis was found to be significant since the model p – value was less than 0.05. The coefficient of determination (R2) was 0.97 and adjusted R2 was 0.95. It was predicted that 34% reducing sugar per gram of coir could be recovered when 32.8 mg/ml biomass was pretreated for 58 minutes at 173°C. The prediction was also experimentally verified.

KEYWORDS: Biofuel, lignocellulosic biomass, hydrothermal pretreatment, response surface methodology, central composite design, ANOVA

REFERENCES: Amarasekara, A. S. (2013). Handbook of cellulosic ethanol. John Wiley & Sons.
Arnold, S. F. (2006). Design of Experiments with MINITAB. The American Statistician.
H.Myers, R., C.Montgomery, D., and Anderson-Cook, M, C. (2016). Response Surface Methodology: Process and Product Optimization Using Designed Experiments. Wiley Series in Probability and Statistics
Harmsen, P., Huijgen, W., López, L., and Bakker, R. (2010). "Literature Review of Physical and Chemical Pretreatment Processes for Lignocellulosic Biomass." Food and Biobased Research, (September), 1–49.

Hydrolysis of Kitchen Waste Using a Continuous Leach Bed Reactor to Maximize Volatile Fatty Acids Yield

Rishi Gurjar1 and Manaswini Behera1,*

1School of Infrastructure, Indian Institute of Technology Bhubaneswar, Argul, Bhubaneswar 752050, Odisha, India

Every day thousands of tons of municipal solid waste (MSW) is generated in India that largely comprise biodegradable waste i.e. kitchen waste. This waste can be utilized to obtain hydrogen, electricity and recover nutrients after bifurcating the anaerobic digestion process in a two stage system. The study demonstrate performance of a continuous leach bed reactor (LBR, 1 L) under no and intermittent stirring conditions. The LBR was operated at an organic loading rate of 50 gVS/L.day for each conditions. The performance of the LBR was evaluated on the basis of parameters such as total chemical oxygen demand (TCOD), soluble chemical oxygen demand (SCOD), total volatile fatty acids (TVFA), ammonium (NH4+) and total phosphate (TP). The LBR under stirring was operated for a duration of 26 days and the highest TCOD and TVFA of 86287.80 mg/L (26th day) and 46808.51 mg/L (11th and 13th days) were obtained, respectively. The average ammonium concentration was 242.19 ± 89.21 NH4+mg/L accompanied with high fluctuation due to presence of readily degradable and complex nitrogen compounds in waste. The total phosphate (TP) concentration increased with time, and reached a maximum of 5713.81 mg/L. On the other hand, LBR under no stirring conditions stopped generating leachate after 13 days of operation with the highest TCOD and TVFA of 81622.51 mg/L (13th day) and 38297.90 mg/L (9th day) respectively were obtained. The study shows that the leachate thus obtained from anaerobic digestion of the kitchen waste have very high organic, nutrient as well as high VFAs concentration. This will further pave way to obtain other valuable products.

"ONE PART" ALKALI ACTIVATED SLAG CEMENT – SYNTHESIS AND CHARACTERIZATION

Satyajit Chaudhuri*1, S.K. Nath2, Prasanta Kumar Rout1

1 Department of Material Science and Engineering, Tripura University (A Central University), Tripura.

2 CSIR - National Metallurgical Laboratory, Jamshedpur.
*E-mail: satyajitchaudhuri0@gmail.com

With the increase in modern infrastructural needs there is a huge increase in need of constructional material. As cement is a major constructional material so to meet the growing need there is a major rise in cement industries parallely leading to huge emission of pollutants. Therefore there is urgent need an alternative of cement. Alone with this millions of tones slag is being generated by the iron and steel plants across the country which poses environmental hazards. Alkali activated slag cement can act as alternative. It is normally manufactured by using solid precursor and an alkaline activator solution. However, the liquid alkali activator solutions are not convenient for storage or transport as these solutions are corrosive and often viscous. The present investigation focuses on manufacturing of dry alkali activated slag cement similar to that of Ordinary Portland cement. The granulated blastfurnace slag (GBFS), an industrial-by-product from iron manufacturing unit, as a precursor and Calcium hydroxide, Calcium Hydroxide and a combination of these activator, as a solid alkali-activator. The solid activator powders are blended with GBFS precursor with variable proportions to prepare three separate types of dry geopolymeric cement. The specimen's cubes are prepared by adding water with the blended powders. The compressive strength of the specimens is tested after 3 days, 7 days, 14 days and 28 days of ambient curing. The highest compressive

strength is shows that the sample made by using the blended powder of the combination of calcium carbonate and sodium hydroxide dry activator. To co-relate the strength data of the specimens are characterised by X-ray Diffraction (XRD) and Scanning Electron Microscope (SEM) techniques.
Keywords: One part Alkali activated slag, Dry alkali activator, Compressive strength, Micro-Structure.

Physics of Pull-in Instability in MEMS actuator/sensor and its Relevance in Device Engineering

Siddhanta Roy[a], Prof. Roy P. Paily[b]

[a] Centre for Nanotechnology, IIT-G, India

[b] Dept. of Electrical and Electronics Engineering, IIT-G, India
&Center for Nanotechnology, IIT-G, India

In this paper, we study the physics of instability and how does that lead to stable and unstable regimes, using MEMS capacitive actuators as an example case. For MEMS capacitive actuators we use a simple spring-mass system to understand its operation and instability. We establish the connection between the so called two well "Landau" energy landscape and the energy landscape of MEMS capacitive actuators. We explain both the static and dynamic characteristics as well as provide the techniques to control the device operation. We examine the consequences of this instability on the static and dynamic response. On static response, we specifically focus on **Spring-softening effect, Negative-capacitance, Abrupt transition and Hysteresis**. On dynamic response, we mainly examine the **Dynamic Pull-in, Noise initiated Pull-in and Uninhibited acceleration during Pull-in.** All these ramifications of instability affect the actuator/sensor performance significantly. As we point out the various instability features and their relevance in device engineering we'll see some of them, if tuned properly can have positive significance on device operation as well.

ELECTRIC FIELD MEDIATED EFFICIENT MICROREACTOR FOR ACHIEVING HIGH YIELD AND CONVERSION FOR A HETEROGENEOUS TWO PHASE REACTION

SurjenduMaity[a*], ShirsenduMitra[b], and DipankarBandyopadhyay[a,b]

[a]Centre for Nanotechnology, Indian Institute of Technology Guwahati, India
[b]Department of Chemical Engineering, Indian Institute of Technology Guwahati, India

E-mail addresses: surjendu.iitg@gmail.com, shirsenduofficial@gmail.com, dipban@iitg.ac.in

In recent years, the microfluidic reactors have become a vital part of every other cutting-edge applications which include MEMS, sensors, lab-on-a-chip, organ-on-a-chip and plant-on-a-chip devices, among others. The usage of microfluidics gives us essential access on high surface to volume ratio, high throughput, fast reaction time, fast and efficient transport which lead to high conversion, yield, among many other. Of late, coupling of microfluidic reactor with external field has been one of the exciting domains of research which includes exciting features associated with the flow patterns, mixing, transport, crystallization, synthesis, delivery, and sensing mechanisms. In view of this context, herein, we have developed a computational fluid dynamic (CFD) framework which includes the descriptions of the two-phase flow, multicomponent transport and reaction, and the Maxwell's stresses generated at oil-water interface owing to the presence of the externally applied AC electric field. The CFD model shows the pathway to improve the yield and conversion of a chemical reaction inside the microfluidic reactor. The study uncovers that the variations of frequency and intensity of the AC field generate the vortices inside or outside these flow patterns. The convective recirculation in and around these miniaturized flow morphologies increase the rate of mass transfer, mixing of reactant and products, conversion of reactant, and yield of products. The results reported can be of significance in the design and development of future advanced-flow rector technologies.

Formic Acid-Powered Micromotors for Fuel-Cell Technology

Amit Kumar Singh,[1]* S. Rarotra,[2] V. Pasumarthi,[2] Tapas K. Mandal,[1, 2] and Dipankar Bandyopadhyay[1,2]

[1]Centre for Nanotechnology,IIT Guwahati,India [2]Department of Chemical Engineering, IIT Guwahati, India

*E-mail: amit.ks@iitg.ac.in

Hydrogen fuel cells work by instigating stored hydrogen to react with oxygen in the air, producing electricity and water. However, generation of pure hydrogen fuel can be a challenging problem. The large-scale production of the hydrogen gas is mostly achieved by steam-methane reforming. The major drawback of the steam reforming is that – (i) it takes place at high temperature and thus requires external heat energy to maintain the elevated temperature and (ii) the process results in emission of greenhouse gases as by-product of the reaction. Furthermore, the hydrogen storage and transportation is expensive and requires exclusive tanks to store the gas at enormously high pressure. In order to address this issue, we report chemically powered micromotors composed of a collection of iron nanoparticles (FeNPs), for rapid on-site generation of pure hydrogen gas using formic acid as fuel. Instead of storing hydrogen gas in bulky pressurized tanks, the motile micromotors could be easily deployed in to aqueous formic acid solutions for on-demand release of the pure hydrogen gas, devoid any of greenhouse gases, at room temperature. To demonstrate the proof-of-concept, the reactive micromotors were employed to power a portable toy fan equipped with PEM fuel cell. The pure hydrogen gas required for the PEM fuel cell was generated through the reaction of the formic acid solution with self-propelling micromotors, whereas, the oxygen gas was produced by catalytic decomposition of peroxide fuel using the same micromotors. The as-generated hydrogen and oxygen gases were directly feed from the reaction chambers to the fuel cell electrodes to generate electricity and thus power the electronic toy fan. The advantage of this type of micromotor-mediated system is that liquid fuels are used for on-site hydrogen release, and thus gas storage will not be prerequisite in near future.

Reference:

1. A. K. Singh, S. Rarotra, V. Pasumarthi, T. K. Mandal and D. Bandyopadhyay, J. Mater. Chem. A, 6(19), 9209–9219, 2018.

Synthesizing Boolean Logic Gates based on Chemotaxis-guided micromotor

TamannaBhuyan[a], Amit Kumar Singh[a],MitradipBhattacharjee[a],Siddhartha Shankar Ghosh [a,b],DipankarBandyopadhyay[a, c]*

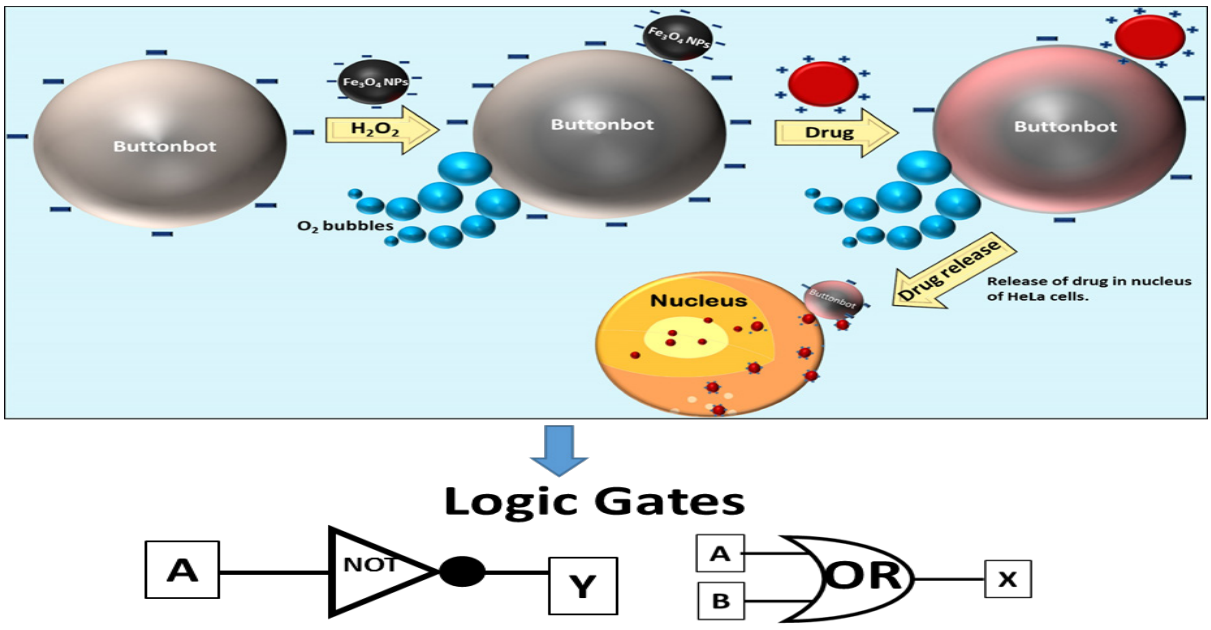
[a]Centre for Nanotechnology, Indian Institute of Technology Guwahati, Assam - 781039, India.
[b]Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Assam-781039, India.
[c]Department of Chemical Engineering, Indian Institute of Technology Guwahati, Assam - 781039, India.

*Corresponding Author E-mail: dipban@iitg.ernet.in

Here, we report the development of Boolean logic operations using a biocompatible micromotor-namely 'buttonbot' fabricated using catalytic tissues from edible button mushroom. Intriguingly, the motor emulates the tactical response of microorganisms that can be manipulated in presence of twin alkali and acid inputs. The micromotors showed directed acid taxis (alkali taxis) from the region of higher (lower) to lower (higher) pH in response to the external acid-enzyme (alkali) triggers due to asymmetric catalytic decomposition of peroxide across motor surface. The Buttonbots could be loaded with anticancer drug with high percentage of drug binding and magnetically driven towards the target site and exploited for killing the cancer cells showing controlled drug release. More interestingly, the versatile buttonbot can be utilized as various Boolean logic gates and circuits - AND, NAND, NOT, OR, NOR, and NIMPLY under the coupled influence of the acid-alkali pH gradient to be considered as input and monitoring the motion as output. This impulsive response of buttonbot towards dual stimuli laid particular emphasis on development of optimised logic gate circuitry and revealed potential applications on pH-responsive drug delivery devices.

Keywords

Buttonbot; chemotaxis; logic gates; drug delivery; input



Aerobic In-vessel Composting of an Invasive Weed, Mikaniamicranthakunth

A.HeenaKauser[1],B.Subhradip Pal[2], C. MeenaKhwairakpam[1] and D. Ajay Kalamdhad[2]

[1]Centre for Rural Technology,IIT Guwahati,India
[2]Department of Civil Engineering, IIT Guwahati, India

E-mail: heena176154002@iitg.ac.in

Species invasion pose a serious worldwide issue. Introduction of invasive species is attributed to transportation and trade amongst various countries which become prominent in the invaded area owing to favourable climatic condition. In many cases, ecology affected by such alien species might not have the competitors for which it becomes dominating upon the native species. At a glance, it can be said such alien species are more competitive and dominating and are responsible for its successful invasion, thus hampering agricultural sector alot. For instance, Mikaniamicranthakunth is one of the 100 most dangerous weed in the whole world which has detrimental effect on both environment and agriculture sectors. Researchers have used chemical, biological and mechanical methods to control this notorious weed but results were not effective to fully eradicate the plant. Composting or vermicomposting seems to be a prized alternative to transform this weed into a valuable product. Hence, the aim of this study is to investigate the efficacy of Mikaniamicranthakunth in Rotary drum composting and exploiting its nutrient content as a final compost product.

Keywords: Vermicomposting; rotary drum composting; terrestrial weed; composting; invasive weed.

A brief review of LEAP as an energy modelling tool.

Archana Prasad[a], Dr. Pankaj Kalita[b]

[a] Centre for Rural Technology, IIT Guwahati
[b] Centre for Energy, IIT Guwahati

Email: pankajkalita@gmail.com, prasad.archana7@gmail.com

Abstract: Energy is the backbone of a nation which connects economic and social development with environmental sustainability. This study deals with the importance of energy modelling in a developing country like India where the demand for energy in both industrial and agricultural sectors has been growing due to the developmental activities. The energy modelling serves the purpose of exploring and shaping the future of developing countries and industrialized countries as well. This study states why energy modelling is so important, the computerized existing tools available, their comparison and how other countries are making energy models. A main focus is made on the LEAP (Long-Range Energy Alternatives Planning System) software tool. LEAP is a widely-used software tool for energy policy analysis and climate change mitigation assessment developed at the Stockholm Environment Institute which has a bottom-up approach of modelling. At least 32 countries have used LEAP to create energy and GHG emissions scenarios that were the basis for their Intended Nationally Determined Contributions on Climate Change (INDCs). This study discusses LEAP as a flexible software tool which considers various data requirements and supports simulation features in addition to basic energy accounting framework, giving a brief idea of how to choose and develop scenarios in order to forecast energy demand for a specific year in a targeted time horizon. This review paper can help researchers and policy makers widely in their respective fields.

Impact of brick kiln activities on surrounding soil quality at rural areas of Napaam, Tezpur, Assam

NihalGujre and SudipMitra*

Center for Rural Technology, Indian Institute of Technology, Guwahati, Assam.

*Corresponding authors: nihal_gujre@iitg.ac.in and sudipmitra@iitg.ac.in

A Study was conducted to assess the impacts of brick kiln activities on the surrounding soil quality in Napaam. Unscientifically operated brick kiln in rural areas of Napaam, Assam poses serious threats not only to human health but also to nearby environment. Investigation was carried out to determine the physicochemical characteristics of soil, soil fertility and heavy metal contamination in the soil. It was found that the soil pH varied from 5.0 to 8.0; electrical conductivity ranged from 0.18 to 0.80 ms cm^{-1} and moisture content of soil remained within 0.01 to 17.48 %. Organic carbon content and organic matter varied from 0.14 to 2.82 %, and 0.24 % to 4.86 %, respectively. Macro-nutrient content, that is, available nitrogen (N), phosphorus (P) and potassium (K) concentration, in the soil ranged from 62.7 to 501.7 kg/ha $^{-1}$, 0.06 to 11.81 kg/ha $^{-1}$ and 3.36 to 426. 72 kg/ha $^{-1}$ respectively. It was also observed that the total concentrations of chromium (Cr) were varied from 46.21mg kg^{-1} to 76.98 mg kg^{-1}, slightly above than permissible limit, while concentration of cadmium (Cd) from 0.01 mg $kg^{-1}$to 0.29 mg kg^{-1} is within permissible limit. However, the physical parameters and nutrient content were deficient in soil at 50 meter which increasing gradually at distances above 50 meter from brick kiln area. This result also indicates that the heavy metal contamination in soil decreases as the distance of a site from the brick kiln increases. Although regular monitoring can assist in evaluating the extent of environmental impact caused and suggest better mitigations strategies.

Keywords: Brick kiln, Soil quality, Heavy metals

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Prerequisite of electrohydrolysispretreatment on lignocellulose terrestrial weed (Lantana camara) to enhance the methane production.

BiswanathSaha[a*], Ajay S. Kalamdhad[b], MeenaKhwairakpam[a]

[a] Centre for Rural Technology, Indian Institute of Technology, Guwahati 789039, Assam, India
[b]Department of Civil Engineering, Indian Institute of Technology, Guwahati 789039, Assam, India.

*Email Id: biswanathsaha33@gmail.com

This study was mostly centered around the impact of electrohydrolysispretreatment on L.camara to chop down the hydrolysis phases and upgrade the biogas generation. Electrohydrolysispretreatment proved to be efficient in the form of increasing the VFA and sCOD when it is compared with untreated L.camara. At 30V for 20min shows the highest sCOD and VFA around (720±3mg/L and 11328±16mg/L) which is 47.22% and 42.24% respectively. Therefore, biochemical methane potential studies were examined for 50days, where cumulative biogas production was observed 3842 ± 12 mL CH_4 in 40days in pretreatedL.camara where as in untreated it was around 2950± 08 mL CH_4 in 50days. In pretreated samples, soluble lignin and cellulose increased, whereas hemicellulose decreased. After electrohydrolysispretreatment morphological and structural changes were observed, where as in XRD high peak was reduced, during FESEM analysis broken fragment was observed on the surface of the substrate and in FTIR remarkable fall of peak was found in 3490.1 and 2675.4 cm^{-1} which specifies stretch of OH in lignin and CH bond of cellulose.

Keyword: Electrohydrolysis; Pretreatment; Hydrolysis; Lantana camara; Lignocellulose; Methane.

Compositional and Magnetic Analysis of Bell-Metal on the basis of study of its processing by Artisans of Assam

Srimonti Dutta, Sashindra K. Kakoty, Pranay K. Sarkar

Centre for Rural Technology, IIT Guwahati

Email: srimonti@iitg.ac.in

Bell-Metal has been used extensively in India since the ancient times but scientific analysis of the alloy is not exhaustive. In this study, a summary of the available literature of technical analyses on the compositional variation of the Bell-Metal alloy and their resulting effects on the properties of the alloy as a whole, as well as the results of some experimental tests conducted for analyzing the properties of bell metal has been presented. From field survey, it has been found that there is no standardized procedure for the formation of Bell-Metal alloys from waste Bell-Metal scraps and it is of utmost importance to know the properties of the alloy in order to standardize its method of processing and also for the diversification of its product range. Characterization of the alloy should include some of its basic parametric values which dictate the nature of the alloy; such an attempt has been made in the present work to find the numerical values of some of the aforementioned parameters. EDX (FESEM) has been used to determine the elemental composition of Bell-Metal samples and they have been found to have Cu in the range of 68.2 to 73% and Sn in the range of 16.9 to 21.3% along with a measurable percentage of trace elements Nb, Zn, Pb, and Co. In an attempt to study the magnetic properties of the bell metal alloy, VSM has been used and a maximum magnetization and retentivity of $1.0877*10^{-3}$ emu and $113.78*10^{-6}$ emu have been obtained respectively. Here, an overview of the alloy Bell-Metal, starting from composition to uses and finally properties has been presented.

Post-consumer use of plastic packaging material in rural housing

Rama Shirwalkar

Centre for Rural Technology, Indian Institute of Technology, Guwahati-781039, Assam, India

Email: rama174154007@iitg.ac.in

Plastics have gained immense importance in our day to day lives. As demand for plastics grew, their production also increased with a significant growth of their share in waste generated per capita. However, there is a great difference in rate of consumption and effective waste management system for plastics as a result of which landfills overflow with non-biodegradable plastic material which becomes a nuisance. While some types of plastics are recyclable, some can be reused more efficiently. This project studies the possibility of reusing post-consumer plastic (PP and PET) bottles in building and construction (particularly rural housing). It explores possibilities of reusing this material in an innovative fashion while maintaining a user-friendly approach.

Potential of Food Waste as a source of decentralized electricity generation

Prakash Singh[1], Biswanath Kumar Saha[1], K. Dhamodharan[2] and Ajay Kalamdhad[2]

[1]Centre for Rural Technology, IIT Guwahati, India

[2]Department of Civil Engineering, IIT Guwahati, India

E- mail: singh174154005@iitg.ac.in

Municipal solid waste is produced on large scale and has a significant impact on the environment. Disposition on landfills is not sufficient and especially food waste causes problems mainly through the generation of the greenhouse gas methane. Food waste (FW) is biodegradable material which can be utilized for the production of methane gas. Inoculum plays a major role in the process of anaerobic digestion. A suitable treatment is the anaerobic digestion. Within the process the organic matter gets biologically degraded and produces next to carbon dioxide methane, that can function as a source of energy. The digestion is a sensitive process because of the micro bacterial activity, thus parameters like pH, volatile fatty acids etc. have to be frequently controlled to maintain optimal conditions. The objective of this study is to find the best loading rate and HRT for a maximum methane production and organic degradation. In addition, the purification of biogas should be enhanced to increase the methane quantity thus increasing the heating value. For identifying the best ratio of Substrate/ Inoculum (F/M) a biomethane potential (BMP) analysis was conducted. Afterwards the Hydraulic retention time (HRT) was determined in a batch study. Eventually the optimum organic loading rate was found with the ABBR, a continuous reactor. The BMP test found the best F/M ratio of 2.0 with the highest Volatile solid (VS) reduction of 50.38 % and cumulative methane production of 2.97 L.

Design of Tea Manufacturing Unit for Small Tea Growers of Assam

A. AlankritaSaikia* and B. Prof. S.K Kakoty

Centre for Rural Technology, IIT Guwahati, India

E-mail: alank174154001@iitg.ac.in

Tea is the most popular beverage in the world. Assam tea is worldwide famous black tea because of its robust flavour. Assam being one of the largest tea growing region in the world, contributes about 52% of the total production area in India Tea holds a national share of about 60% of agricultural crops in Assam. Thus the economy of the region is highly dependent on it. Although economic perspective is more focused on the macro tea growers of the region, about 40% of the tea growers are small tea growers having small land holdings. This paper focuses on designing of manufacturing unit for small tea growers of Assam. The input capacity of the production unit is to be kept in accordance with the production amount of these small tea growers. Field survey is done on macro tea industries present in the state to understand the detailed manufacturing process in both CTC tea and Orthodox Tea. CTC tea manufacturing process of Balijan Tea Factory is studied in details. Orthodox tea manufacturing process of Latakojan Tea Factory affiliated to TATA Tea, is studied in details. Taking in consideration fundamental system design, design criteria has been considered to scale down the manufacturing unit. Efforts are made to analyse and dissemble the entire system using concepts of reverse engineering.

Key Words: CTC Tea, Orthodox Tea, Fundamental System Design, Reverse Engineering

"Marigold farming as a powerful technology in enhancing the livelihoods of rural women of Assam"

Chayanika Lahkar[1] & R.P. Borkakati[2]

[1]M.Sc. Scholar, [2] Professor, Dept.of Plant Breeding & Genetics, Assam Agricultural University, Jorhat, Assam

Phone: +91-8638348028. E-mail id: chayoolahkar94@gmail.com

Evidences from all civilizations reveal that mankind has historical interest in gardening and culturing flowers to satisfy aesthetic need. But, in the present world, flower becomes important not only for its aesthetic social values, but also for its economic contribution (Aditya, 1992; Dadlani, 2003). Today floriculture is recognized as a lucrative business since it has higher potential per unit area than most of the field crops even horticultural crops both for domestic market and export (Mishra &Pathania, 2000). Marigold (Tageteserecta) is an important commercial flower crop having its demand as loose flower as well as widely used in landscape gardening and as pot plants. Commercially, the importance of marigold is well established in the markets of Assam with its demand as loose flower round the year for garland making, and different festivals and celebrations and religious offerings. Marigolds has been used traditionally in stomach upset, ulcers, menstrual period problems, eye infections, inflammations, and for wound healing and as antiseptics.The industrial applications include the pigment and oil extraction.Additionally, this flower is grown as intercrops to reduce the population of nematodes.Assam has favorable conditions for marigold cultivation both in terms of suitable agroclimatic conditions and soil.Almost every household of the state, specially the villages, has marigold plants in its homegarden or entrances but is yet to graduate from the hobby growing to a commercial activity. Barring Hajo and Nagaon, there are only few places in the state which produces commercial flowers of quantity and quality, as a result of which 75 per cent of the flowers sold in the state are from Kolkata, Karnataka and even Thailand. The estimated area under marigold cultivation in India is about 55.89 thousand ha with a production of 511.31 thousand metric tones. In Assam, the total area under flower crops is about 600ha, out of which about 250ha is under marigold cultivation, producing 7.27tonnes of flower/year (National Horticulture Board, 2015), occupying 13th position among the states of the country.An estimated production of 2.5 to 4.5 and 6.0 to 9.0 million numbers of flowers/ha has been reported in French and African marigold respectively from Assam. Food based agriculture getting priority all through has led to little attention being given to this potential sector of agri-business.

Women play a vital role in the agricultural scenario of the state. The growth in agriculture in the country has been associated with an increase in female employment, a process that is often claimed to enhance women's empowerment. All category of farmers particularly farm women if devote a small piece of land to flower cultivation, round the year the net income of the family can be increased many folds. Marigold cultivation in rural areas by farm women suits the most as it requires care and nurturing, picking and packing with care in which the female workers have an edge over the male counterparts. Marigold farming can play a significant role in making the rural women self-dependent. Everything, right from the plantation of saplings, to making and selling garlands in the market, can done by the women folk. Growing marigolds is comparatively easier than other commercial flowers. The flowers can be harvested for about 6-9times, and with proper management and care, we can expect 125-150q/ha yield for African marigold and 80-120 q/ha in French marigold cultivation. There is a huge demand for marigold during puja season and Diwali and to meet this demand, the vendors buy flowers from West Bengal. So, if more villagers adopt this cultivation, the state will also become self-sufficient. However, when it comes to other crops or horticulture, farmers have to face challenges, right from input supply to farming technology, and struggle with finding a market. Marketing of marigolds is not a problem due to constant demand for flowers in the local markets as well as the religious places. Thus it has the potential to contribute immensely for sustainable development of the state.

Demand for flowers has been growing and there is huge potential for further growth. Flower decoration has become a fad in banks, restaurants and various institutions. The demand of flower is going up with the improvement in people's lifestyle. According to the flower markets in Jorhat, the price of marigold small seedlings is Rs.10-15 and that of the potted plants is Rs.20-30. The price of a garland is about Rs. 30-50 depending upon the seasons and demand. The cut-flower production would also lead to other industries such as good seed production and vermi-composting as well as poly and green houses. Thus, marigold cultivation can be a profitable venture for the small and marginal farmers, as the traditional crops are becoming less remunerative and it can serve as an effective technology in improving the rural livelihoods, making women self-dependent and promoting their empowerment and the socio-economic rural upliftment as a whole.

Keywords: Floriculture, Marigold, Women empowerment, Rural technology, Marketing

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Abstracts (Poster)

Investigating the DNA binding function of plant intrinsically disordered protein HYH by protein charge transfer spectra

Abheek Sengupta, Rajaram Swaminathan*

Indian Institute Of Technology, Guwahati

*E-mail: rsw@iitg.ac.in

Intrinsically Disordered Protein (IDP) exists as an ensemble of multiple conformations. In past few years it has been established that despite structural disorder, IDPs perform several vital functions such as they play a key role in several regulatory events inside the human cell as well as plants[1]. IDPs are rich in charge amino acid residue and mostly devoid of aromatic amino acid. ProCharTS helps us to track the structure and dynamics of proteins rich in charged amino acids [2]. ProChaTS is recently discovered phenomenon based on photoinduced electron charge transfer in charged amino acids and protein. The method is used to study natural proteins or protein domains which are rich in charged amino acids regardless of their aromatic amino acid content. It establishes a quantitative link between non aromatic protein amino acid sequence content and the UV-Vis absorption features above 320 nm which provides a new spectral window to probe prominent proteins of biomedical relevance. In particular, DNA and RNA binding proteins such as histones, spliceosomal proteins and transcription factors mainly consists of charged amino acids Lys and Arg.

The protein HYH is disordered DNA binding protein rich in charged amino acids. Genetic analysis indicates that HYH is involved in blue-light regulation of development and gene expression, and that the function of HYH overlaps to that of HY5 which is a positive regulator of photo morphogenesis, and promotes its proteasome-mediated degradation [3].

References

1. B.He, K.Wang, Y.Liu, B.Xue, V. N Uversky, A .K Dunker., Cell Research, 2009, **19**, 929-949
2. S. Prasad, I. Mandal, S. Singh, A. Paul, B. Mandal, R. Venkatramani and R. Swaminathan. Chem. Sci., 2017, **8**, 5416–5433
3. M Holm, LG Ma, LJ Qu, XW Deng, genes dev, 2002, **16**, 1247-125

Efficient saccharification of finger millet stalk by a new thermostable α-L-arabinofuranosidase (PsGH43A) from Pseudopedobacter saltans

Abhijeet Thakur and Arun Goyal

Carbohydrate Enzyme Biotechnology Laboratory,

Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India.

E-mail: abhijeet.thakur@iitg.ernet.in

Arabinoxylan has the backbone of β-(1→4)-linked xylose residues with the substitution of one or more L-arabinofuranosyl residues, at position 2 or 3. The action of α-L-arabinofuranosidase alone or in combination with other lignocellulose degrading enzymes has promising biotechnological applications in pulp and paper industry, sourdough fermentation and saccharification of lignocellulosic biomass for bioethanol production. In present study, the gene (1.7 kb, Genbank Acc.

No. ADY53124.1) encoding α-L-arabinofuranosidase, a family 43 glycoside hydrolase (PsGH43) containing His-6 tag was cloned into pET-28a (+) vector and expressed in E. coli BL21 (DE3) cells as a soluble protein. PsGH43 on purification by His GraviTrap column and analysis by SDS-PAGE the protein gave single band displaying the molecular mass approximately, 65 kDa. It displayed the optimum pH 6.5 and the optimum temperature 50°C. The stability profile showed that the enzyme is stable at pH 8 (in 50 mM sodium phosphate buffer) and at 50°C for 2 h. PsGH43 displayed activity against natural substrate such as rye arabinoxylan (89 U/mg), wheat arabinoxylan (79 U/mg) and also against synthetic substrate, 4-pNP-α-L-arabinofuranoside (168 U/mg). The kinetic parameters, K_m and V_{max} for PsGH43 against rye arabinoxylan was 3.02 mg/ml and 103 µmole/min/mg, respectively and against wheat arabinoxylan was 3.04 mg/ml and 99 µmole/min/mg, respectively. PsGH43 showed enhanced activity in the presence of Ba^{+2} (x1.9), Mg^{+2} (x1.6), Ca^{+2} (x1.3), Cd^{+2} (x1.2), Na^{+} (x1.16) and Li^{+} (x1.1) ions as compared to control. PsGH43 showed synergistic effect with xylanase (CtXyn11A) from Clostridium thermocellum and β-xylosidase (BoGH43) from Bacteroides ovatus. The saccharification of pre-treated finger millet stalk with CtXyn11A and BoGH43 gave a TRS yield of 27.5 mg/g of biomass, whereas, along with the PsGH43, the TRS yield was enhanced by 2-fold to 53.7 mg/g of biomass.

Protein Charge Transfer Spectra (ProCharTS) mediated structure and dynamics study of Taq MutS

Alka Singh and Rajaram Swaminathan*

Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, India

*E-mail: rsw@iitg.ac.in

Protein **Char**ge **T**ransfer **S**pectra (ProCharTS) has recently been reported among various charged amino acids and proteins rich in charged amino acids which undergo photoinduced charge transfer transitions. These transitions involve spatially proximal Lys/Glu amino acids in folded proteins. The charged amino (NH_3^+)/carboxylate (COO^-) groups of Lys/Glu side chains act as electronic charge acceptors/donors for photoinduced electron transfer either from/to the polypeptide backbone or to each other. Similar transitions have also been reported for His, Arg, Asp, phosphorylated Ser and Thr.

MutS is a unique core component of DNA Mismatch Repair (MMR) which recognizes mispaired bases and targets them for mismatch repair. This protein is rich in charged amino acids (~ 30%) which is a characteristic of nucleic acid binding proteins such as DNA repair proteins, transcription factors etc. The binding of these proteins are mainly dependent upon the presence of highly negatively charged phosphate backbone of nucleic acids. However, this binding could be altered with the change in biochemical (pH, salt concentrations, ligand, and inhibitors) and physical (temperature) conditions. Apart from this, transient changes in conformation of MutS has been observed upon ATP/ADP binding and initiation of mismatch repair. Since, ProCharTS are very sensitive to the proximally located charged amino acid residues in a protein fold, any conformational change that alters the proximity of these charged residues will subsequently change the Protein charge transfer spectra. This will provide a label free approach to study the interaction of DNA and nucleic acid binding proteins.

In the present work, expression and purification of MutS from Thermus aquaticus is carried out and some initial experiments on the ProCharTS of MutS will be presented.

References

1. Prasad, S; Mandal, I; Singh, S; Paul, A; Mandal, B; Venkatramani, R; Swaminathan, R. Chem. Sci., **2017**, 8, 5416-5433
2. Ansari,MZ; Kumar,A; Ahari,D; Priyardarshi,A; Lolla,P; Bhandari,R; Swaminathan,R. Faraday Discuss., **2018**, 207, 91-113

3. Qiu , R; DeRocco, VC; Harris, C; Sharma, A; Hingorani ,MM; Erie, DA; Weninger, KR. EMBO J., **2012**, 31(11):2528-40
4. Elizabeth, JS; Weninger, KR. Biophysical.J., **2012**, 102, Special Issue 3, 282A.

Genome size estimation of four herbaceous plants of Assam

Alok Senapati[1], Heeramoni Boro[2] and Latha Rangan*

Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati-781039, Assam, India.

Edible plants namely Centella asiatica (L.), Hydrocotyl sibthorpoides (Lam.), Eryngium foetidum (L.) and Bacopa monnieri (L.) with medicinal properties against asthma, fever, edema, ulcers, and hair loss are commonly found in Assam. Till date, there is no genomic data related to these plants. Genome size (2C- Value) of these plants were investigated and quantified in the present study using flow cytometry. Propidium iodide was used to stain leaf nuclei and the fluorescence intensity was compared to that of standard reference plant. The relative DNA content of C. asiatica (L.), H. sibthorpoides (Lam.), E. foetidum (L.) and B. monnieri (L.) were estimated to be 1.3±0.04 pg , 2.36±0.01 pg, 1.48±0.04 pg & 3.04±0.02 pg respectively. This study would be helpful in further characterization of these plants, their conservation, ploidy determination, evolutionary studies and genome sequencing.

Keywords: edible plants, genome size, flow cytometry, propidium iodide

Emission arising from Protein Charge Transfer Absorption among charged amino acids and proteins rich in charged amino acids

Amrendra Kumar, Dileep Ahari, Mohd. Ziauddin Ansari and R. Swaminathan*
Department of Bioscience and Bioengineering, Indian Institute of Technology Guwahati, Guwahati, Assam, India
*E-mail: rsw@iitg.ac.in

Recently, charged amino acids and the monomeric proteins rich in charged amino acids have been shown to undergo photoinduced charge transfer transitions giving rise to the Protein Charge Transfer Spectra (ProCharTS). These transitions involve the side-chains of charged amino acids and the peptide backbone, where charged amino ($NH3^+$)/ carboxylate (COO^-) groups of lysine/glutamate side chains act as acceptor/donor for photoinduced electron transfer either from/ to the polypeptide backbone or to each other. [1,2] Such transitions give rise to a distinct UV-Visible absorption spectrum in the range of 250-800 nm.[3,4,5]

In the present work, we are investigating the emissive properties of ProCharTS among charged amino acids (lysine and glutamate) and different charged proteins (including Intrinsically Disordered Proteins; PEST domain, α-Synuclein and DHN1 and ordered protein; Human Serum Albumin). We have found that the ProCharTS are emissive when excited in the range of 280 to 410 nm and in some cases up to 600 nm. However, the quantum yields were found to be low, between 1-5%. The absorption bands for the above mentioned fluorescence emissions were found to be in the range of 330-380 nm. As striking features, these emissions which originate from monomeric proteins, show huge Stokes shift (3000-12000 cm^{-1}) and are exceptions to Kasha's rule. We have also done time resolved fluorescence studies which depicted multi-exponential decays with the lifetime of such transitions in the range of 1-3 ns. Apart from these, we have utilized this intrinsic fluorescence arising from ProCharTS to study the oligomerization of charged protein.

References

1. Prasad S.; Mandal I.; Singh S.; Paul A.; Mandal B.; Venkatramani R.; Swaminathan R. Chem. Sci. 2017, 8, 5416
2. Mandal I.; Paul S.; Venkatramani R. Faraday Discuss. 2018, 207, 115
3. Ansari M.Z.; Kumar A.; Ahari D; Priyadarshi A.; Lolla P.; Bhandari R.; Swaminathan R. Faraday Discuss. 2018, 207, 91
4. Homchaudhuri L.; Swaminathan R. Chem. Lett. 2001, 844-845
5. Homchaudhuri L.; Swaminathan R. Bull. Chem. Soc. 2004, 77, 765-769

INSILICO ANALYSIS AND BIOCHEMICAL CHARACTERIZATION OF FIKK 9.1 KINASE TO DEVELOP ANTIMALARIALS AGAINST P.FALCIPARUM

Anil Kumar D and Vishal Trivedi*

Malaria Research group, Department of Biosciences and Bioengineering, Indian Institute of Technology- Guwahati, Guwahati, Assam, India-781039

*Corresponding Author: Professor Vishal Trivedi, vtrivedi@iitg.ac.in

Plasmodium Falciparum is one of the deadliest causative agent for pernicious malaria in humans. Malaria parasite contains ~65 eukaryotic like protein kinases to drive crucial signalling events within infected RBCs. These signalling events controls several events such as cytoadherence, RBC remodelling and other crucial cellular processes for its survival. Out of 65 ePK's, 20 unique proteins belonging to FIKK family possibly play significant role in altering stability of RBC, hallmark event responsible for infectivity of parasite. In order to understand its involvement in lethality of malaria parasite, we have selected FIKK 9.1 kinase (PlasmoDB accession Number PF3D7_0902000) as possible drug target through preliminary bioinformatic analysis. FIKK9.1 was cloned as whole protein or truncated versions (N-terminal substrate binding domain or C-terminal catalytic domain) in bacterial expression vectors. Unfortunately FIKK9.1 catalytic domain(CD) was found to give soluble expressed in BL21DE3. FIKK9.1 CD was purified by affinity chromatography and gel-filtration analysis of purified product gives native molecular weight as 50.5kDa. Circular dichroism (CD) spectroscopy of purified desalted FIKK9.1 indicate presence of 29.1% helices, 43% β-sheets and 27.7% random coils. The interaction of ATP with FIKK 9.1 CD was studied by Isothermal Titration Calorimetry (ITC). FIKK9.1 CD binds ATP with a stoichiometry of 1, dissociation constant (K_d) of 1.03± 0.97μM and The protein FIKK 9.1 CD obtained from bacteria is autophosphorylated and further studies are required to identify the suitable substrate within infected RBCs. Bioinformatic analysis and preliminary biochemical characterization of FIKK 9.1 highlights presence of several crucial determinants to exploit it as potential drug target to develop novel anti-malarials.

Keywords - FIKK kinase(S), remodelling of host, Circular dichroism, ITC and Autophosphorylation.

Recombinant Newcastle disease virus based approach for the development of vaccine against Japanese encephalitis virus

Barnali Nath, Sachin Kumar

Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati, Assam 781039, India.

Presenting author's e-mail: barnalinath2014@gmail.com

Japanese encephalitis (JE) is a mosquito-borne viral disease. It is a global public health concern since it causes an acute encephalitis syndrome (AES). A large number of JE/AES cases are reported to occur in areas with established or developing JE vaccination program. Partial vaccine coverage and emergence of new variants of Japanese encephalitis virus (JEV) might be playing an important role.

Newcastle disease virus (NDV) is known to be an attractive vaccine vector candidate for both human and animal pathogens. In the present study, a recombinant NDV was generated entirely from cloned cDNA. Furthermore, the recombinant NDV was used to express the envelope protein (E) of JEV, which is the primary target of neutralizing antibodies. The recombinant NDV expressing E protein of JEV was characterized in cell culture, embryonated chicken eggs and 1-day-old chickens. The recovered recombinant virus could be a potential tool for the development of diagnostics and vaccine against JEV infection. We are exploring the possibility of using mice as a model to study the immunogenicity of the recombinant vaccine.

Role of Lipocalin Receptor in the Development of Lung Cancer

Bethsebie Lalduhsaki Sailo, Ajaikumar B Kunnumakkara*

Cancer Biology Laboratory & DBT-AIST International Laboratory for Advanced Biomedicine (DAILAB), Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati, Assam-781039, India.

*Email: kunnumakkara@iitg.ac.in

Lung cancer is the most common malignancy and the leading cause of cancer-related death with approximately 1.8 million cases reported in 2012 worldwide. Late stage diagnosis and lack of effective response to the available treatments contributes to the elevated mortality rate and poor clinical outcome. Therefore, it is essential to develop novel biomarkers for early diagnosis and identify molecular targets for effective management for this disease. In the current study, we have investigated a solute carrier transporter called neutrophil gelatinase-associated lipocalin receptor (NGALR) as a potential biomarker and target for lung cancer. Expression of NGALR protein was evaluated by immunohistochemistry in lung cancer tissue microarray consisting of tissue samples from 75 lung cancer patients. The expression level of NGALR was found to be upregulated in the lung cancer tissues compared to the normal tissues. NGALR was also upregulated in different stages and grades of lung cancer compared to the normal tissues. Additionally, NGALR expression was comparatively higher in NSCLC than in SCLC. Further, the effect of different tobacco components on NGALR expression in normal lung epithelial and lung cancer cells was evaluated using semi-quantitative PCR. It was found that NGALR expression was increased upon treatment with tobacco components in both normal lung epithelial and lung cancer cells compared to untreated control. Thus, our findings indicate that NGALR may play a significant role in the initiation and progression of lung cancer and may serve as a novel biomarker and potential therapeutic target in lung cancer.

Understanding the Role of microRNAs in the Post-Transcriptional Regulation of RNPS1 gene

Bhagyashree Deka and Kusum Kumari Singh,

Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati

RNA-binding protein with serine-rich domain 1, RNPS1, is an important regulator of splicing activity. Transcriptome-wide studies reported deficiency of RNPS1 causes mis-splicing due to the de-repression of cryptic or non-canonical splice sites, indicating the critical role of RNPS1 in maintaining splicing fidelity. Additionally, RNPS1 acts as an important alternative splicing regulator of neuronal microexons, which has vital functions during neurodevelopment and other brain functions. The crucial role of RNPS1 in splicing activity raises a fundamental question, whether the expression of RNPS1 is altered to orchestrate differential splicing activity during cellular differentiation and organism development. Here we investigate the role of microRNAs in regulating the expression of RNPS1. Using in silico prediction tools we analysed microRNA databases and selected four microRNAs: miR-221-3p, miR-149-5p, miR-33b-5p and miR-590-3p for further analysis. We identified miR-149-5p as an important potential regulator of RNPS1 gene expression. Further studies on the regulation of RNPS1 via microRNA at the physiological level will provide in-depth insights into the significance of the regulation.

Generation of Biologically Active, Cell-Permeant Human OCT4 Protein for the Transgene-free Reprogramming of Human Fibroblast to iPSCs

Chandrima Dey and Rajkumar P. Thummer*

Laboratory of Stem Cell Engineering and Regenerative Medicine,

Department ofBiosciences and Bioengineering, IIT Guwahati,India

E-mail:dey.chandrima@iitg.ac.in

Advent of induced pluripotent stem cell technology paved path to a new era of cellular reprogramming. Earlier studies generating iPSCs reported the use of various approaches for the transduction of pluripotency factors namely, OCT4, SOX2, KLF4 and c-MYC (OSKM). Amongst integrative (retrovirus and lentivirus) and non-integrative (protein, small molecules, mRNA, miRNA, etc.), recombinant protein approach is the safest, imparting control over dosage and time. Major roadblocks curbing the efficiency of recombinant proteins are inefficient cell and nuclear permeability, improper protein expression due to codon bias and many more. OCT4, a POU transcription family protein is a crucial factor centrally regulating the pluripotency machinery. The aim of our study is to generate an active, cell-permeant human recombinant OCT4 protein, overcoming the barriers by codon optimizing gene sequence for bacterial system, incorporating cell penetrating peptides (CPP), nuclear localization signal (NLS) and poly-histidine tag (His) in the C-terminal end of the protein. We optimized the expression parameters such as IPTG, OD, Temperature and Time for maximum yield in E.coli system. The protein was purified using native purification method and further checked for cell permeability in BJ cells. Additionally, stability testing for the determination of purified protein half-life was performed in the basic reprogramming media. This study provide an understanding and help articulate a better system for generating biologically active recombinant proteins for more efficient and safer use in the production of human iPSCs.

Analysis of codon usage pattern in the viral proteins of chicken anemia virus and its possible biological relevance

Urmil Dave[1], Ariktha Srivathsan[1] andSachin Kumar[1*]

[1]Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati 781039 Assam India.

Email: m.dave@iitg.ac.in

Chicken anemia virus (CAV) is an important poultry pathogen. CAV infection can lead to severe immunosuppression and mortality in birds. The viral proteins (VP1, VP2 and VP3) are major protective immunogens that determine the pathotype of CAV strains. The factors influencing the synonymous codon usage bias and the nucleotide composition of the viral protein genes of CAV have not been studied. In the present study, we have analyzed the synonymous codon usage pattern in VP1, VP2 and VP3 genes of CAV. Our results showed that all the genes have a low codon usage bias; however, this bias was slightly higher in the VP2 gene as compared to VP1 and VP3. Furthermore, the major contributing factor is mutational pressure followed by the host factors. The conclusion was drawn based on codon usage, correspondence analysis, ENC-GC3 plot and correlation analyses among different indices. The study will help us to understand the codon usage bias of CAV and related single-stranded DNA viruses which could further be used to explore their biology. This study would further aid in developing effective vaccines against CAV based on modulation of codon usage.

Probing the structural transitions in DHN1 by a new tool: Protein Charge Transfer Spectra

Dileep Ahari and R. Swaminathan*

Department of Bioscience and Bioengineering, IIT Guwahati, Assam, India

*E-mail: rsw@iitg.ac.in

Intrinsically Disordered Proteins (IDPs) in the past few years have emerged as a special class of proteins and are known to play a key role in various cellular processes despite lacking a unique three dimensional structure[1]. Many recent studies strongly support the notion that structural fuzziness renders IDPs uniquely capable of functioning in key regulatory processes in biology. As the IDPs are functional under extreme conditions, they are envisioned to play important roles in various plant abiotic stresses[2]. Since, IDPs are often rich in charged amino acid residues and they can be easily probed by Protein Charge Transfer Spectra (ProCharTS)[3,4,5]. ProCharTS was recently discovered phenomena among proteins and amino acids which arises from photoinduced electronic charge transfer. It originates when charged amino/carboxylate group in the side chain of Lysine/Glutamate, act as electronic charge acceptor/donor for photoinduced charge transfer either from/to the polypeptide backbone or to each other. The absorption band intensities in ProCharTS at wavelength 250-800 nm are dependent on 3D spatial proximity between these charged functional groups across the protein.

Here we exploit the abundance of charged amino acid residues in Dehydrin (DHN1) (a member of Late Embryogenesis Abundant protein family) from Zea mays to probe the structural transitions in the protein. To monitor the structural transitions under various abiotic stress conditions, both absorption and fluorescence characteristic of ProCharTS will be used as a label free tool.

References

1. Wright, P. E. & Dyson, H. J. Intrinsically unstructured proteins: re-assessing the protein structure-function paradigm. J. Mol. Biol.**293,** 321–331 (1999).
2. Hanin, M. et al. Plant dehydrins and stress tolerance: versatile proteins for complex mechanisms. Plant Signal. Behav.**6,** 1503–1509 (2011).
3. Prasad, S. et al. Near UV-Visible electronic absorption originating from charged amino acids in a monomeric protein. Chem. Sci.**8,** 5416–5433 (2017).
4. Ansari, M. Z. et al. Protein Charge Transfer Absorption Spectra: An Intrinsic Probe to Monitor Structural and Oligomeric Transitions in Proteins. Faraday Discuss. **207**,91-113 (2018).
5. Mondal, I et al. Optical-sidechain charge transfers transitions in proteins sensitive to secondary structure and modification. Faraday Discuss. **207,** 115-135 (2018).

Expression, purification and biochemical characterization of family 5 glycoside hydrolase(RfGH5_7) from Ruminococcus flavefaciens FD-1 v3

Dishant Goyal*, Krishan Kumar, Abhijeet Thakur and Arun Goyal

Carbohydrate Enzyme Biotechnology Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India.

Email: goyal174106052@iitg.ac.in

Mannans are the major hemicellulose polysaccharides found in the plant biomass, which can be hydrolyzed to simple sugars by mannanase enzymes. Ruminococcus flavefaciens is an anaerobic cellulolytic rumen bacterium which contains multi-enzyme complex of cellulolytic and hemicellulolytic activity. One of the enzyme from R. flavefaciens, classified in family 5 glycoside hydrolase is modular in nature and contains two domains GH5_4 and GH5_7. To understand the function of individual domains, GH5_7 (RfGH5_7) was individually cloned and expressed in E. coli BL21(DE3) cells. SDS PAGE analysis of purified RfGH5_7 showed a molecular size of ~ 35.287.1 kDa, respectively. Substrate specificity analysis of RfGH5_7 showed activity against Locust Bean galactomannan (298.5 U/mg), Konjac glucomannan (256.2 U/mg), Carob galactomannan (44 U/mg) and guar gum galactomannan medium viscosity (76 U/mg), which is further confirmed by TLC. RfGH5_7 showed optimum activity at pH 6.0 and Temperature 60 °C. RfGH5_7 displayed stability in a wide range of pH from 6.0 to 9.0 and thermostability upto 50 °C. The enzyme kinetics parameters of RfGH5_7 against galactomannan were; V_{max}, 483.2 ± 50 U/mg and K_m,1.802 ± 0.5 mg/ml. TLC analysis of RfGH5_7 hydrolysed product of galactomannan at different time intervals showed the presence of mannobiose, mannotriose and higher manno-oligosaccharides till the end of 24 hours indicating the endo- acting mechanism of RfGH5_7.

Inhibitory effect of nitazoxanide on Newcastle disease virus infection: A possible repurposing of drug for poultry.

Ferrin Antony[1a], Sudhir Morla[1] and Sachin Kumar[1b]

[1]Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati, Assam, India

[a]Presenting author address: ferri174106054@iitg.ac.in

[b]Corresponding address: sachinku@iitg.ac.in

Newcastle disease virus (NDV) infection is prevalent throughout India among the domesticated and the wild birds. It is commonly known to affect chicken, pheasant, ostrich, pigeon and waterfowl. NDV belongs to family Paramyxoviridae and classified under the genus Avulavirus. Depending on the virulence, NDV strains are further classified into lentogenic (less virulent), mesogenic (moderate virulent) and velogenic (high virulent). The velogenic strains cause severe respiratory and nervous disorders with high mortality rate. The average incubation time of the virus is 15-21 days and can be transmitted easily causing significant economic loss to the poultry industry. The live and killed vaccines are available for the prevention of infection in the market but the drug for the treatment is not available. Nitazoxanide (NTZ), a member of thiazolides, is an FDA approved antiparasitic drug. In the present study, we investigated the effect of NTZ on the NDV replication. The experiments were conducted in chicken fibroblast DF1 cells and in embryonated chicken eggs. The inhibition of the NDV production was observed upon treatment of NTZ at a concentration of ~12.5µM. Significant reduction in viral load was observed post-treatment of NTZ upon infection. The mechanism of action by which NTZ causes inhibition of NDV is not known. The study will help us to repurpose a drug for the treatment of viral infection in poultry. This will also pave a way towards understanding of similar effect in other animal pathogens.

Keywords: Newcastle disease, Nitazoxanide, chicken fibroblast DF1, repurposing.

Generation of Transducible Recombinant Cardiac-Specific Transcription Factor GATA4

H Krishna Kumar and Rajkumar P. Thummer

Laboratory for Stem Cell Engineering and Regenerative Medicine, Department of Biosciences and Bioengineering

Indian Institute of Technology Guwahati, India

Email ID: hk.kumar@iitg.ac.in

The ground breaking discovery of induced Pluripotent Stem Cells (iPSCs) articulated the path for direct reprogramming, an emerging method of lineage to lineage conversion directly bypassing the pluripotent state. Various reports showed successful direct reprogramming of somatic cells to cardiomyocytes by forced expression of cardiac-specific transcription factors, using integrative (retrovirus and lentivirus) and non-integrative methods (small molecules, sendai virus and miRNA). Among all the factors specified in different reports, GATA binding protein 4 (GATA4) was reported to be one of the most critical factor regulating cardiogenesis. The aim of our study is to generate cell-permeant recombinant GATA4 protein creating an effective and safe tool box for the cardiac reprogramming process. Notably, protein transduction is the safest approach among all the non-integrative methods and provides control over time and dosage. However, the major drawback is the low efficiency impeding its use in direct reprogramming. Addressing this bottleneck, we have cloned codon-optimized synthetic GATA4 into

the protein expression vector, pET28a(+), fusing with cell-penetrating peptide followed by nuclear localization sequence to the C-terminal end of the gene to ensure its accessibility into the nucleus. We also screened the optimal induction conditions for the maximal expression of recombinant GATA4 protein. Purification was performed by the implication of mild denaturing condition on the soluble protein fraction with hidden poly-histidine tag, there by circumventing the protein loss. Thus, this study will provide a noble and safer outlook towards generating transgene-free cardiomyocytes, opening a plethora of new opportunities to understand the cardiac-specific recombinant protein dynamics in the process of reprogramming

Implication of NGALR in the development of oral squamous cell carcinoma

Choudhary Harsha and Ajaikumar B. Kunnumakkara*

Cancer Biology Laboratory, & DBT-AIST International Laboratory for Advanced Biomedicine (DAILAB), Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Assam-781039, India.

*kunnumakkara@iitg.ernet.in

Oral squamous cell carcinoma is one of the highest malignancy causing cancers in the world. Despite the high incidence of oral cancer, there is a lack of safe and effective therapies for the management of this disease. Therefore, the treatment of oral cancer demands potential therapeutic targets and markers for prognosis of the disease. Neutrophil gelatinase associated lipocalin receptor (NGALR) is a membrane protein that belongs to the solute carrier family and is known to be upregulated in different cancers. However, the role of this protein has not been deciphered in oral cancer. Immunohistochemical analysis of the expression of NGALR has shown that the expression of this protein is significantly high in cancer tissues compared to normal tissues. The expression of NGALR was also found to increase with the increasing developmental stages of oral squamous cell carcinoma and different stages and grades of oral tumor.This shows that NGALR might be associated with the development and progression of tumor. Further, analysis of mRNA expression of NGALR in different cell lines also revealed high expression of NGALR in oral cancer cells compared to normal cells. The effect of treatment of tobacco extract and major tobacco components classified as carcinogens on the expression of NGALR in oral cancer cells also showed that NGALR might be associated with tobacco induced oral cancer. Our studies suggest that NGALR might have some role in the tumorigenesis of oral cancer and unravelling its role might help in establishing this protein as a therapeutic target.

In silico structural characterization of a new member heparinase II/III of family 12 polysaccharide lyase from Pseudopedobacter saltans

Himadree Das, Karthika B., Kedar Sharma and Arun Goyal
Carbohydrate Enzyme Biotechnology Laboratory,

Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati 781039, Assam, India.

The structure of heparinise II/III belonging to family 12 polysaccharidelyase (PsPL12a) from Pseudopedo bacter saltanswas generated by homology modeling. Multiple sequence alignment showed conserved (Asn216, Tyr270 and His400) and semi-conserved active site amino acid residues.

Themodeled structure of PsPL12a displayed α/αtoroiddomainatN terminal and antiparallel β sheets at C terminal domain. The modelled structure was similar to that of heparinase from PL12 and PL21 families. Validation of PsPL12a model by Ramachandran plot showed 94.6% of residues in the favoured region, 5.2% of residues in the allowed region and only 0.2% of residues in the outlier region. Molecular docking study of modelled PsPL12a structure with heparinand heparan sulfatetetra-saccharide showed the binding energy of-6.5kcal/mol and-7.75kcal/mol, respectively. Comparison of the active site of modelled PsPL12a with other heparinises of the PL12 family revealed putative catalytic residues as Asn216, His400 and Tyr 270. The area and volume computed for PsPL12a displayed an open conformation of the active site similar to hep C from Pedobacter heparinus. The charge calculation on the surface of the PsPL12a structure showed the higher distribution of positive charge in the active site cleft compared to other homologous structures.

Emergence of Protein therapeutics in Cancer Medicine

Hirakjyoti Roy Siddhartha Sankar Ghosh
Department of Biosciences and Bioengineering, IIT Guwahati, India
Centre for Nanotechnology, IIT Guwahati, India

E-mail: hirak174106056@iitg.ac.in

Protein therapeutics has revolutionized the cancer research ever since the first monoclonal antibody(mAb) rituximab has been approved by FDA for cancer therapy. Herein, we present the expression, purification and characterization of recombinant proteins PTEN, INF-□, I□B□ and sFRP1 that modulate cellular signalling pathways in cancer cells. The GST tagged bacterially expressed proteins were purified by glutathione-agarose affinity column and characterized by biophysical techniques such as western blot, MALDI and circular dichroism. For enhancing the efficacy of proteins as therapeutic agents nanoparticle or nanocarriers are used for their enhanced delivery. Anti-proliferative activity of the recombinant protein loaded nanocomposites or in combination with chemotherapeutic drugs indicated futuristic potential for effective cancer therapy

Investigating the effects caused by expression of NDV matrix protein on yeast cells

Jitika Rajpoot SahayaGlingston, Shirisha Nagotu
Department of Biosciences and Bioengineering, IIT Guwahati,India

Newcastle disease is a contagious bird disease which affects both domestic and wild avian species and is caused due to Newcastle disease virus (NDV), which is a paramyxovirus. The poultry industry incurs huge losses every year due to high mortality rate of the disease, which is why it is being studied extensively by researchers. However, NDV has also attracted attention because of its ability to selectively kill cancer cells. One of the six structural proteins of NDV is matrix (M) protein which is a nucleocytoplasmic shuttling protein. Reports have suggested that it plays a role in assembling and budding of the virus. However not much is known about its effect on host cell and its organelles.

In this work we have cloned the NDV M protein in a yeast expression vector and confirmed its expression by fluorescence microscopy. Cell expressing NDV M protein did not exhibit any growth defect and no significant effect on viability was observed. Microscopic analysis of various organelle morphologies in these cells was performed. Our preliminary analysis shows no striking effect on mitochondria, peroxisomes and nucleus. A significant fragmentation of vacuoles as visualized by FM-464 staining was observed in cells expressing NDV M protein. We are also analyzing the localization of the protein to various sub cellular structures in yeast cells.

Molecular organization and protein stability of the Clostridium thermocellumglucuronoxylan endo-β-1,4-xylanase of family 30 glycoside hydrolase in solution

Kedar Sharma , Carlos M.G.A. Fontes, Shabir Najmudin and Arun Goyal

Carbohydrate Enzyme Biotechnology Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati 781039, Assam, India.
CIISA-Faculdade de Medicina Veterinária, Universidade de Lisboa, Av. da Universidade Técnica, 1300-477 Lisboa, Portugal.

Email: s.kedar@iitg.ac.in

Glucuronoxylan-β-1,4-xylanohydrolase from Clostridium thermocellum (CtXynGH30) hydrolyzes β-1,4-xylosidic linkages in 4-O-Methyl-D-glucuronoxylan. CtXynGH30 comprises an N-terminal catalytic domain, CtXyn30A, joined by a linker peptide to a carbohydrate-binding module, CtCBM6. The Ca^{2+} ions provide stability to CtXynGH30. The ITC, mass spectrometric and enzyme activity analyses of CtXyn30A:CtCBM6 (1:1 molar ratio), CtXyn30A and CtXynGH30 showed that the linker peptide plays a key role in connecting and orienting CtXyn30A and CtCBM6 modules resulting in the enhanced activity of CtXynGH30. SAXS analysis of CtXynGH30 showed the monomeric and elongated form in solution with a D_{max} of 17 nm and Rg of 3.6 nm. Kratky plot displayed protein in a fully folded and flexible state. The ab initio derived dummy atom model of CtXynGH30 superposed well with the modeled structure.

The Role of Lipogenic enzymes in the Initiation and Progression of Oral cancer

Amrita Devi Khwairakpam, Ajaikumar B Kunnumakkara*

Cancer Biology Laboratory, DBT-AIST International Laboratory for Advanced Biomedicine (DAILAB), Department of Biosciences and Bioengineering, Indian Institute of Technology (IIT) Guwahati, Assam-781039, India.

E mail: kunnumakkara@iitg.ernet.in

Oral cancer is one of the most common cancer in India which can be mainly attributed to extensive tobacco smoking and chewing habits. The North-eastern part of India alone constitutes more than 40% of the oral cancer cases in India. The molecular complexity and clinical behavior of oral cancer minimize the chances for early detection of oral cancer. Increase upregulation of glycolytic and lipogenic enzymes have been reported in oral squamous cell carcinoma (OSCC). The rising level of lipogenesis in tumor cells indicates the ever increasing demands of energy for membrane synthesis. Increasing lines of evidence suggest that over 93% of triacylglycerol fatty acids are produced by de novo fatty acid synthesis. Moreover, dysregulation in the expression of lipogenic enzymes like ATP citrate lyase (ACLY), acetyl CoA carboxylase (ACACA) and fatty acid synthase (FAS) occurred in cancer cells. ACLY crosslinks glycolysis with fatty acid synthesis and mevalonate pathway. In our study we investigated the alterations in ACLY in oral cancer using tissue microarray. Higher level of phosphorylated ACLY was observed in cancer tissue as compared to the normal. Further, we also examine the effect of tobacco and its components in the mRNA expression of ACLY and associated genes. Increase levels of ACLY and alterations in the expression of genes such as FAS, ACACA, endothelial growth factor receptor (EGFR), insulin growth factor receptor 1 (IGF1R), glucose transporter-1 (GLUT-1), AMP-activated protein kinase (AMPK), hypoxia-inducible factor 1-alpha

(HIF1-α), kinase-1 (LKB1) and glycogen synthase kinase-3 (GSK3) was observed indicating their significant roles in tumorigenesis of OSCC.

Development of TNFAIP8 Family of Proteins as Novel Biomarker in Bone Cancer.

Kishore Banik[1], Ajaikumar B. Kunnumakkara[1#]

Cancer Biology Laboratory & DBT-AIST International Laboratory for Advanced Biomedicine (DAILAB), Department of Bioscience & Bioengineering, Indian Institute of Technology (IIT) Guwahati, Assam-781039, India.

Email: kunnumakkara@iitg.ac.in

Bone cancer originates in the bone either as primary tumor or as secondary site of metastasis or spread from other cancers. The 5 year survival rate of bone cancer remains as low as 60-70% attributing to the late diagnosis, development of chemoresistance and tumor recurrence. Therefore, it is essential to develop novel biomarkers for early diagnosis and treatment of this deadly disease. In the current study, TNFAIP8 family of proteins (TIPE, TIPE1, TIPE2 and TIPE3) are explored for their potential as tumor biomarkers for bone cancer. Differential expression of TNFAIP8 proteins in context with tumor type, pathology, tumor origin, different age groups and gender were analyzed using tissue microarrays. In bone cancer, all TNFAIP8 proteins were observed to be significantly upregulated except TIPE3 compared to the normal tissues. All the TIPE proteins were found to be highly upregulated from early childhood to adolescence with maximum expression observed in the age between 45 to 55 years. TIPE, TIPE1 and TIPE2 were found to be upregulated in females than males in both osteosarcoma as well as chondrosarcoma. The expression analysis of TNFAIP8 proteins suggests that upregulation of these proteins may be one of the additional molecular events required for bone carcinogenesis. Tumor necrosis factor (TNF) is a multifunctional cytokine and an endogenous tumor promoter that plays important roles in diverse cellular events such as cell survival, proliferation, differentiation, and death. On the other hand, TNF could be a cancer killer. The property of TNF in inducing cancer cell death renders it a potential cancer therapeutic, although much work is needed to reduce its toxicity for systematic TNF administration. Therefore, in this study we wanted to elucidate the effect of TNFα and TNFβ on proliferation, viability, cell death, colony formation and migration of MG-63 osteosarcoma cells. We found that both TNFα and TNFβ induces proliferation and viability compared to untreated MG-63 cells. It does not have much effect on the cell death of MG-63 cells even after 72 hours of treatment. Rather TNFβ decreases cell death and may play important role in tumorigenesis in bone. TNFα and TNFβ induces clonogenic potential of MG-63 cells compared to untreated cells. It also induces the migration potential of MG-63 cells as we observed almost 65-80% wound healing upon treatment with TNFα and 35-40% in case of TNFβ. To elucidate the role of TNFα and TNFβ and find its relationship with the expression of TIPE, TIPE1, TIPE2 and TIPE3 we performed real time PCR and western blot. The expression of all the four TIPE proteins i.e. TIPE, TIPE1, TIPE2 and TIPE3 were found to be upregulated upon treatment with 0.1nM TNFα and TNFβ. Therefore, we can conclude that TNFα and TNFβ regulate the expression of TIPE proteins and involve in tumorigenesis in bone by regulating different hallmarks of cancer i.e. Survival, proliferation and migration. However, further investigations will be performed to decipher the actual function and underlined mechanism of action of this family of proteins in the carcinogenesis of bone.

Overexpression of neutrophil gelatinase-associated lipocalin receptor in breast cancer and associated with clinical prognosis

Krishan Kumar Thakur and Ajaikumar B Kunnumakkara*
Cancer Biology Laboratory and DBT-AIST International Laboratory for Advanced Biomedicine (DAILAB), Department of Bioscience and Bioengineering, Indian Institute of Technology Guwahati, Assam-781039, India.

*Email: kunnumakkara@iitg.ernet.in

Breast cancer is the most common cancer and the leading cause of cancer death among women worldwide. According to GLOBOCAN 2018, 2.1 million (11.6%) new cases were diagnosed with breast cancer. Breast cancer is a heterogeneous disease of different biological subtypes recognized by gene expression study using DNA microarray and immunohistochemistry. Triple-negative breast cancer (TNBC) is a cancer that tests negative for the estrogen receptors, progesterone receptors, and the human epidermal growth factor receptor 2 protein over expression. TNBC subtype comprised about 15-20% of all breast cancers with poorer overall prognosis and high risk of recurrences assessed by relapse-free survival. TNBC is highly aggressive subtype of tumor as it lacks well-defined molecular target for the disease, so treatment of patients with this has been very difficult. Recent studies reported that neutrophil gelatinase-associated lipocalin (NGAL) were overexpressed in breast cancer patients and this overexpression was related with the severity of disease. Therefore, we investigated the expression of NGAL receptor (NGALR) in tumor sections obtained from patients with breast cancer, and compared these results with the clinical characteristics of the patients. Using immunohistochemical assays, the expression levels of NGALR were found to be up-regulated in breast cancer tissues, and to be related to tumor grade ($p < 0.05$). These findings suggest that NGALR expression is frequently up-regulated in breast cancer, and closely associated with poor clinical outcome.

Miniaturized Nanobiosensor design for fast diagnosis of pulmonary infection

Kuldeep Mahato[1], Ira Bhatnagar[2]*, Pranjal Chandra[1]*
[1]Department of Biosciences and Bioengineering, Indian Institute of Technology, Guwahati, Assam, INDIA
[2]CSIR- Center for Cellular and Molecular Biology, Hyderabad, Telangana, INDIA

Invasive Aspergillosis (IA) is a most common invasive mold in global context. The risk of developing its lethal form is higher in immunocompromised patients suffering from AIDS, neoplastic diseases, renal and bone marrow transplantation etc. IA causes by virulent strains of Aspergillosis sp., which mainly includes A, fumigatus, A. flavus, and A. terrueus. These species synthesize a secondary metabolite known as gliotoxin (GTX), one of the established biomarker of IA; where infectious gene plays an important role for its biosynthesis. In this present work, we have fabricated a nanobiosensor targeting the infectious gene for a rapid, selective and highly sensitive detection of IA. Here, we have fabricated a biosensing probe using nano-gold containing composite and characterized the same using electrochemical techniques. Thereafter, we have optimized of experimental condition and assessed the analytical performance of fabricated nano-biosensing probe. To test the compatibility of fabricated probe in clinical application, we have studied the biosensor by examining in real sample matrix. The biosensing probe was also studied for its reusability, where the biosensor is capable of delivering the detection for seven regeneration cycles.

Keywords: Nanobiosensor, Invasive Aspergillosis, Electrochemical Biosensor, glipT gene

3,5-dihydroxy-4',7-dimethoxyflavone: structural characterization, enzyme kinetics, and in-silico approach against melanogenic activity

Manish Kumar Gupta, Latha Rangan*
Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati Assam

*lrangan@iitg.ac.in

Tyrosinase (EC 1.14.18.1), a predominant multifunctional enzyme, plays an imperative role in pigment production. It essentially contributes to the production of melanin, but excessive production of melanin leads to hyperpigmentation disorders like age spots and melanoma. Tyrosinase is involved in the browning of fruits and vegetables as well as in the molting process of agricultural pests. Hence, it is necessary to screen for safe and highly prospective tyrosinase inhibitor from a natural source. Natural source of the bioactive compound has a less toxic effect. In perspective of this scenario, we isolated a flavone, 3,5-dihydroxy-4',7-dimethoxyflavone, from leaves of Alpinia nigra (family Zingiberaceae). About 50% of inhibition was determined by 40 micromolar of the compound. In silico (docking) study showed that the compoundbound with the active site of the enzyme. Further, the interaction of the compound with the amino acid residues of tyrosinase has been validated through fluorescence quenching studies. These results suggests that 3,5-dihydroxy-4',7-dimethoxyflavone can be targeted a potential

Biochemical characterization of CRISPR-Cas Cascade complex subunit protein-Cas7 in Leptospira interrogans Copenhageni Strain Fiocruz L1-130

Md. Saddam Hussain and Manish Kumar
Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India
Email IDs: sh13ebt013@iitg.ac.in; mkumar1@iitg.ernet.in

The CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats)–Cas (CRISPR associated proteins) system is a small RNA-guided adaptive immune system that confers immunity in prokaryotes against alien genetic elements. The elimination of invading genetic elements by CRISPR-Cas type-I system involves a Cascade (CRISPR-associated complex for antiviral defense) complex that comprises of Cas5, Cas6, Cas7, and Cas8 proteins along with crRNA. Cas7 protein is a major constituent of Cascade complex that oligomerizes along the length of crRNA to form a helical-backbone of Cascade complex. Leptospira interrogans, the causing agent of zoonotic disease- Leptospirosis, is the only known pathogenic spirochete harboring the CRISPR-Cas defense system. In vitro activity assessment of rCas7 protein of Leptospira interrogansCRISPR-Cas type I-B system reveals it to be a Mg^{2+} ion-dependent endodeoxyribonuclease that can digest DNA non-specifically in a conformation-independent manner. Leptospira rCas7 has been found inert for pre-crRNA however against other RNA substrates it showed sequence independent RNase activity which is inhibited by the divalent metal ion in a concentration-dependent manner. These findings on Leptospira Cas7 point towards the possibility of a highly regulated and divergent mechanism of CRISPR-Cas interference in Leptospirainterrogans compared to other organisms. Further functional characterization of Cas7 is warranted to decipher their specific role in ensuring adaptive immunity to Leptospira against intruding genetic elements.

Keywords: Leptospira interrogans,Leptospirosis,CRISPR-Cas, Cas7, endodeoxyribonuclease, RNase.

Saccharification of Sorghum durra by Chimera (β-glucosidase + endo β-1,4 glucanase; CtGH1-L1-CtGH5-F194A) and Cellobiohydrolase (CtCBH5A) for bio-ethanol production

Mohanapriya.N*, Shweta Singh, Sumitha Banu, Priyanka Nath and Arun Goyal
Carbohydrate Enzyme Biotechnology Laboratory, Department of Biosciences and Bioengineering.
Indian Institute of Technology Guwahati, Guwahati, Assam-781039, India.

E-mail: mpriya219@gmail.com, mohan174106036@iitg.ac.in

The population boost and increasing energy consumption has aroused the need for alternative fuels like bioethanol. Lignocellulosic biomass has been a promising source for bioethanol production because it contains approximately 50% (w/w) of cellulose. The plant sources like Sorghum contain 55% (w/w) holo-cellulose and can be effectively used. This study deals with enzymatic saccharification of acid assisted alkali pre-treated Sorghum durra biomass using enzymes CtGH1-L1-CtGH5-F194A (Chimera constructed from β-glucosidase and a mutant endo β-1,4 glucanase) andCtCBH5A (Cellobiohydrolase) followed by simultaneous fermentation (SSF). The biochemical characterization of the enzymes was performed for various conditions, i.e. temperature, pH and reaction time. The optimized parameters for saccharification using pretreated substrate for obtaining maximum total reducing sugars (TRS) were, reaction time (24 h), temperature (30°C), substrate concentration (3% w/v), enzyme ratio Chimera: Cellobiohydrolase (2:3) and total enzyme concentration (350 U/g). Thus, these conditions were utilized for bioethanol production of Sorghum biomass by SSF process.

Keywords: Acid-assisted alkali pretreatment, Enzymatic saccharification, Sorghum, SSF, TRS.

Reference

1. Banu, S.; Sharma, K.; Rani, A.; Moholkar, V. S.; and Goyal, A., Comparative analysis of pretreatment methods on sorghum stalk agrowaste for holocellulose content, Preparative biochemistry and biotechnology,2018. ISSN: 1082-6068.

Repurposing and revival of drugs: A therapeutic option against tuberculosis

Monica Sharma, Sooram Banesh, Vishal Trivedi,

Malaria Research Group, Dept. of Biosceinces and Bioengineering, Indian Institute of Technology Guwahati, Assam, India

Tuberculosis (TB) is one of the most ancient dieases of mankind which still remains a major cause of death worldwide despite the discovery of effective and affordable therpeutic agents more than 50 years ago. According to WHO globally, 10 million people were reported to develop TB. This disease is caused by Mycobacterium tuberculosis H37Rv, that is transmitted primarily via the respiratory route. Despite the availability of short course chemotherapy (DOTS) and Bacillus Calmette-Guerin (BCG) vaccine, current TB drug development efforts are not sufficient to end the global TB burden. Additionally, the emergence of multi-drug resistant tuberculosis (MDR-TB), defined as tuberculosis is caused by bacteria resistant to the two first-line anti-tuberculosis drugs rifampicin and isoniazid, is especially alarming. According to WHO, there were an estimated 4.1% of new cases and 19% of previously treated cases with MDR/RR-TB in 2016. In this regard, the concept of re-purposing of already approved drugs offers a wide scope to challenge the diseases. Drug re-purposing can be done with high throughput virtual screening of compounds from FDA approved library, and the database can be used to reposition new potent drugs. On the basis of binding energy and docking score based parameters, binding mechanics of selected compounds can be evaluated at molecular level. Drug re-purposing seems to be a safer and quicker approach to rely on and find new anti-tuberculars from already examined and approved drugs for human use.

Study on human mesenchymal stem cell differentiation

Vishnu K,, Bithiah Grace Jaganathanan

Department of Biosciences and Bioengineering, IIT Guwahati, India

MSC are multipotent stem cells, which can be differentiated into multiple lineages based on the physical and biochemical cues in the microenvironment. Here we studied the role of Piezo-1 protein, which is a known mechanosensor and its role in lineage commitment of MSC using a chemical activator and analysed for its effect in proliferation, differentiation, migration and marker expression in stem cells. Dedifferentiation and lineage commitment of MSC have important role in regenerative medicine and tissue engineering. Where the cells from one's own body can be used for tissue regeneration. To study the effect of dedifferentiation the cells were induced with specific media for different sets of days, switched to the different lineage media, and analysed for its lineage commitment using staining and gene expressions.

Piezo-1 activation using its chemical activator yoda showed similar proliferation when compared to untreated stem cells. The phenotype analysis showed higher expression of CD49e, which is an integrin having role in differentiation of stem cells into osteogenic lineage. Similarly wound healing assay showed that the migratory speed of the cells were reduced after the activation of piezo-1 channel. F-actin staining showed increased polymerization after activation of piezo-1. The lineage commitment studies showed that cells tends to dedifferentiate until the 7^{th} day of pre-treatment with the induction media and the F-actin staining gave a conclusive result on the morphology of the cells in each different conditions.

A fungal based system for the synthesis of vitamin D and studying its relationship with zinc homeostasis

Nayan Mani Bania, Ranjan Tamuli and Utpal Bora
Department of Bioscience and Bioengineering, Indian Institute of technology, Guwahati, India

Vitamin D is critical for bone mineralization and muscle health. Adequate exposure to sun light is required to meet the requirement of vitamin D in both children and adult human beings. However, due to modern day life style, exposure to sunlight is inadequate, which is a major cause of vitamin D deficiency. Vitamin D deficiency may cause several disorders in human. Vitamin D deficiency is also recognized as an epidemic in India. Although, vitamin D supplements are currently available in the market, these are of mostly of animal source that limits its availability and acceptability to all. Therefore, we investigated a fungal system using Calocybe indica (milky mushroom), for vitamin D synthesis in large quantities. We are also examining the possibility of using the model fungus Neurospora crassa to investigate the relationship of vitamin D to zinc homeostasis in the body. We studied initial phenotypic analysis ofthe N. crassaΔzrc-1 mutant. The ZRC-1 protein is associated with maintaining zinc homeostasis in the cell. The Δzrc-1 mutant shows altered phenotypes like reduced conidiation, radial growth rate, sensitivity to high zinc level, and high sensitivity to stress conditions. We hope to standardize a system for vitamin D synthesis and determine the relationship of vitamin D to zinc homeostasis.

Investigating the role of Pex30 in peroxisome biogenesis

N. M. Deori1 and S. Nagotu1

1 Department of Biosciences and Bioengineering, IIT Guwahati, India

Peroxisomes are dynamic single membrane-bound organelles whose number and function may vary according to the need of the cell. Previous studies have reported that peroxisomes interact with other surrounding organelles like mitochondria, lipid droplet, endoplasmic reticulum (ER) etc in order to optimize their multiple cellular functions. Pex30 is a peroxisomal protein that resides in the endoplasmic reticulum (ER) and associates with peroxisomes to regulate peroxisome biogenesis. Our study aims to understand the importance of this dual localization of Pex30 in both peroxisome inducing and non-inducing growth conditions. For this we have constructed Saccharomyces cerevisiae strains expressing Pex30-GFP and GFP-Pex30. A very interesting difference in localization pattern for both the fusion proteins was observed by fluorescence microscopy. It was observed that Pex30-GFP co-localizes partially with both DsRed-SKL, a peroxisomal marker and Sec63-mRFP, an ER marker whereas GFP-Pex30 exhibits a clear co-localization with Sec63-mRFP but not with DsRed-SKL.

Our insilico analysis identified that Pex30 also interacts with the lipid droplet proteins Erg6, Pet10 and the mitochondrial protein Mdm10. Localization of Pex30 in cells deleted for these genes was studied. Our microscopy and western blot analysis showed similar localization patterns and expression levels of Pex30-GFP and GFP-Pex30 in these strains as compared to WT cells. The peroxisome number and morphology examined in these mutant strains showed distinct puncta characteristic of peroxisomes similar to WT cells. To study post-translational modifications (PTMs) in Pex30, His-tagged Pex30 protein was expressed under the control of an inducible promoter in yeast. Following purification, Mass spectrometry will be performed to identify and confirm the residues that undergo phosphorylation. Our future work aims to perform site-directed mutagenesis on these residues and study the role of PTMs in the targeting and function of Pex30.

Optimality of Papaya Drying Processes from Nutritional Perspective

Paushali Mukherjee, Ramgopal Uppaluri and Latha Rangan
] Department of Biosciences and Bioengineering, IIT Guwahati, India
Department of Chemical Engineering, IIT Guwahati, India

E-mail: paush174106041li@iitg.ac.in

The social and industrial fabric post globalization era is indicative of improved consumer lifestyle, rapid urbanization and high disposable income, all of which prompt towards ever increasing demands for ready-to-eat foods in the market. Papaya is abundantly produced in the North-east India and its ready-to-eat food applications are in niche. Raw and ripe fresh papayas constitute significant water content which prompts for their rapid spoilage. Drying through sun/oven/tray processes effectively reduces water content and enhances preservation through effective resistance towards microbial attack and post-harvest loss. Thereby, the return on investment can be increased significantly for the farmers through enhanced consumption of the dried fruit throughout the year. With moderate infrastructural availability in the region, oven and tray drying processes can be regarded as the most suitable and scalable processes for dried papaya production and ready-to-eat preserved papaya foods.

This work refers to unripe Papaya (Carica papaya L.) drying to effectively maximize retention of antioxidants and Vitamin C content in due course of the process. Both oven and tray drying processes have been optimized in terms of their process parameters (drying temperature and time) for constant sample thickness and fixed air velocity (tray dryer). For comparison purposes, fresh unripe and ripe papaya have been as well evaluated for the said parameters. Among both cases, the tray drying process provided maximum retention of nutritional parameters (antioxidant activity, vitamin c content and

moisture content for an optimized drying temperature and time respectively). Thereby, it is apparent that drying is effective to retain the desired nutritional parameters which are highly relevant for medicinal purposes and food industry. These experimental findings are eventually utilized towards an effective ready-to-eat soup formulation with unripe papaya.

Advanced Gene Therapy: Future of Cancer Therapeutics

Plaboni Sen and Siddhartha Sankar Ghosh
Department of Biosciences and Bioengineering, IIT Guwahati, India
Centre for Nanotechnology, IIT Guwahati, India
E-mail: plaboni@iitg.ernet.in

Escalating number of deaths worldwide due to cancer is now crucial for the exploration of efficient alternatives to radiotherapy and conventional chemo therapy, which has poor prognosis and less efficiency, along with high mortality rate. The dawn of gene therapy has paved a way to combat various diseases, including cancer. We have designed multiplex systems targeting specific signalling pathways in cancer. Modified genes of different origins, viz., human, bacterial and plant, for the determination of their potential effect on proliferation and signal transduction by inserting into mammalian cancer cells.

Novel approaches are designed to treat multidrug resistant glioblastoma, where conventional anticancer drugs cease to work alone or in combination. In particular, by overexpressing the IkB gene, a cellular inhibitor of NFkB signaling pathways, we observed chemosensitization of the glioblastoma cells.

Our group also exploited the antitumor property of the gap junction (GJ) protein, connexin-43 (Cx43) in conjunction with the artesunate (ART), a plant-based active anti-malarial compound. GJ deficient MCF-7 cells transfected with Cx43 gene showed an increased sensitivity towards ART treatment and required a significantly lower dose of ART to attain its IC50, as compared to parental cells. Revealing that expression of Cx43 helped in reducing the dose dependent cytotoxicity of ART as well as enhanced the bystander apoptosis of the neighbouring cells.

One crucial aspect of gene therapy is its successful delivery to tumor cells. The development of gene delivery vehicles for preferential delivery of the therapeutic agents to the tumor cells and avoiding undesired accumulation at other sites is of utmost importance. Nanoparticle mediated drug delivery systems have been devised in our laboratory that offers promising opportunities. Their advantages like small size and fluorescence properties, enable biomaging, monitoring of controlled release, and specific targeting of cancer cells, assists the evolution of the novel field of cancer theranostics. In this regard, a nanocomposite, consisting of highly fluorescent gold nanoclusters and the biopolymer chitosan, has been developed, which could easily be converted into nanoparticles and would form a stable polyplex with suicide gene for induction of apoptosis. Thus, we devised simple strategies offering the scope of using combination module for cancer therapy.

Two dimensional µPAD for alcohol detection

Pooja Rani Kuri, Phurpa Dema Thungon, and Pranab Goswami*
Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati,

E-mail-pgoswami@iitg.ac.in

A simple low cost "green" colorimetric alcohol biosensor configuration comprising of 2D paper microfluidic system with alcohol oxidase (AOx) entrapped in silk film was developed. AOx catalyses the oxidation of alcohols into their corresponding aldehydes (equation 1), along with the production of hydrogen peroxide (H_2O_2). This reaction was paired with peroxidase and the dye, ABTS (2,2_-azino-di[3-ethylbenzthiozoline-6-sulfonic acid]) to develop a colorimetric sensor (equation 2) (Thungon et al. 2017).

$$RCH_2OH + O_2 \xrightarrow{AOx} RCHO + H_2O_2 \quad (1)$$

$$H_2O_2 + \text{ABTS (reduced)} \xrightarrow{\text{Peroxidase}} H_2O_2 + \text{ABTS (oxidized) (colored)} \quad (2)$$

AOx was entrapped in Silk fibroin (SF) films to improve its stability. SF is a unique protein biopolymer, that possess inherent high stability to changes in temperature and moisture, along with being mechanically robust, due to the extensive network of physical cross-links (β-sheets) formed during the assembly process (Lu et al. 2009). Paper as a substrate for sensor design has many advantages such as power-free fluid transport via capillary action and a high surface area to volume ratio that improves detection limits for colorimetric methods (Cate et al. 2015). A 2D microfluidic paper-based analytical device (µPAD) was prepared using AKD inject printing to produce two-pattern hydrophilic zones and simple folding. One zone was used for sample and the other as detection zone for the colorimetric detection of alcohol. AOx entrapped silk film was placed on the detection zone. A small volume of sample was added to the µPAD, which was photographed after 15 min using a phone camera and the pixel intensity was obtained using Image J software. The resulting paper- based biosensor is sensitive, selective and employs low-cost substrate and is simple to manufacture.

References:

1. Cate. D. M., Adkins J. A., Mettakoonpitak J, Henry C. S., 2015. Recent Developments in Paper-Based Microfluidic Devices. Analytical Chemistry 87, 19-41.
2. Lu, S., Wang, X., Lu, Q., Hu, X., Uppal, N., Omenetto, F.G., Kaplan, D.L., 2009. Stabilization of Enzymes in Silk Films. Biomacromolecules 10, 1032–1042
3. Thungon, P.D., Kakoti, A., Ngashangva, L., Goswami, P., 2017 Advances in developing rapid, reliable and portable detection systems for alcohol. Biosensors and Bioelectronics

Abstract for Research Conclave 2019

Poulomi Adhikari1, Sachin Kumar1 and Rajkumar Thummer1
1 Department of Bioscience and Bioengineering, IIT Guwahati, India
E-mail: poulo174106001@iitg.ernet.in

A landmark study by Prof. Yamanaka and group unfurled a new arena of research of induced pluripotent stem cells (iPSCs), which garnered the attention of the global scientific community. These cells, very similar to embryonic stem cells, can be used for understanding developmental biology, disease modelling, drug discovery and toxicity testing, and autologous cell-based therapy. Thus, the wide range of applications necessitated exploration into non-integrative gene delivery approaches and currently, Sendai virus (SeV) based vectors are most commonly used due to the lack of the DNA phase and complete cytoplasmic life-cycle.In this project, we have cloned core reprogramming factors in a novel single-stranded RNA viral vector. This viral vector is very similar to SeV, antigenically distinct from common human pathogens and safe due to host range restriction. We incorporated restriction sites and gene sequences important for

viral replication and transcription to the factors using PCR. Simultaneously, the viral vector backbone was digested and dephosphorylated, and then ligated with the amplified insert. The ligated products were then transformed in E.coli. The picked colonies were screened for orientation using colony PCR and restriction digestion, and subsequently sequenced to determine the integrity of the gene sequence. In the near future, we will proceed with the production of the viral particles to generate integration-free iPSCs for various biomedical applications.

The prediction of stress shielding after fixation of subtrochanteric femoral fractures.

Pratik Nag, Souptick Chanda
Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati,

Proximal femoral fractures, commonly known as hip fractures, account for a large proportion of hospitalization among trauma cases. The problem associated with this type of fracture is that it causes immense pain when any stress is experienced in this area. Fixation techniques are basically of two types i) Intramedullary and ii) extra medullary. Intramedullary devices are stronger than extra medullary devices for the fixation of trochanteric fracture with subtrochanteric extension. It also requires shorter surgical time. Use of extramedullary devices such as dynamic condylar screws, blade plates or locking compression plates should be reserved for unstable fractures in young patients with the primary goal of restoring the anatomy.

Proximal femoral locking plate (PFLP) is a new type of extramedullary implant designed to offer optimum fixation of comminuted and highly unstable femur fractures. Dynamic Hip Screws (DHS) is considered as the standard fixation for extra capsular femoral fracture and yielded good results in the patients with stable intertrochanteric fractures. However, the fact whether PFLP or DHS is better remains debatable. Moreover, it has also been observed that there is no clear relation between the biomechanical and clinical studies with regard to the success of plate fixation devices. One important biomechanical parameter that affects adverse bone adaptation is the implant induced stress shielding of bone. The extent of stress-shielding is linked to the rigidity of fixations [1]. Bone apposition or resorption is directly related to the stress variations of the implanted construct. The plate has a considerably higher modulus and bears the bulk amount of the physiological load. Consequently, there exists a discrepancy of load sharing between the implant and the bone resulting in the bone being shielded from stress. At first the rigid fixation favours the primary bone healing but in later stages stress shielding leads to osteoporosis with decreased bone strength. Several studies have shown that stress shielding results from rigid internal fixation of plate [2-3].

The primary aim of this study was to understand the load transfer mechanism in a subtrochanteric femur fracture fixated with PFLP and DHS implant under physiological loading (F = 3kN). The extent of stress shielding was predicted by comparing between von Mises stresses of the intact and the implanted construct obtained from finite element (FE) models. The 3D FE models of the implanted and the intact femur were generated using the manufacturer supplied CAD model of a left femur. After analysis, it was found that the percentage stress shielding in the PFLP and DHS model was roughly 4.5% and 9.18%, respectively. It was also observed that the maximum stresses in both the cortical and the cancellous bone of the intact model were lesser compared to that of the respective bones in PFLP and DHS models.

References:

1. I. Claes, U. Palme and U. Kirschbavm, “Biomechanics: Principles and Applications”, Huiske, R, Van Campen, D and De Wijn, J. Martinus Nijhoff Publishers: The Hague, pp. 325-330,1982.

2. AJ. Tonino, CL. Davidson, PJ. Klopper and LA. Linclau, “ Protection from stress in bone and its effects: experiments with stainless steel and plastic plates in dogs”, J. Bone Joint Surge, Vol. 58-B, pp. 107-113,1984.

3. KH. Uhthoff and FL. Dubuc, “Bone structure changes in dog under rigid internal fixation”, Clin Orthop, Vol. 81, pp. 165-170,1971.

Investigating the role of PEX25 in peroxisome biogenesis in yeast

Rachayeeta Deb, Shirisha Nagotu

Organelle Biology and Cellular Ageing Lab, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India

Peroxisomes are single membrane bound dynamic ubiquitous organelles. Yeast peroxisomes have an interesting ability to induce peroxisome proliferation depending on the cellular environment which has made them attractive systems for studying peroxisome biogenesis. The importance of peroxisome biogenesis is emphasized by the existence of several inherited disorders in humans that are caused by defect in biogenesis and are called peroxisome biogenesis disorders (PBDs). Peroxisomes multiply by growth and division i.e. they proliferate by the fission of pre-existing peroxisomes. Elongation of the peroxisomal membrane is a crucial step in the biogenesis pathway. In yeast, the peroxins which play a vital role in membrane elongation and peroxisome proliferation are the Pex11 family proteins (Pex11, Pex25 and Pex27). The role of Pex11 in peroxisome biogenesis is studied extensively, while the role of Pex25 in this process is not yet deciphered.

In this study we aim to characterize the role of Pex25 in peroxisome biogenesis in Saccharomyces cerevisiae. For this, C and N-terminal GFP fusion plasmids of Pex25 were constructed. The expression and localization of these constructs were studied in wild type cells under peroxisome inducing and non-inducing conditions. In addition, to further understand the function of Pex25 in peroxisome biogenesis, expression of both Pex25-GFP and GFP-Pex25 were analyzed in strains deleted for the interacting partners of Pex25. To understand the regulation of Pex25, post-translational modification like phosphorylation will be studied. For this, an HA-tagged fusion protein is expressed in yeast. Future work aims to study whether phosphorylation of Pex25 has any role in its targeting and function.

Ayurveda: Ancient Science with Potentials to Cure Cancer

Rakesh Kumar Singh and Vishal Trivedi*
Department of Biosciences and Bioengineering, Indian Institute of Technology-Guwahati, Guwahati, Assam, India-781039

vtrivedi@iitg.ac.in

Cancer is one of the major diseases recording highest mortalities worldwide. There are so manysynthetic, biological drugs evolved to treat this disease with a good success rate. Among the drugs available ayurvedic formulations are recent and do have less side effects as compared to the synthetic ones. The component in most of the ayurvedic formulations is Triphala which is known for its mild to moderate anticancer activity. Based on the triphala content beheld, various ayurvedic formulations were selected and tested on the breast cancer cell line (MDAMB-231). Among all Shukramatrika bati(13.95% triphala content) has potential toxicity on MDAMB-231 cell line. Apart from MDAMB-231, it has also significant cytotoxicity on various cancer cell lines like CaCo2(epithelial colorectal adenocarcinoma cells), HeLa (cervical cancer cells) and MCF-7 (breast cancer cells). Further

investigation into the mechanism, concluded that Shukramatrika bati treated MDAMB231 and HeLa cancer cell lines showed increased ROS levels, disruption of mitochondrial membrane potential, release of cytochrome c from mitochondria and increased activity of Caspase-3 and Caspase-9 that confirmed that Shukramatrika bati has potential cytotoxicity to induce apoptosis in MDAMB231 and HeLa cancer cell lines through intrinsic pathway (Mitochondrial mediated death pathway).

Preparation of the nano-bentonite by using sonochemical and co-precipitation method and their application in dye removal

In the present work, we have used various strategies for the preparation of nano-bentonite by using the sonochemical method with ethanol, and co-precipitation method with HCl, H_2SO_4, and HNO_3 followed by ball milling. The prepared nano-bentonite samples were characterized by using Fourier Transformation Infrared Spectroscopy, Dynamic Light Scattering Surface Charge Analyzer, Energy Dispersive X-ray Spectroscopy, Field Emission Scanning electron microscopy, and Brunauer Emmett Teller Surface Analyzer. All designed nano-bentonite systems were used for the removal of various dyes from their respective aqueous solutions. Physiochemical conditions were optimized for maximum removal of dyes and obtained data was fitted to kinetic models followed by isotherm models to study the adsorption mechanism. The adsorption process was found to be exothermic and spontaneous as well as reusability of the system was explored. The designed system is cost-effective, easy to handle, highly efficient, eco-friendly, and reusable that makes the present system attractive for removal of the dyes from aqueous solution at a larger scale.

Keywords: Adsorption; Sonochemical; Co-precipitation; Nano-Bentonite;

Role of RHO GTPases and Bone Morphogenetic Proteins in Breast Cancer Metastasis

Renu Sharma , B. Dr Bithiah Grace Jaganathan
Department of Biosciences and Bioengineering, IIT Guwahati, INDIA

Breast cancer is the most common cancer in women. The incidence of breast cancer increases with age and this is true in India like rest of the world. Around 70% of all patients living with advanced breast cancer have bone metastasis. Metastasis involves a complex series of steps in which cancer cells leave the original tumor site and migrate to other parts of the body. With an osteolytic metastasis, the cancer cells promote severe bone loss significantly increasing the risk of bone fractures. Matrix metalloproteinase (MMPs), Bone Morphogenetic proteins (BMPs), Ras homolog gene family member A (RHOA) and other factors like Tissue inhibitor of metalloproteinase (TIMPS) are key factors for metastasis.

To study the role of BMPs and RHO GTPase on breast cancer metastasis two model breast cancer cell lines MDA-MB-231 (ER^- PR^- $HER2^-$) and MCF-7 (ER^+ PR^+ $HER2^-$) were used. We found that LDN-193189 hydrochloride (potent inhibitor of BMP pathway) treated cells shows reduction in both proliferation as well as migratory speed of cells. Higher expression of E-cadherin and changes in cytoskeleton arrangement of the MCF7 after LDN treatment shows that BMP signalling pathway is one of the significant pathway for migration. Reduction in CD44+ population after LDN treatment in MDA-MB-231 shows that metastasis effect of cells can be reversed by altering BMP pathway. Higher expression of tumour suppressor gene like ACVR1B after LDN treatment in MDAMB-231 proves that LDN reduces stemness of breast cancer cells. Higher expression of SNAI-2, a mediator of EMT and

VIMENTIN, a mesenchymal marker after BMP4 exogenous addition, support that BMPs are responsible for migration and metastasis of cells.

Y-27632 dihydrochloride (ROCK inhibitor) promotes proliferation as well as migration speed in both the cell lines by altering cell junctions. Y27632 treatment induces changes in morphology, which support the invasion and migration assay.We are studying the signaling pathways that are regulated by Rho GTPases and BMPs for understanding the role in metastasis which will help in identifying novel targets to inhibit breast cancer metastasis.

Stress evaluation in non-edible oil crops – anatomical, physiological and phytochemical studies

Reshmi Das and Latha Rangan*
Indian Institute of Technology Guwahati, Assam

Increase in population and need of technology for survival has augmented the need for an alternative energy, which is being fulfilled by biofuel. Among many biofuel producing plants, Pongamia pinnata, Jatropha curcas, Ricinus communis and Mesua ferrea are considered in the present research to examine the effect of abiotic stress (drought and salinity) on several anatomical and physiological parameters which were responsible for plant growth and yield. This study was essential for a clear perception of plant resistance to stress conditions. Stomatal length, pore size, average number of stomata and epidermal cell area were estimated and found to be decreasing significantly in plants under stress conditions. Relative water content, root: shoot ratio, total chlorophyll content, and relative growth rate were found to be lower in stressed plants as compared to the control. In addition, phytochemical study was carried out with regard to different industrially important primary and secondary metabolites. An increase of 11% was observed in secondary metabolites of stressed plants as compared to the control where as 10% decrease was estimated with regard to the primary metabolites. Though the plants experienced abiotic stress, minimal differences were observed in the estimated phytoconstituents. Thus, this study suggests that the studied plants are idle candidates to be grown under abiotic stress condition without much productive loss.

To gain insights into the function of yeast Dnm1 in organelle biology and cellular ageing

Riddhi Banerjee and Shirisha Nagotu
Organelle Biology and Cellular Ageing Lab; Department of Biosciences and Bioengineering
Indian Institute of Technology Guwahati, Assam

All living systems are based upon network of interactions ranging from ecological communities to intracellular organelles. Each eukaryotic organelle acts as a functional unit that needs to perform a specific task along with maintaining interaction with other cellular compartments for overall homeostasis. Prime examples of such organelles include mitochondria and peroxisomes which are dynamic in nature and interact with surrounding organelles to regulate their biogenesis and function. While mitochondria undergoes continuous fission and fusion to meet the cellular energy needs peroxisomes on the other hand can change its number and size based on different environmental stimuli. Evolutionarily conserved GTPase family member, dynamin related protein 1 (Drp1) together with its accessory proteins forms a complex regulatory network that is essential to maintain the dynamic behaviour of these organelles. Dynamin family proteins undergo a repeated cycle of assembly and disassembly onto the target membrane, binding and hydrolysis of GTP resulting in remodelling of membrane curvature. Altered activity of Drp1 contributes to the pathophysiology of several human diseases predominantly neurodegenerative diseases like refractory epilepsy, amyotrophic lateral

sclerosis, Parkinson's, Huntington's and Alzheimer's disease. Another aspect of Dnm1 that requires thorough investigation is its role in cellular ageing. Absence of yeast homologue (Dnm1) is reported to hamper organelle fission thereby leading to increased chronological lifespan (CLS) in Saccharomyces cerevisiae. Such multitudinous activities of Drp1 require a tightly regulated mechanism which can potentially be fulfilled by post translational modifications (PTM) of the protein.

In this study we aim to investigate the role of PTMs especially phosphorylation on the function of Dnm1, the yeast homolog of human Drp1. With the help of a C-terminal GFP construct and organelle marker cellular localisation was analyzed by both fluorescence microscopy. Purification of Dnm1 with suitable tag followed by mass spectrometry analysis was performed to determine and confirm the putative phosphorylation sites identified insilico. Site directed mutagenesis of MS identified and literature reported Dnm1 PTM will provide us further insights of Dnm1 function. Future work aims to identify the role of Dnm1 in yeast CLS using differential proteomics approach.

Effect of extraction solvent system on the native structure of the plant metabolites: A study on para- coumaric acid from Mesua ferrea

Sanjana SenthilKumar, Rajaram Swaminathan*, Latha Rangan*

Applied Biodiversity Lab, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati, India.

*lrangan@iitg.ac.in

Natural products from plants have been the foundation of traditional medicine which has directly or indirectly contributed in the modern drug development. With increasing demand, isolation and characterization of bioactives and improvisations on the extraction techniques for better yield are being hugely explored. One of the most important factors is to choose the right technique, solvents and conditions for the particular compound of interest. Among the solvents for the primary extraction of compounds, acidified methanol/ethanol is a very popular method owning to higher yield. Acidic alcohol provides the perfect condition for esterification reaction. We report such chemical modification of a plant phenolic acid, para-coumaric acid from the leaves of Mesua ferrea to its ester form, methyl 4-hydroxycinnamate during the crude extraction preparation. The esterified form of the compound was initially isolated and characterized using Single Crystal- XRD, HR-MS analysis and was further proven as an artifact by Reverse phase- HPLC. It can be concluded that extraction solvents and techniques must be rightly chosen to obtain the metabolites in their native form.

Role of Sorcin in Oral Squamous Cell Carcinoma (OSCC)

Bano Shabnam, Harsha Choudhary, Ajaikumar B. Kunnumakkara*
Cancer Biology Laboratory, DBT-AIST International Laboratory for Advanced Biomedicine (DAILAB), Department of Biosciences & Bioengineering, Indian Institute of Technology Guwahati,

Email: kunnumakkara@iitg.ac.in

Oral cancer (the cancer of lips, mouth and tongue) is one of the most prevalent cancers in the Indian subcontinent. The various incidences and patterns of oral cancer can be due to some regional differences in the prevalence of specific risk factor. The low-income groups in India are affected mostly due to a wide exposure to risk factors such as tobacco chewing. The North East region in India especially Assam and Meghalaya is turning to be the stock home of Oral cancer. There are no efficacious biomarkers and drugs for the management of this disease. Therefore, there is an urgent need to develop biomarkers, drug targets and drugs for this disease. Recent studies have reported that sorcin (Soluble resistance related calcium binding protein) is a small soluble penta EF family (PEF) of calcium (ca2+) binding protein has role in the progression of cancer. It is a 22 KDa protein. "SRI", the sorcin encoding gene was found to be located on human chromosome seven (7q21.12) with nine exons and the sorcin protein was composed of 198 amino acid residues. It has been described to perform essential roles in the regulation of calcium (Ca2+) homeostasis, apoptosis, cancer development and multidrug resistance (MDR). However, Sorin is greatly emphasized for the development of malignancy as well as multidrug resistance (MDR) in cancer cells. It has a role in the advancement of cancer by inducing invasion, migration, metastasis and epithelial mesenchymal transition (EMT). The current study was aimed at evaluating the expression and role of sorcin in human oral cancer development.

Analysing the characteristic absorption and fluorescent properties of charged amino acids in Arginine/Aspartate rich protein: Symfoil-4P

Shah Ekramul Alom, Rajaram Swaminathan*
Dept. of Biosciences and Bioengineering, Indian Institute of Technology, Guwahati, India

*E-mail: rsw@iitg.ac.in

ProCharTS refers to **Pro**tein **Char**ge **T**ransfer **S**pectra which was recently developed as a novel label free tool to detect structural transitions and aggregation among charged proteins [1]. Charge transfer in a protein arises when charged sidechains in Lysine and Glutamate along with the polypeptide backbone undergo photo-induced electron transfer. It is shown that such photo-induced charge transfer (CT) results in population of electronic CT states giving rise to moderate electronic absorption from 250 nm till 800 nm. Interestingly, the intensity of protein charge transfer absorption is directly linked to spatial proximity between charged residues, i.e. Lysine and Glutamate arising from protein 3D fold [2]. Now the question that remains unanswered is whether apart from Lysine [3] and Glutamate, any other charged amino acids like Arginine, Aspartate and Histidine also show such electronic absorption in that wavelength range. Recently, the absorption spectra of naturally charged amino acids (Lys, Glu, Arg, Asp and His) has been examinedusing time dependent density functional theory calculations extracted from solution phase protein structures generated by classical molecular dynamics simulations [4] but no in vitro studies regarding these absorption features of these amino acids have been carried out till date.

Here, we investigated the absorption and fluorescent properties of these charged amino acids in different salt and pH conditions. To get a better insight of the role of these amino acids in proteins, the PDB database was searched and a highly charged synthetic protein Symfoil-4P devoid of any aromatic amino acid with 30% charge content (mostly consisting of Arginine and Aspartate) was selected [5]. It will be of great interest to analyse the absorption and fluorescence features of this protein and depicting the structural transitions of this protein under various conditions using ProCharTS. Thus, the role of these charged amino acids viz. Arginine, Aspartate and Histidine to act as a label free intrinsic probe for charged proteins is a very intriguing topic to investigate.

References

(1) Ansari, M. Z.; Kumar, A.; Ahari, D.; Priyadarshi, A.; Padmavathi, L.; Bhandari, R.; Swaminathan, R. Protein Charge Transfer Absorption Spectra: An Intrinsic Probe to Monitor Structural and Oligomeric Transitions in Proteins. Faraday Discuss.**2018**, 207, 91-113
(2) Prasad, S.; Mandal, I.; Singh, S.; Paul, A.; Mandal, B.; Venkatramani, R. ; Swaminathan, R. Near UV-Visible Electronic Absorption Originating from Charged Amino Acids in a Monomeric Protein. Chem. Sci.**2017**, 8 (8), 5416–5433
(3) Homchaudhuri, L. and Swaminathan, R. Novel Absorption and Fluorescence Characteristics of L-Lysine
Chem. Lett.**2001**, 844
(4) Mandal, I.; Paul, S.; Venkatramani, R. Optical backbone-sidechain charge transfer transitions in proteins sensitive to secondary structure and modifications. Faraday Discuss.**2018**, 207, 115-135
(5) Longo, L.M.; Lee, J.; Blaber, M. Simplified protein design biased for prebiotic amino acids yields a foldable, halophilic protein. Proc. Natl. Acad. Sci. USA.**2013**, 110, 2135-2139

Ayurvedic Nanomedicine as Drug Delivery Vehicle for Cancer Chemotherapy

Shikha Jha and Vishal Trivedi*

Department of Biosciences and Bioengineering, Indian Institute of Technology- Guwahati, Guwahati, Assam, India-781039
Professor Vishal Trivedi,
vtrivedi@iitg.ac.in

Bhasmas are incinerated metallic or non-metallic preparations which are being used as therapeutic drugs in ayurveda. Several studies have reported that these bhasmas have nanoparticle like characteristics which makes it competent as nanocarrier to deliver drugs. In the current study, we proposed to test anticancer and drug carrying capacity of ayurvedic bhasmas. Preliminarily biophysical characterization of several ayurvedic bhasmas (Jasada bhasma, tamra bhasma, naga bhasma, vanga bhasma and manikya bhasma) was done using DLS, FESEM, EDX-FESEM, XRD and FTIR. These studies confirm the size and surface chemistry suitable for exploiting these formulations as nanocarriers to deliver anticancer drugs. Besides this, aqueous extract of ayurvedic bhasmas were tested for their potential anticancer activity. In vitro anticancer screening of aqueous extract of bhasmas against several cell lines was done and cell viability was measured by MTT reduction assay. Anticancer screening of crude aqueous extract of several bhasmas indicate that these preparations have moderate effect on cell viability of different cancer cell types. Among these bhasmas, Manikya bhasma showed considerable cytotoxicity against the different types of cell lines (breast cancer MDAMB-231 cells, cervical cancer HeLa cells, osteosarcoma MG-63 cells, colon cancer DLD1 & HCT-116 cells and HEK-293 cells), for which the IC50 values were calculated. Our preliminary analysis highlights the immense potential of these ayurvedic preparations as nanocarrier to deliver drugs and reservoir of bioactive agents to provide suitable anticancer agents. Further studies are on the way to optimize the parameters to exploit them as nanocarrier and explore the downstream biological pathways to drive the cellular death in cancer cells.

Keywords: Ayurveda, Bhasmas, Drugs, nanoparticle, drug carriers, viability

INSIGHTS INTO THE FUNCTIONAL DYNAMICS OF AN INTRINSICALLY DISORDERED ENZYME USING FLUORESCENCE BASED TOOLS

SHRUTIDHARA BISWAS, Rajaram Swaminathan

Dept. of Biosciences & Bioengineering, Indian Institute of Technology Guwahati-781039

Intrinsically disordered proteins(IDPs) are currently known to carry out a variety of crucial functions even though they lack a well-defined 3-dimensional structure. Nevertheless, they have been observed to perform

catalytic activities in very limited cases. Monomeric chorismate mutase (mCM) is one such rare disordered enzyme that can undergo efficient catalysis yet retain a flexible fuzzy structure even after complex formation with substrate/ligand. mCM can be used as a model system to expand our knowledge of enzymatic catalysis as well as our ability to control functions performed by disordered proteins. Wild mCM enzyme is a two tryptophan and single cysteine protein, making it a relatively simple and suitable system for fluorescence based studies. In our study, we have utilized FRET and lifetime fluorescence measurements of tryptophan and fluorophore-labeled cysteine to collect information on the transitions occurring in the functional state of this enzyme. Alternations in secondary structure and dynamics of wild type mCM and few in-house generated mutants of mCM were investigated through kinetics, fluorescence, ANS assay and Circular Dichroism experiments. Major secondary structural changes were observed in a cysteine deficient double mutant (w24k/c69a) of mCM. Time-Resolved Fluorescence measurements could very sensitivity detect local changes in structure of mCM after TSA binding. The single tryptophan mutant (w24k) of mCM displayed substantial shift between the Trp-Cys FRET pair of approximately 6 Å after addition of the ligand. Moreover, a triple mutant (w24k/c69a/a6c) also showcased a decrease in FRET distance from 29.4 Å to 25.2 Å after large excess of the ligand was used for binding. Lifetime fluorescence anisotropy measurements revealed expansion in structure of mCM due to mutations as well as compaction of structure in Wt mCM and mutant1 after ligand (TSA) binding. Our findings provide us with quantitative values for the local segmental transitions and compaction brought about in the functional state of a disordered enzyme. The sensitivity of this disordered protein to certain point mutations was also highlighted through our studies.

Stress Responsive signaling in Parasite: Potentials in Drug Resistance

Siddharth Neog1, Anil Kumad D1 and Vishal Trivedi1#

Department of Bioscience and Bio-Engineering, IIT Guwahati, India
#Corresponding author : Professor Vishal Trivedi,

E-mail: vtrivedi@iitg.ac.in

In the human body, the malaria parasite Plamodium is subjected to various stress constrains such as Redox stress, Osmotic stress, Starvation, ER stress etc. To dynamically regulate their biochemistry in response to these stresses, the parasite uses various signaling pathways for sensing and modulation. Recent studies shows that enhanced adaptive responses against oxidative stress and protein damage are associated with decreased drug susceptibility and development of resistance. Most of the major antimalarials such as Artemisinin and Chloroquine target Redox regulation and detoxification occurring in Digestive Vacuole of the parasite. The DV is also known to be the hub of stress signaling pathways. As a result it was found that mutations in key genes such as PfCRT and Pfmdr1 are responsible for enhanced efflux of chloroquine resulting in resistance. Delayed susceptibility and resistance to Artemisinin and its derivatives are attributed to PfATP6, Pfmdr1, GSH, PfPK4 and K13 which are major players in Redox stress responsive pathways. Induced stress from drugs also causes loss of balance in protein trafficking and thus inducing ER stress. In response, the parasite undergoes gametocytogenesis and dormancy with effectors like AP2 transcription factors and cascade of enzymes in Ubiquitin Protein network which further diminishes the effect of the drugs as most of them are cleared from the body within a short span of time. Another major drug response group of pathways involves remodelling of erythrocytic membrane by secretion of various novel kinases and transmembrane proteins targeting RBC's cytoskeleton. This causes upregulation of PfEMP1 through interplay of MAPK and MEK signaling pathways resulting enhanced cytoadherence and pathogenicity. Amidst signaling proteins and complexes, secondary messengers like cAMP and cGMP and Ca^{++} involved in extensive stress response signaling during hypoxia and starvation are also found to be involved in development of drug resistance. All these evidence suggests that there is indeed an intricate link between stress

response pathways and drug resistance. On the account of increasing drug resistance cases against the major weapons in our arsenal, it is imperative to explore the stress responsive signal pathways in search of novel targets against the malaria pathogen.

Withaferin A as a Potential Anticancer Agent Against Oral Squamous Cell Carcinoma

Sosmitha Girisa, Harsha Choudhary, Devivasha Bordoloi, Kishore Banik, Krishan Kumar Thakur, Amrita Devi Khwairakpam and Ajaikumar B Kunnumakkara*
* Authors for correspondence
Dr. Ajaikumar B. Kunnumakkara, Ph.D, FRSM, Associate Professor (IITG) & Honorary Chair Professor (MGU),
Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati, Assam-781039, India

Email: kunnumakkara@iitg.ac.in;ajai78@gmail.com

Despite the advances in diagnosis and treatment for oral cancer, it still remains the sixth most common cancer in the world. The annually diagnosed cases with this cancer is reported to be 2, 63,000 patients approximately and mortality rate of 1,28,000 patients per year. About one third of the oral cancer cases are reported from India with 80,000 cases diagnosed annually and the North-Eastern states have the highest reported cases of oral cancer in India. The common therapies for this cancer are associated with severe side effects, chemoresistance and recurrence of tumor. Therefore, there is a need for the development of highly efficacious, safe and affordable therapies. In this regard, natural compounds are extremely vital on account of their minimal side effects for the prevention and treatment of oral cancer. One such potential compound is withaferin A isolated from Withania somnifera (Ashwagandha) possessing various pharmacological activities such as anti-inflammatory, immuno-modulatory, anti-angiogenesis, anti-carcinogenic, etc. In the current study, we have investigated the potential of withaferin A as an anticancer agent against oral squamous cell carcinoma (OSCC).The cell viability and proliferation percentage of OSCC cells was determined using MTT assay. It was observed that withaferin A inhibited the proliferation of OSCC cells (IC_{50}= 0.4µM) dose-dependently. Further, withaferin A inhibited cell migration, cell invasion and cell cycle progression of human OSCC cells effectively. Additionally, it was also observed that withaferin A suppressed the expression of various signalling proteins involved in OSCC. Collectively, our findings indicate that withaferin A possesses potential to serve as a promising anticancer agent for the treatment of human OSCC.

Keywords: Oral Squamous Cell Carcinoma (OSCC), Withania somnifera (Aswagandha), withaferin A

UNDERSTANDING THE ROLE OF ERK SIGNALLING PATHWAY IN BREAST CANCER CHEMORESISTANCE

A. Sreeja Dattachoudhury, B. Dr Bithiah Grace Jaganathan.

Department of Biosciences and Bioengineering, IIT-Guwahati, India

Breast cancer is one of the leading cause of death among patients worldwide. Majorly chemotherapy is one of the treatment options applied to cure the menace but unfortunately it fails due to several factors, one of them being chemoresistance. Chemoresistance, leads to recurrence of cancer in patience undergoing treatment. It is one of the crucial cause for relapse of the disease which happens due to

certain mechanism in cancer cells that oppose the effect of the chemotherapeutic drugs targeting the cells. The signalling pathways involved in the process of resistance either efflux out the drugs or make them insensitive to the molecular targets. One of the signalling pathways which gained much importance in this arena is the ERK signalling pathway due to its involvement in regulating the cancer cell mechanisms in a huge way. We are trying to look at how ERK signalling pathway regulates chemoresistance in breast cancer cells.

It has been observed that ERK pathway inhibition led to reduced proliferation of MDA-MB-231 cells but did not affect the cell survival. Self renewal of MDA-MB-231 cells were inhibited after ERK inhibition as seen by reduced percentage of CD24-CD44+ population. Conversely, ERK activation through EGF treatment significantly up-regulated self renewal and proliferation of MDAMB-231 cells. Gene expression analysis is being performed to understand the mechanism involved.

Newcastle disease virus mediated apoptosis and migration inhibition of human oral cancer cells: A probable role of β-catenin and matrix metalloproteinase-7.

Authors: Sudhir Morla, Ajay Kumar, Sachin Kumar

Affiliation: Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati, Assam 781039, India.
Corresponding author: Dr.Sachin Kumar

Squamous cell carcinoma (SCC) is a highly invasive form of oral cancer. Cancer cell metastasis and its dissemination are most enigmatic and challenging aspects in the development of its therapeutics. Newcastle disease virus (NDV) is a well studied avian paramyxovirus frequently isolated from birds and rarely from mammals. Since the first report of its oncolytic property, many NDV strains were studied for its effect in various cancer cells. In the present study, NDV strain Bareilly was characterized for its apoptotic potential and migration inhibition in human oral cancer cells. The NDV mediated apoptosis was confirmed by flow cytometry, DNA laddering, and immunoblotting. Moreover, NDV decreased the mitochondrial membrane potential suggesting an intrinsic pathway of apoptosis in oral cancer cells. NDV infection in oral cancer cells results in migration inhibition by a reduction in levels of MMP-7. MMP-7 is one of the key target genes of β-catenin. The study will provide us a better insight into the molecular mechanism of NDV mediated oncolysis and the key cellular partners involved in the process.

DNA methylation-dependent regulation of GPER1 expression in colon cancer cells: The role of the upstream CpG island

Sujasha Ghosh[1],Dr. Anil Mukund Limaye[2]
Department ofBiosciences&Bioengineering,IIT Guwahati,India

Endogenously produced estrogens play an important role in the regulation of normal physiology, aging and many disease conditions. Although the classical estrogen receptors (ERs) have traditionally been described as ligand-activated transcription factors which mediate genomic effects in hormonally-regulated tissues, recent studies have revealed that estrogens are also capable of stimulating rapid signaling events via membrane-bound receptors. The G protein-coupled estrogen receptor GPER1 (formerly known as GPR30) is the most recent entry to the list of membrane-associated ERs (mER) capable of inducing non-genomic estrogen signaling effects. Moreover, this mER is also garnering attention as a prognostic marker and potential therapeutic target in various cancers. Indicating its

possible tumor-suppression role, studies suggest that a higher expression of this receptor correlates with better clinical outcomes for cancer patients, and this expression is reduced in the course of disease progression. The relevance of GPER1 in endocrine cancers in understandable, given estrogen's protective role. But surprisingly, significant levels of GPER1 expression in the colon and its down modulation in associated cancers have been observed. A previous publication from our laboratory has demonstrated the existence of an eight CpG dinucleotide-long Differentially Methylated Region (DMR) in the GPER1 locus in breast cancer cell lines. In this study, we investigate the effect of epigenetic modification in the silencing of this newly-found receptor via DNA methylation of that upstream CpG island across a panel of colon cancer cell lines.

Investigating the role of SAP18 in splicing regulatory activity

Sweta Kumari, Bhagyashree Deka, Kusum K Singh

Department of Biosciences and Bioengineering,
Indian Institute of Technology, Guwahati

Sin3-associated protein of 18 kDa (SAP18) is an ubiquitin-like nuclear protein that was originally identified as a component of the Sin3 histone deacetylase complex (HDAC). Sin3-HDAC is a conserved eukaryotic complex that functions in gene repression. Presence of SAP18 in Sin3a-HDAC complex is necessary for the recruitment of the transcription factors to repress their gene targets.

Besides interaction with HDAC complex, SAP18 also associates with splicing regulators such as RNPS1 and Acinus forming a ternary complex known as Apoptosis and Splicing Associated Protein (ASAP) complex. Consistent with this, artificial tethering of SAP18 was shown to induce alternative splicing of reporter mRNA, implying the role of SAP18 in splicing regulation.

SAP18 being an adapter protein remains associated with other splicing factors most of the times, therefore the individual splicing activity of SAP18 in the absence of these factors has not been clearly elucidated.

In this study, we have developed stable cell lines using the Flp-In Trex system expressing various forms of SAP18 which includes wild type, ASAP-interaction-deficient mutant of SAP18 and siRNA resistant SAP18. With the employment of RNA sequencing approach comparative study of these stable cell lines will provide insights into the individual splicing regulatory activity of SAP18 in a genome wide scale.

Screening of FDA Approved Drug Data Bank to Identify New Anti-TB Drugs Exploiting KatG (Rv1908c) As Target.

Umesh, Vishal Trivedi[#]

Malaria Research Group, Department of Biosciences and Bioengineering,
Indian Institute of Technology Guwahati, Assam India.

Tuberculosis is an airborne infectious disease caused in human by organisms of the Mycobacterium tuberculosis H37Rv. It reported to cause ~1.6 million deaths per year.Mycobacterium tuberculosis H37Rv primarily causes pulmonary disease and after than it can causes disease in almost any part of body. Its diverse metabolic functions empower M. tuberculosis H37Rv to establish and maintain a state of chronic infection within the host as well as to facilitate its survival during drug treatment. Also the development of resistance against existing anti-TB drugs urges the necessity to develop novel anti-TB agents for its eradication. Considering the concept that drugs are pharmacological compounds with

diversified functional groups to block the active site of targets besides their cognate targets. We hypothesized that FDA (Food and Drug Administration) approved drugs could be good leads for developing new anti-TB drugs as it save time for several steps essential for drug development such as clinical trials. Currently FDA database has ~2,574 drugs with diversified pharmacological properties. We have used anti-TB Drugs in circulation (total number 20) as a search criterion to screen FDA drugs. A similarity search between US FDA approved drugs and anti-TB drugs provided ~4099 candidate drugs. Further molecular modelling and docking studies is been used to screen these candidate drugs against well-established TB drug targets. Further investigation of the hits could lead to the discovery of a novel mechanism for anti-TB effect of drugs combating MDR and XDR.

Keywords: Tuberculosis, M. tuberculosis H37Rv, Drug targets, Drugs, MDR, XDR, and FDA approved drugs.

Synthesis and characterization of nanoliposomal formulations of natural terpenoid drugs and evalution of their anti cancer potential against oral squamous cell carcinoma.

Vikkurthi Rajesh1*, Sajin Fransis K2, Mangalam S. Nair2 and Ajaikumar B Kunnumakkara1#

1Cancer Biology Laboratory & DBT-AIST International Laboratory for Advanced Biomedicine (DAILAB), Department of Biosciences & Bioengineering, Indian Institute of Technology (IIT) Guwahati, Assam-781039, India

2Division of Organic Chemistry, National Institute for Interdisciplinary Science and Technology (NIIST), Thiruvananthapuram, Kerala-695019, India.

. #Email: kunnumakkara@iitg.ernet.in

Oral squamous cell carcinoma (OSCC) ranks among the three most common types of cancer in south Central Asia. In India, the age standardized incidence rate of OSCC is 12.6 per 100000 population. Most of chemotherapeutic drugs available for the treatment of OSCC are often very expensive and highly toxic to normal cells. On the other hand, natural product based drugs are effective and associated with least side effects; however, they possess poor bioavailability. Liposomal formulations are well proven to improve the bioavailbility and thereby enhancing the efficacy of drugs. Therefore, we designed liposomes of natural terpenoid drugs like Coronarin D,Epoxyazadiradione isolated from Hedychium coronarium and Azadirachta indica and evaluated its anti-cancer potential against human oral squamous cell carcinoma. liposomes were synthesized by both ethanol injection method and polyol injection method and their size and morphology were determined by Dynamic Light Scattering Method and Field Emission Scanning Electron Microscope respectively. The drug entrapment efficiency was determined by ultracentrifugation followed by quantitative analysis by HPLC. Further, its effect on the proliferation, survival and cell cycle progression of oral cancer cells was analyzed using MTT, colony formation, Annexin V/PI apoptosis and Live/Dead assays. This is the first study report which reports the synthesis, characterization and anticancer effect of Coronarin D and Epoxyazadiradione liposomes.The synthesized nanoliposomal were of spherical shape large unilamellar vesicles. Further, this formulation also inhibited the proliferation, survival and induced cell death of human OSCC cells effectively. Altogether, these results suggest that these liposome formulations can be used for the effective management of human OSCC. However, further in depth in vitro and in vivo studies are critical to establish it as an effective therapy against human OSCC

Biocompatibility and anti-cancer activity analysis of pectic oligosaccharides

produced from waste of Pineapple(Ananas comosus)

Vikky Rajulapati, Arun Dhillon and Arun Goyal
Carbohydrate Enzyme Biotechnology Laboratory,

Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India

Presenting author: E-mail: r.vikky@iitg.ac.in

Pectin is a complex polysaccharide found in primary plant cell walls. It is used as gelling agent or stabilizer in jams, jellies and other food products in food industry and also in healthcare and pharmaceutical industries [1,2].

Pineapple waste is a potential source of pectin. In this study, pectin from the waste peel of Pineapple(Ananas comosus)was extracted by Ultrasound Assisted Extraction (UAE) process [3]. The FESEM analysis of UAE treated and untreated fruit peel showed that the fruit peel sample was more porous than the untreated fruit peel sample. The extracted pectin from pineapple was characterised by FTIR, HPSEC, DSC-TGA, XRD and NMR analyses.FTIR and NMR analyses of extracted pectin showed esterified galacturonic acid residues. TGA showed thermal degradation at 248°C. XRD analysis revealed its crystalline nature. HPSEC analysis showed the molecular size, 73 kDa. The pectic oligossacharides were produced by using a pectate lyase (CtPL1B) from Clostridium thermocellum [4]. HPLC analysis showed the action of PL1B on extratced pineapple pectin produced mainly DP2 oligosaccharide followed by DP1 and DP3. Anti-cancer activity of pineapple pectic oligossacharides was analysed. The viablity of colon cancer (HT29) cells after treatment with 1 mg/ml of pineapple pectin oligossacharides for 24h reduced by 13% and for 48h by 40%. Pectin is involved in induction of apoptosis and inhibition of galectin-3 receptor [5]. The microscopic observation of treated HT29 cells revealed the reduced proliferation, cell to cell contact and the change in cell morphology from undifferentiated to globular shape.

Key words: Pineapple waste, UAE process,Clostridium thermocellum, pectic-oligosaccharides, anticancer effect.

References

[1] D.R. Kashyap et al., Bioresour. Technol., 77(3) (2001) 215-227.

[2] P. Sriamornsak, Silpakorn Univ Int J., 3 (2003) 206-228.

[3] A. N.Grassino et al., Food Chem., 198 (2016) 93-100.

[4] Chakraborty et al., PLoS One., (2015) e0116787.

[5] Do Prado et al., Sci. Rep., (2017) 16564.

Probing the effects of pH and salt on Protein Charge Transfer Absorption spectra and fluorescence of α3C

Anurag Priyadarshi, Rajaram Swaminathan*

Indian Institute of Technology, Guwahati

*E-mail: a.priyadarshi@iitg.ac.in

Non-aromatic amino acids are expected to be optically silent in the Near UV and visible range of the electromagnetic spectrum. However a recent investigation revealed the presence of Protein Charge Transfer Spectra (ProCharTS) in a synthetic protein α3C (α3C is devoid of aromatic amino acids but rich in charged amino acids). Significant absorbance was observed from 250 nm onwards (ε = 7168.5 M-1 cm-1) with a long tail extending till 800 nm (ε = 614.5 M-1 cm-1) [1].

The origin of ProCharTS was attributed to the PBS (Peptide Backbone to Sidechain) and SS (Sidechain To Sidechain) Charge Transfer (CT) transitions between charged amino acids Lys and Glu which come in close spatial proximity of each other upon folding of proteins. In a recent computational study the presence of CT transitions was also established for other charged amino acids (Histidine, Arginine and Aspartate) as well as uncharged amino acids Serine, Threonine and Tyrosine in their phosphorylated forms [2]. Additionally the effect of the physical parameters pH, salts and temperature on α3C have been reported [3] and are also subject of the present investigation.

CT transitions should be affected by changes in pH and addition of salt ions in the solution. The effects of pH on α3C absorption were investigated and the absorption was observed to be significantly affected. NaCl and KCl salt solutions diminish absorbance considerably throughout the Near UV-visible range of the electromagnetic spectrum. The decrease was attributed to the shielding of charges in the presence of high amounts of salt.

α3C shows moderate fluorescence when excited with near UV wavelengths. The fluorescence was found to increase linearly with concentration upon excitation at 355nm. The fluorescence lifetime decay of α3C was measured and lifetime calculated at 295 and 340nm.

The present study thus reveals the effect the physical parameters pH and salts have on α3C ProCharTS and novel charge transfer states based fluorescence. This study is important in the context of exploring the potential applications of ProCharTS to understand fundamental problems in protein biochemistry.

References

1. Prasad, S., Mandal, I., Singh, S., Paul, A., Mandal, B., Venkatramani, R., Swaminathan, R. Near UV-Visible electronic absorption originating from charged amino acids in a monomeric protein. Chem. Sci. 8, 5416–5433 (2017).
2. . Mandal, I., Paul, S., Venkatramani, R. Optical backbone-sidechain charge transfer transitions in proteins sensitive to secondary structure and modifications. Faraday Discuss. 207, 115–135 (2018).
3. Ansari, M. Z., Kumar, A., Ahari, D., Priyadarshi, A., Lolla, P., Bhandari, R., Swaminathan, R. Protein charge transfer absorption spectra: an intrinsic probe to monitor structural and oligomeric transitions in proteins. Faraday Discuss. 207, 91–113 (2018).

3D Printed Biomimetic Silk-based Functional Constructs for Meniscus Tissue Engineering

Ashutosh Bandyopadhyay1 and Biman B. Mandal1 1

Department of Biosciences and Bioengineering, IIT Guwahati, India

E-mail: biman.mandal@iitg.ac.in

The menisci facilitate distribution of loads in the knee joint and protect articular cartilage from excessive stress and damage. Meniscus injury and degeneration have been linked to onset of knee osteoarthiritis. Injuries to the avascular region of the menisci do not heal, disrupt the mobility and result in long term pain. Current approaches in meniscus tissue engineering focus on the development of multi-layered constructs and scaffolds to mimic the internal architecture and the overall morphology of the meniscus with optimal mechanical strength, bio-functionality and degradability. The advent of three dimensional

(3D) bioprinting has enabled fabrication of acellular as well as cell-laden scaffolds with the intricate internal micro-structure and external morphology to bio-mimic the native tissues. The present study investigated the potential of a silk-gelatin based blend bioink for fabrication of 3D printed structures to form functional meniscus tissue constructs. Meniscus scaffolds with the three layers of circumferential, radially lamellar and grid mesh infill were 3D fabricated and crosslinked through EDC/NHS (1-Ethyl-3-(2-dimethylaminopropyl)carbodiimide and N-hydroxysuccinimide) chemistry. The scaffolds were analysed physico-chemically and found to possess peak compressive strength of 120170 kPa at 60% compression, nutrient diffusion ability (swelling ratio of ~7 times within 48 h) and optimal degradability (~80% after 3 weeks). The scaffolds retained their compressive strength up to 200 cycles of 20% compression. Acellular scaffolds were seeded with primary porcine meniscus fibrochondrocytes and analysed for their biological functionality. The native meniscus fibro-chondrocytes were found to be viable and proliferate (~2 times) over the culture period of 21 days. Increased deposition of extracellular matrix components such as glucosaminoglycans (~1.5 times) and collagens (~2.5 times) over 3 weeks validates the functional efficacy of the scaffolds. Acellular scaffolds were found to be immuno-compatible in-vitro in the presence of murine macrophages. Moreover, 3D fabricated cross linked scaffolds implanted subcutaneously in mice possessed optimal immunocompatibility and degradation after 14 days. Therefore, these 3D printed scaffolds fabricated using the optimized silk based bioink can be used to provide a suitable biomimetic template for regeneration of functional meniscus tissue

Exploiting the reactive oxygen species producing enzymes for bioremediation of industrial wastewater

Gaurang Gurjar1, Mohd Faheem Khan2 and Sanjukta Patra3 1 Department of Biosciences and Bioengineering, IIT Guwahati, India

E-mail: sanjukta@iitg.ac.in

Reactive oxygen species (ROS) are derivatives of oxygen that are more reactive than molecular oxygen. A primary ROS is superoxide, which is formed by one-electron reduction of molecular oxygen. Hydrogen peroxide (H2O2) is produced by reduction of O22 through dismutation. Hydroxyl radical (OH2) is generated by the reduction of H2O2 by the Fenton reaction. The present work suggests a novel approach for oxidation of toxic compounds found in industrial waste water based on enzymatic reactions. The microbial enzyme xanthine oxidase isolated from Blastobotrys Adeninivorans was proposed to remediate wastewater from industrial effluent having xanthine, which is utilized as a substrate for xanthine oxidase. The resulting product formed is H2O2 which is decomposed to hydroxyl radicals in the presence of ferrous ions Fe2+ in industrial wastewater; those radicals are effective in oxidation of toxic compounds from wastewater. The enzymatic assay and biochemical characterization for the proposed enzymes has been done and the results showed that 25ºC and pH 7.5 is the optimum temperature and pH for the enzyme. Moreover, the effect of the most common metal ions in the wastewater on xanthine oxidase has been investigated. Copper and Zin ions showd increase in enzyme activity. Then, both enzymes were independently immobilized on ZnO nanoparticles (ZnO NPs) to further improve the stability and reusability of the enzymes. The crystalline structure of synthesized ZnO NPs and immobilized enzymes ZnO NPs were confirmed using FT-IR, FESEM and FETEM. Conclusively, this work reveals a promising perspective of using low-cost nanoparticle conjugated biocatalysts in the treatment of industrial effluent to overcome the hazardous effect of these industrial wastes on the living systems.

Keywords: Blastobotrys Adeninivorans, Reactive oxygen species (ROS), Xanthine oxidase, Hydrogen peroxide, ZnO nanoparticles.

Molecular characterization of CSFV envelope proteins E2 and Erns in Saccharomyces cerevisiae

J. Yadav and S. Nagotu

Department of Biosciences and Bioengineering, IIT Guwahati, India

E-mail: jyoti174106055@iitg.ac.in

Classical swine fever virus (CSFV) is the causative agent of Classical Swine Fever in domestic pigs and wild boars making it economically one of the very important viral diseases in swine husbandry. Its genome (12.3kb long positive sense ssRNA) encodes for 4 structural and 8 non-structural proteins. CSFV infection is known to result in cytopathic effects like induction of apoptosis in B-lymphocytes. However, very little is known about the sub-cellular alterations caused by the expression of these viral proteins in the host cells.

In this study, we aim for molecular characterization of two of the three CSFV envelope proteins (E2 and Erns) using S. cerevisiae as a model system. For this, CSFV envelope proteins were cloned in yeast expression vector with GFP tag and the protein expression was confirmed with western blot and fluorescence microscopy. Expression of CSFV Erns in yeast cells delayed cell growth. However, expression of E2 did not exhibit any significant growth delays. Microscopic analysis and flow

cytometry studies to check the cytopathic effect of CSFV envelope proteins using PI staining and ROS accumulation are in progress. We aim to study the effects of E2 and Erns protein on different yeast cell organelles like peroxisomes, endoplasmic reticulum, golgi apparatus and mitochondria. These findings will shed more light on our understanding of ssRNA viruses and the effects caused by them on host organisms.

Inhibition of Newcastle disease virus replication by chicken viperin

Manisha Shah, Sachin Kumar*

Affiliation: Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati, Assam 781039, India.

Mailing address- *Corresponding author: sachinku@iitg.ernet.in
Presenting author: shahmanisha127@gmail.com

The identification of immune pathway which protects against pathogens may lead to novel molecular therapies for both livestock and human health. Viperin is one of the interferon stimulating gene (ISG) that is highly conserved from lower vertebrates to mammals and plays an important role in protection against virus. Viperin and other ISGs orthologues are not well studied in context of virus infection in chickens. Newcastle disease virus(NDV) is the causative agent of an Newcastle disease, which is economically important for avian species. NDV is endemic in many developing countries including India. NDV outbreaks have been reported because of the emergence of its variant strains.

In the present study, we cloned the chicken Viperin(cViperin) gene from peripheral blood mononuclear cells and analyzed its modulation upon NDV infection in chicken embryo fibroblast (CEF). Overexpression of cViperin showed inhibition of NDV replication in CEF. The cViperin gene expression was down regulated the expression of NDV protein genes. Similarly, protein expression studies showed significant down regulation of NDV in presence of cViperin. The findings in the study indicated the antiNDV effect of cViperin which could be helpful in the development of antiviral therapies against its infection.

Isolation and characterization of Pilobolus like species from cow dung samples

Shalini Shokeen1 and Ranjan Tamuli 2

1 Department of Biosciences and Bioengineering, IIT Guwahati, India

E-mail: ranjantamuli@iitg.ac.in

Coprophilous (dung loving) fungus play an important role in the ecosystem as they are the actively participating members of nutrient cycling in animal droppings. We have isolated two strains of Pilobolus like species from fresh cow dung samples. Initially these two strains were studied morphologically on culture media and a set of contrasting results have been observed. Strain 1 appears white and is able to produce the sporangiophores on the PDA, while strain 2 is yellow with the lack of sporangiophore development. The molecular studies have revealed that the strain 2 lacks ergosterol in their cell wall. The two strains are under the molecular identification. Pilobolus is also a part of JGI 1000 Fungal Genome Project. Our ongoing study focuses on the ability of these Pilobolus like species in degrading the complex plant biomass and to study the light sensing mechanism.

Understanding chemoresistance in AML

Amit Sharma1 , Bithiah Grace Jaganathan2

1 Department of Biosciences and Bioengneering, IIT Guwahati, India

Primary resistance to chemo-therapeutic drugs and frequent early relapses pose a persistent hindrance in treatment of acute myeloid leukemia (AML), leading to poorer five year survival rate as compared to other hematological malignancies. Minimal residual disease correlates with poor prognosis and is attributed to presence of slow cycling leukemic stem cells (LSCs) which are not cleared effectively on treatment with conventional drugs. CD34+ fraction of bone marrow cells, which contains hematopoietic stem cells and multipotent progenitor cells, has been implicated to contain LSCs as well (Terwijn et al. 2014). As compared to whole blood, CD34+/CD38- cells have been shown to be less sensitive to Cytarabine which is a nucleoside analogue drug and forms the backbone of treatment for AML alongside anthracyclines like Daunorubicine or Idarubicine (Guzman et al. 2002). These CD34+ cells are known to be maintained by secreted factors as well as direct cell interactions in bone marrow niche comprised of mesenchymal stem cells (MSCs) along with other stromal cells. Bone morphogenetic proteins (BMPs) are among these secreted factors which are involved in proliferation and differentiation pathways and have been found to be dysregulated in AML patients (Battula et al. 2017).

In this study, Acute pro-myelocytic leukemia cell line, HL60, or mononuclear cells (MNCs) isolated from bone marrow aspiration of patients with AML (n=3) and other hematological disorders (n=5) were treated ex-vivo with combination of Cytarabine and Daunorubicine in presence or absence of MSCs. MNCs were stained for CD34 at the time of isolation and after in-vitro culture in different conditions. Whereas, cells co-cultured with MSCs showed higher percentage of CD34+ cells as compared to MNCs cultured alone for all the samples (n=8), a decrease in percentage of CD34+ cells was observed in all conditions when compared to the that at the time of isolation except for one patient with Non-Hodgkin's lymphoma. Drug treatment diminished CD34+ percentage in all samples except for one AML sample. HL60 cells or MNCs were also treated with chemo-drugs in presence of BMP4 or BMP signalling inhibitors, LDN193189 and Noggin. Whereas, treatment with BMP4 or Noggin did not show significant effect on cell death, treatment with LDN193189 showed cyto-toxic effect at 3µM without exerting significant change in CD34+ percentage.

These results corroborate the role of MSCs in supporting the leukemic cells to evade drug induced apoptosis and maintain their CD34 positivity, which is a measure of long term proliferative capacity (Ito et al. 2015). Since the CD34+ fraction was not found to be enriched post drug treatment in any condition except for one sample, the CD34+ cells might be relevant in imparting chemo-resistance only in a fraction of patients. However, treatment with BMP4 did not alter the response of HL60 cells to the cyto-toxic drugs, but BMP receptor inhibition using LDN193189 showed increased cell death. Therefore, other BMPs might be involved in maintenance of leukemic cells in bone-marrow niche.

UV-Visible absorption and fluorescence spectra of Karanjin in different solvents and solvent mixture

Anuma Singh, Mohd Ziauddin Ansari, Latha Rangan*, Rajaram Swaminathan*

Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, 781039, Assam, India.

*lrangan@iitg.ac.in ; rsw@iitg.ac.in

Karanjin, a furanoflavonoid (3-methoxy-2-phenylfuro [2,3-h] chromen-4-one) isolated from seeds of Pongamia pinnata, is the most widely studied flavonoid due to its vast biological and therapeutic activities. The current work highlights the application of absorption and fluorescence spectroscopic methods in the investigation of photophysical properties of Karanjin in different solvents and membrane mimetic condition (aqueous SDS solution). Attention is focused on the intrinsic property of flavonoid as its own 'signature' and changes in absorbance and fluorescence properties as a function of the solvatochromic parameters.Furthermore, the dimerization of fluorophores and formation of higher order aggregates in solution induce changes in the spectral patterns of Karanjin. The reduced fluorescence intensity after 50% water fraction may be attributed due to reduced solubility and crystallization of Karanjin in water and water-MeOH mixtures. Karanjin fluorescence decay in all solvents are bi-exponential with decay times ranging from 1.3 to 3.4 ns. The mean lifetimes are highest in SDS and least in water. There is a significant improvement of photophysical property of Karanjin in micellar solution due to shielding from water inside the micelle and inaccessibility of solvent molecules around the fluorophore molecule in surfactants. Photophysical characterization of Karanjin could provide initial insight into other potential applications in different areas.

Selenium Removal From Wastewater Using Fungal Pellets

Bharat Bhushan Negi and Kannan Pakshirajan

Department of Bioscience and Bioengineering, Indian Institute of Technology, Guwahati, Assam 781039, India

Selenium containing wastewater is discharged from various industries such as electronic, refinery, mining etc., and it can potentially pollute the surface water bodies if released into the environment without proper treatment. In the recent time, more focus has been towards the biological methods of selenium removal over conventional physiochemical methods. Biological methods involving bacteria, fungi, algae, etc., for selenium removal are more attractive as they are sustainable, environmental friendly and cost effective. This study investigated the removal of selenite from wastewater using five different fungal strains namely Asergillus fumigatus, Mucor hiemalis, Cunninghamella elegans, Aspergillus niger KP and tea leaf degrading fungi. The effect of different, carbon source and initial selenite concentration on fungal growth, palletization and selenite reduction was investigated at pH 4.5. All the fungal strains were capable of removing selenite from the aqueous media by reduction to elemental selenium, however, the fungus Aspergillus niger KP isolated from a laboratory scale inverse fluidized bed bioreactor with anaerobic biomass, treating selenite rich wastewater showed maximum selenite removal of 86% within 7 days. Analysis of the selenium bioreduced fungal pellets by Field-Emission Scanning Electron Microscopy, Field-Emission Transmission Electron Microscopy and Energy-dispersive X-ray spectroscopy showed that it contained elemental selenium nanoparticles, produced intracellularly, with size in the range of 65-100 nm. Furthermore, an increase in the initial selenite concentration in the media influenced the pellet morphology of A. niger KP by making compact pellets with smooth hyphae structure, whereas the fungal pellets grown in the media without any selenite

showed hair like hyphae structure. It was also observed that an increase in the initial selenite concentration reduced its removal from aqueous solution, and lowered the COD utilization efficiency. Overall, this study showed very good potential of A. niger KP pellets for the removal of selenium from wastewater.

Keywords: Selenite removal, Fungal pellets, Selenium nanoparticles, Wastewater treatment, Aspergillus niger

Bio-filters/bio-barriers: A green synthesis for nuclear waste, dye, oil and rare earth metal

Tasrin Shahnaz , Chandi Patra and N. Selvaraju

Department of Biosciences & Bioengineering, IIT Guwahati, India

With the advent of 20th century, heavy industrialization has generated excess quantities of industrial wastes containing toxic pollutants like toxic heavy metals, radio-nuclides, rare-earth metals, metalloids and various inorganic and organic pollutants like dyes and oils. These highly toxic materials are dumped directly to wastelands or aqueous bodies; via which they enter the eco-system and to the food chain and thus to humans especially from water bodies. They are non-biodegradable and are potent carcinogens for humans and other life forms (Gupta, Agarwal et al. 2017). Examples of heavy metals include Mercury (Hg), Cadmium (Cd), Arsenic (As), Chromium (Cr), Lead (Pb) etc (Jaafari and Yaghmaeian, 2019); rare-earth metals include Europium (Eu), Neodynium (Nu), Lanthanum (La), Cerium (Ce) etc (Liang, Yin et al., 2018). Dyes being one of the priority industrial product from textile, paper and printing, food, cosmetics industries end up in waste waters and are therefore considered a potential source of pollution of waterways (Careghini, Saponaro et al., 2012). Similarly accidental spillage of oil in to aquatic ecosystem has gained particular attention owing to its long term fatal effect on its flora and fauna as well as on regional biota (Bai and Bai 2014). Various conventional means are being opted by the industries viz. chemical precipitation, adsorption, flotation and electrochemical deposition. But, however they are economically expensive, non-reusable and produce secondary pollutants (Sadegh, Ali et al., 2018).

Bio-filters/bio-barriers are the new intrinsical budgetary remediation technique used for a vast range of pollutant incuding nuclear waste, dye, oil, rare earth metal and many other micro-contaminants. This work discusses the application of bioremediation using adsorbent of green synthesis that are gaining momentum in the recent research.

Bibliography

1. Bai, Y. and Q. Bai (2014). Chapter 16 - Consequences of Failure Modeling for Oil and Gas Spills. Subsea Pipeline Integrity and Risk Management. Y. Bai and Q. Bai. Boston, Gulf Professional Publishing**:** 345-362.
2. Careghini, A., S. Saponaro and E. Sezenna (2012). Biobarriers for groundwater treatment: A review.
3. Gupta, V. K., S. Agarwal, A. K. Bharti and H. Sadegh (2017). "Adsorption mechanism of functionalized multi-walled carbon nanotubes for advanced Cu (II) removal." Journal of Molecular Liquids**230**: 667-673.
4. Jaafari, J. and K. Yaghmaeian (2019). "Optimization of heavy metal biosorption onto freshwater algae (Chlorella coloniales) using response surface methodology (RSM)." Chemosphere**217**: 447-455.

5. Liang, Q., H. Yin, J. Li, L. Zhang, R. Hou and S. Wang (2018). "Investigation of rare earth elements in urine and drinking water of children in mining area." Medicine (Baltimore)**97**(40): e12717.
6. Sadegh, H., G. A. M. Ali, A. S. H. Makhlouf, K. F. Chong, N. S. Alharbi, S. Agarwal and V. K. Gupta (2018). "MWCNTs-Fe3O4 nanocomposite for Hg(II) high adsorption efficiency." Journal of Molecular Liquids**258**: 345-353.

Understanding the interactions of phospholipase C-1, secretory phospholipase A2, and Ca2+ /H+ exchanger in circadian regulated conditions, development, and cell survival in Neurospora crassa

Darshana Baruah and Ranjan Tamuli

Department of Biosciences and Bioengineering, IIT Guwahati, India

E-mail:darshana@iitg.ac.in

Ca^{2+} has evolved as a universal second messenger and plays a central role in intracellular signaling in eukaryotes, yet little is known about the Ca^{2+} signaling mechanism in N. crassa or any other related fungi in comparison to plants and animals. In N. crassa, Ca^{2+} signaling regulates a variety of processes such as Ca^{2+} stress tolerance, the circadian clock, growth, hyphal tip branching, ion transport, ultraviolet (UV) survival, and sexual development. In N. crassa, several Ca^{2+} signaling proteins, including the phospholipase C (PLC), secretory phospholipase A2 (sPLA2), and Ca^{2+} exchangers are involved in sensing the increase in $[Ca^{2+}]_c$. The knockout mutant of plc-1 exhibited defects in the circadian clock. From genetic studies, it had been revealed that plc-1 regulates the clock function by maintaining a proper level of frq and wc-1.The knockout mutants of the plc-1, cpe-1 and splA2 genes also showed reduced survival in induced thermotolerance after exposure to heat shock temperatures. Moreover, plc-1 interacts with cpe-1 and splA2 in acquisition of induced thermotolerance. Studies on heat stress induced transcription showed plc-1, cpe-1 and splA2 participate in regulating HSP expression under HS probably via the cytosolic Ca^{2+}. In addition, the Δplc-1 and ΔsplA2 knockout mutants consumed cellulose faster than the wild type, and exhibited significantly increased protein secretion. Therefore, this study revealed multiple cellular roles of plc-1, cpe-1 and splA2 in the regulation of circadian clock, acquisition of thermotolerance and biomass degradation in N. crassa.

Fungal enzymes as candidates for holistic treatment of textile industry effluent

Ghadir Nofal1 , Mohd Faheem Khan1 and Sanjukta Patra1

1 Department of Biosciences and Bioengineering, IIT Guwahati, India

Textile industry is one of the major industries in the world that provide employment with no required special skills and play a major role in the economy of many countries. However, its effluent constitutes a serious environmental risk that should be solved. The present work suggests a novel approach for dye removal from textile industry wastewater based on enzymatic reactions. Two fungal enzymes α-amylase and glucose oxidase isolated from Aspergillus oryzae and Aspergillus niger, respectively were proposed to remediate the textile effluent from dyes using starch, exists in this effluent, as a substrate for α-amylase. Subsequently, the product of this reaction is oxidized by glucose oxidase, resulting in the production of hydrogen peroxide. H2O2 is decomposed to hydroxyl radicals in the presence of ferrous

ions Fe2+ in the wastewater of textile industry; those radicals are effective in dyes removal from wastewater.

The effect of glucose oxidase on α-amylase products has been verified, so the biochemical characterization for the proposed enzymes has been done and the results showed that 40ºC and pH 5.0 is the optimum temperature and pH for both the enzymes. Moreover, the effect of the most common metal ions in textile wastewater on those enzymes has been investigated. Ferrous ions showed increasing in glucose oxidase activity and a minute decrease in α-amylase activity. Then, both enzymes were independently immobilized on ZnO nanoparticles (ZnO NPs) to further improve the stability and reusability of the enzymes. The crystalline structure of synthesized ZnO NPs and immobilized enzymes ZnO NPs were confirmed using FT-IR, FESEM and FETEM.

In addition to that, the parameters affected dye decolourization by enzymatically produced H2O2 has been optimized using Congo red and methylene blue as model dyes. 1.5 % H2O2 with 2 mM ferrous solution after 3 hrs of incubation at room temperature were the optimum conditions for dye decolourization.

Conclusively, this work reveals a promising perspective of using low-cost nanoparticle conjugated biocatalysts in the treatment of textile industry effluent to overcome the hazardous effect of these industrial wastes on the living systems.

Keywords: Aspergillus niger, glucose oxidase, Aspergillus oryzae, α-amylase, textile effluent, hydrogen peroxide, ZnO nanoparticles, dye decolourization.

Physico – rheological characterization of organically derived seed samples from Alpinia nigra

Ishani Chakrabartty[1], Naba Kumar Kalita[2], Vimal Katiyar[2], Latha Rangan[1*]

[1]Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati, Assam 781039
[2]Centre of Excellence for Sustainable Polymers, Department of Chemical Engineering, Indian Institute of Technology Guwahati, Assam India – 781039

Alpinia nigra is one of the most easily available medicinal plants but there has not been any systematic effort focused on its collection and characterization with regard to its bioactive molecules from various parts of the plant.Thus, the industrial potential of large number of such valuable natural products remains unexplored and unexploited. A comprehensive study on the physico-chemical and rheological characterization of plant extracts and products are thus, of utmost importance. Physico - rheological characterization of the colloidal seed extracts of A. nigra and an isolated compound molecule, labdane diterpene, has been carried out in the current study. The optimum seed-to-solvent ratio for maximum yield of seed extracts is found to be 1:6. Contact angle value indicate the hydrophobicity of the plant samples; labdane diterpene being the most hydrophobic. All the samples exhibited some degree of optical behavior. DSC results suggest lack of crystalline structure of the samples; the compound molecule exhibits characteristic behavior of diterpenes. The plant samples show a high degree of thermal stability and viscosity of the samples show an increasing trend with concentration but a decreasing trend with temperature; labdane diterpene exhibits the highest viscosity at all temperatures. These results therefore, offer a scientific basis for the use of these seed extracts and labdane diterpene in food, pharmaceutical and other commercial product industries.

Silk based bioinks for 3D bioprinting of hierarchically relevant osteochondral interface

Joseph Christakiran Moses1, Triya Saha and Biman B. Mandal1

1 Biomaterial and Tissue Engineering Laboratory,
Department of Biosciences and Bioengineering, Indian Institute of Technology, Guwahati-781039, Assam, India

E-mail: biman.mandal@iitg.ac.in; mandal.biman@gmail.com

Bioinks for cartilage and bone bioprinting has seen the use of various synthetic and natural polymers such as agarose, gelatin and modified forms, gellan gum, collagen, polyethylene glycol (PEG) and its modified forms [1, 2]. Though each polymer has its own innate advantages and disadvantages, we tried to address these problems pertaining to three aspects of bioprinted bone/cartilage, namely: (i) bioactivity, (ii) mechanical properties and (iii) osteoinductive or chondroprotective properties. In this regard we resorted to use composite polymer blends of polyvinylpyrrolidone (PVP) silk blends (Bombyx mori silk fibroin (BMSF) + Antheraea assama silk fibroin (AASF) to form interpenetrated network, to improve the overall mechanical and rheological properties of silk based bioinks developed here. Further in order to improve the osteoinductivity we included nano-hydroyapatite (either unmodified or doped with strontium), while silk fibroin used imparted the needed bioactivity for the bioinks. The osteochondral interfaces bioprinted with the help of the developed bioinks encapsulated with mesenchymal stem cells (MSCs) resulted in spatial maturation and differentiation of encapsulated stem cells towards osteogenic and chondrogenic lineages. The promising findings from this work vouches for the potential clinical translation of these silk based bioinks for bioprinting autologous stem cell laden grafts for tissue repair and also for in vitro pre-clinical tissue model for drug screening applications.

Keywords: 3D bioprinting; multifunctional bioinks; cell instructive biomaterials; silk fibroin; osteochondral tissue engineering;

REFERENCES

1. Daly, A.C., et al., A comparison of different bioinks for 3D bioprinting of fibrocartilage and hyaline cartilage. Biofabrication, 2016. 8(4): p. 045002.

2. Daly, A.C., et al., 3D bioprinting for cartilage and osteochondral tissue engineering. Advanced healthcare materials, 2017. 6(22): p. 1700298.

Sequestration of hexavalent Chromium from aqueous solution using EDTA modified acid activated biosorbent

M.R.Mohan Naidu, Vivek Sharma, K.Pakshirajan and N.Selvaraju

Department of Biosciences and Bioengineering , IIT G

Since 20th century, heavy industrialization has generated excess quantities of industrial wastes containing toxic pollutants like toxic heavy metals. Chromium is one such heavy metal which is dumped directly to wastelands or aqueous bodies; via which they enter the eco-system and to the food chain and thus to humans especially from water bodies. They are non-biodegradable and are potent carcinogens for humans and other life forms [Gupta et al., 2017].Hexavalent species of Chromium is responsible for various carcinogenic and mutagenic implications to humans and other living forms as they form secondary structures when bound to DNA and tend disrupt the protein and enzymes [Bendjeffal et al., 2018].

Biosorption using lignocellulosic biomass is a simplistic and budgetary method and has been broadly examined for wastewater treatment. Present study deals with the acid activation of Sterculia villosa Roxb. shells (Malvaceae family) followed by physical activation resulting in chemically modified-activated carbon and tested for the removal of Cr(VI). Effects of chelation with EDTA over the adsorption efficiency of the chemically-physically activated carbon is also studied for enhanced adsorption capacities of Cr(VI). Overall the activated-chelated biosorbent showed more removal of Cr(VI), followed by activated and least for raw. For reusability, desorption-regeneration studies were also contacted.

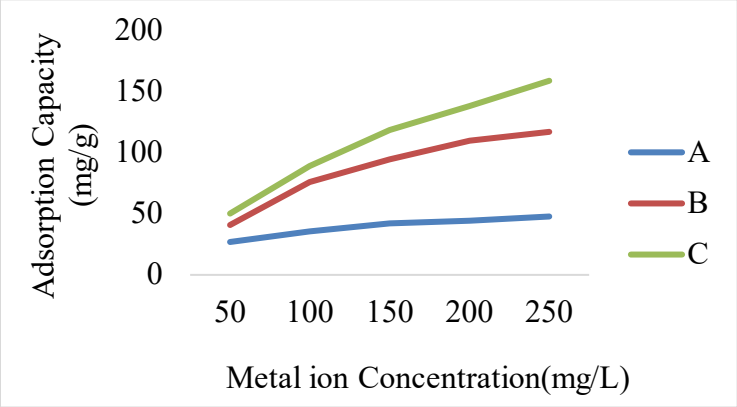

Fig: Comparison of Cr(VI) adsorption capacities between A) raw biomass; B) acid-activated; C) chelated-acid activated biosorbents

REFERENCES

- Gupta, V.K., Agarwal, S., Bharti, A.K., Sadegh, H., 2017. Adsorption mechanism of functionalized multi-walled carbon nanotubes for advanced Cu (II) removal. Journal of Molecular Liquids 230, 667–673.
- Bendjeffal, H., Djebli, A., Mamine, H., Metidji, T., Dahak, M., Rebbani, N., Bouhedja, Y., 2018. Effect of the chelating agents on bio-sorption of hexavalent chromium using Agave sisalana fibers. Chinese Journal of Chemical Engineering 26, 984–992.

Mutation of aspartate 256 to glycine enhanced the catalytic efficiency of CMCase from Bacillus amyloliquefaciens SS35 UV2 mutant strain

Shweta Singh, Priyanka Nath, Krishan Kumar and Arun Goyal

Carbohydrate Enzyme Biotechnology Laboratory, PAN-IIT DBT Center for Bioenergy,
Department of Biosciences and Bioengineering,
Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India

Corresponding author: E.mail: shweta.2014@iitg.ernet.in

The demand for the development of bioethanol is increasing worldwide due to the continuous depletion of fossil fuels and environmental pollution caused by them. The saccharification of lignocellulosic biomass by cellulases and hemicellulases to monomeric reducing sugars for their subsequent microbial conversion to ethanol is the cost limiting step in bioethanol production. Therefore, for reducing the cost of bioethanol production the strain improvement of cellulase producing microorganisms is of prime concern. The cellulases are produced by a variety of bacteria and fungi. These extracellular cellulase enzyme is a group of enzymes that includes endoglucanases (Carboxymethylcellulase, CMCase), cellobiohydrolases and β-glucosidases [1]. Bacillus amyloliquefaciens SS35 was subjected to UV irradiation that resulted in a hyper carboxymethyl cellulase producing mutant strain named UV2 strain. The purified wild-type enzyme (CMCase-WT)from Bacillus amyloliquefaciens SS35 gave 15.4 U/mg enzyme activity, whereas the CMCase-UV2 gave enhanced activity, 32.1 U/mg. In the present study the gene encoding endoglucanase (CMCase), BaGH5-WT from Bacillus amyloliquefaciens SS35 (wild-type strain) and mutant enzyme, BaGH5-UV2 from its UV2 mutant strain were cloned in pHTP0 vector. For molecular screening of gene encoding BaGH5-WT and BaGH5-UV2, the homologous sequence from previously known members of the GH5 family was deduced from phylogenetically related spp. Bacillus amyloliquefaciens KGH19. Polymerase chain reaction using degenerate primers designed for GH5 (GenBank: AJK65578.1) from Bacillus amyloliquefaciens KGH19, were used to identify the homologous gene in Bacillus amyloliquefaciens SS35. The amplification of BaGH5-WT and BaGH5-UV2 genes was achived at 58°C. The PCR amplified products analyzed on 0.8% (w/v) agarose gel showed the same size of ~1.5 kb for the gene encoding BaGH5-WT and BaGH5-UV2 enzymes. The comparison of the sequences of the cloned genes of BaGH5-WT from wild-type and UV2 strains showed that Asp256 residue in wild-type is changed to Gly256 in the UV2 mutant. The mutation occurred in the loop which connects α-helix to β-sheet and had one binding residue H252 near the catalytic pocket. Docking results showed that subsitution of Asp256 to Gly residue in BaGH5-UV2 gave free energy (ΔG°) -5.3 kJ/ mol against cellotriose which was higher than -4.34 kJ/mol given by BaGH5-WT.

Keywords: UV mutation, cellulase, glycoside hydrolase

Reference

1. Singh, S., Moholkar, V. S. & Goyal, A. (2013) Isolation, identification, and characterization of a cellulolytic Bacillus amyloliquefaciens strain SS35 from Rhinoceros dung. ISRN Microbiology, 2013, Article ID 728134.

Macrophage polarization in response to silk biomaterials

Sohenii Bhattacharjee1, Joseph Christakiran Moses1, Manishekhar Kumar1 and Biman B. Mandal1*
1Biomaterials and Tissue Engineering Laboratory, Department of Biosciences and Bioengineering, IIT Guwahati, India

Silk fibroin produced by the Bombyx mori (mulberry silk) and Antheraea assama (non-mulberry silk) silkworms has been used abundantly for fabricating biomedical implants of different formats [1, 2]. Macrophages are one of the earliest components of innate immunity that interact with the implant. Macrophages can be generally grouped into resting (M0), inflammatory (M1) or anti-inflammatory/tissue-regenerative (M2) phenotypes. Although it does not activate the adaptive immune response or form permanent fibrotic capsule [3], the polarization potential of silk fibroin with respect to macrophage phenotype has not been studied yet. In this study, we attempt to understand the effect of two-different types of silk fibroin – Bombyx mori (BM) and Antheraea assama (AA) on macrophage phenotype and functionality with special emphasis on tissue regeneration. There exist marked differences in terms of amino acid sequences and physical properties betweenBMand AA silk fibroin. Compared to BM, AA fibroin has innate tripeptide RGD sequences that assists in integrin-mediated cell attachment. Silk films derived from both the proteins were used as a substrate for culturing macrophages. Physico-chemical characterization revealed superior mechanical properties and hydrophilic surface of AA silk films compared with BM silk films. Monocytic cell line derived M0, M1 and M2 macrophages cultured on BM and AA silk films showed higher amount of regenerative bias (M2/M1 ratio) compared to standard tissue culture plastic (TCP) control. Biochemical analysis for M1 marker Nitric oxide (NO) and M2 marker Arginase indicated a higher production of NO and lower production of Arginase in response to BM. Macrophages showed upregulation in M2 specific cell-surface marker expression when cultured on AA films and downregulation of M1 specific surface marker. Through these findings we envisage that use of silk based matrices for biomedical implantation may induce a positive remodelling outcome.

References

1. Mandal, B.B., et al., High-strength silk protein scaffolds for bone repair. Proceedings of the National Academy of Sciences, 2012. **109**(20): p. 7699-7704.
2. Bhunia, B.K., D.L. Kaplan, and B.B. Mandal, Silk-based multilayered angle-ply annulus fibrosus construct to recapitulate form and function of the intervertebral disc. Proceedings of the National Academy of Sciences, 2017: p. 201715912.
3. Kumar, M., et al., Immunomodulatory injectable silk hydrogels maintaining functional islets and promoting anti-inflammatory M2 macrophage polarization. Biomaterials, 2018. **187**: p. 1-17.

Bio-filters/bio-barriers: A green synthesis for nuclear waste, dye, oil and rare earth metal

Tasrin Shahnaz,Chandi PatraandN. Selvaraju

Department ofBiosciences&Bioengineering,IIT Guwahati,India

With the advent of 20th century, heavy industrialization has generated excess quantities of industrial wastes containing toxic pollutants like toxic heavy metals, radio-nuclides, rare-earth metals, metalloids and various inorganic and organic pollutants like dyes and oils. These highly toxic materials are dumped directly to wastelands or aqueous bodies; via which they enter the eco-system and to the food chain and thus to humans especially from water bodies. They are non-biodegradable and are potent carcinogens

for humans and other life forms (Gupta, Agarwal et al. 2017). Examples of heavy metals include Mercury (Hg), Cadmium (Cd), Arsenic (As), Chromium (Cr), Lead (Pb) etc (Jaafari and Yaghmaeian, 2019); rare-earth metals include Europium (Eu), Neodynium (Nu), Lanthanum (La), Cerium (Ce) etc (Liang, Yin et al., 2018). Dyes being one of the priority industrial product from textile, paper and printing, food, cosmetics industries end up in waste waters and are therefore considered a potential source of pollution of waterways (Careghini, Saponaro et al., 2012). Similarly accidental spillage of oil in to aquatic ecosystem has gained particular attention owing to its long term fatal effect on its flora and fauna as well as on regional biota (Bai and Bai 2014). Various conventional means are being opted by the industries viz. chemical precipitation, adsorption, flotation and electrochemical deposition. But, however they are economically expensive, non-reusable and produce secondary pollutants (Sadegh, Ali et al., 2018).

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Bibliography

Bai, Y. and Q. Bai (2014). Chapter 16 - Consequences of Failure Modeling for Oil and Gas Spills. Subsea Pipeline Integrity and Risk Management. Y. Bai and Q. Bai. Boston, Gulf Professional Publishing: 345-362.

Careghini, A., S. Saponaro and E. Sezenna (2012). Biobarriers for groundwater treatment: A review.

Gupta, V. K., S. Agarwal, A. K. Bharti and H. Sadegh (2017). "Adsorption mechanism of functionalized multi-walled carbon nanotubes for advanced Cu (II) removal." Journal of Molecular Liquids 230: 667-673.

Jaafari, J. and K. Yaghmaeian (2019). "Optimization of heavy metal biosorption onto freshwater algae (Chlorella coloniales) using response surface methodology (RSM)." Chemosphere 217: 447-455.

Liang, Q., H. Yin, J. Li, L. Zhang, R. Hou and S. Wang (2018). "Investigation of rare earth elements in urine and drinking water of children in mining area." Medicine (Baltimore) 97(40): e12717.

Sadegh, H., G. A. M. Ali, A. S. H. Makhlouf, K. F. Chong, N. S. Alharbi, S. Agarwal and V. K. Gupta (2018). "MWCNTs-Fe3O4 nanocomposite for Hg(II) high adsorption efficiency." Journal of Molecular Liquids 258: 345-353.

Study on leukemia-bone marrow stroma interactions

Trishna Anand, Dr. Bithiah Grace Jaganathan

Department of Biosciences and Bioenginnering IIT Guwahati, Assam, India

e-mail:a.trishna@iitg.ernet.in

The bone marrow niche comprised of endothelial cells, osteoblasts, osteoclasts, perivascular cells and mesenchymal stem cells (MSCs) play a pivotal role in the development and maintenance of hematopoietic stem cells (HSCs). Various factors secreted by the MSCs such as cytokines, chemokines as well as the intracellular signalling involved in the cell adhesion help in the regulation and differentiation of hematopoietic stem cells. Several life threatening haematological malignancies such as leukaemia, multiple myeloma are defined by abnormal development, differentiation and inability to undergo apoptosis of HSCs. The intermolecular signalling between MSCs and HSCs helps in the prosurvival of leukemic cells during drug treatment as well as they modify the phenotype of the

leukemic cells. The cross talk between leukemic cells and MSCs also affects the differentiation and marker expression of MSCs. The development of drugs based on molecules involved in the cross talk can help in finding the cure for various haematological malignancies including leukaemia.

To study the effect of cell- cell contact of leukemic cell lines and MSCs on the differentiation and marker expression of MSCs, two cells lines HL60 and THP1 were used. HL60 is a Human Caucasian promyelocytic leukaemia cell line and represents AML in poor prognostic group. THP1, an acute monocytic leukaemia cell line, belongs to intermediate to poor prognostic group of AML. After 7 days of co-culture with leukemic cell line, the marker expression and differentiation of MSCs was analysed and it was found to be modulated by the immediate microenvironment.

Similarly, the expression of markers involved in the migration and adhesion of leukemic cell lines was found to be regulated by the cell-cell mediated signalling between MSCs and leukemic cells. The drug sensitivity of the leukemic cell line was also modulated by the direct cell- cell contact signalling between MSCs and cell lines.

From the experiments conducted we conclude that microenvironment provided during the coculture of leukemic cells and MSCs regulate the phenotype and other properties of the cells

Designing novel Inhibitors of PcaA (Mycolic acid cyclopropane synthase) involved in the dormant state of Mycobacterium Tuberculosis by Virtual screening of Known anti-tuberculosis (bioactive) compounds

Jyoti Verma, Dr.Naidu Subbarao*
School of Computational & Integrative Sciences, Jawaharlal Nehru University,
New Delhi, India
Email: Jyoti Verma: vermajyoti363@gmail.com; Naidu Subbarao: nsrao.jnu@gmail.com

Mycobacterium tuberculosis can sustain inside the host in dormant (non-replicating) state for years. It suppresses the host immune system by residing in the host alveolar macrophage, resulting in the development of latent tuberculosis. [1] Despite many antibiotic available for the treatment of tuberculosis, the major hurdle in complete elimination is the ability of the bacilli to undergo dormancy and develop resistance against the existing drugs. Cyclopropanation of mycolic acids present in the cell wall of mycobacteria is required for its persistence and virulence. PcaA is a cyclopropane mycolic acid synthase 3 belonging to a family of cyclopropane synthases that are responsible for site-specific modification of mycolic acids. [2] The gene expression level of PcaA is upregulated during the dormant state of Mtb and PcaA mutants fails to persist, showing reduced survival in host macrophage. Hence, PcaA is a potential target for developing inhibitors against the dormant bacilli. In our study, 30,981 unique anti-tuberculosis bioactives from ChEMBL library and their analogues from ZINC database were screened against PcaA to identify compounds with maximum inhibitory activity. Molecular dynamic simulation was performed using Gromacs (version 5.1.4) for the top ranking inhibitors each from both the libraries, to determine the stability of the protein ligand complexes. Further analysis includes binding energy calculation with g_mmpsa method to support the results. This study reports novel lead compounds that can act as better antituberculosis agent targeting PcaA.

References

[1] Tufariello JM, Chan J, Flynn JL. Latent tuberculosis: mechanisms of host and bacillus that contribute to persistent infection. Lancet Infect Dis. 2003;3(9):578-590. doi:10.1016/S1473-3099(03)00741-2.

[2] Huang C, Smith C V, Glickman MS, Jacobs WR, Sacchettini JC. Crystal structures of mycolic acid cyclopropane synthases from Mycobacterium tuberculosis. J Biol Chem. 2002;277(13):11559-11569. doi:10.1074/jbc.M111698200.

Use of Actinomycetes Group of Microbes for the Management of Bacterial Blight of Rice

Kakumoni Saikia* and L.C. Bora

Department of Plant Pathology, Assam Agricultural University, Jorhat-13, Assam

kakusaikia05@gmail.com

Plant pathogens are important constraints of crop production and productivity, worldwide. Bacterial blight (BB) caused by Xanthomonas oryzae pv. oryzae (Xoo) is one of the most important disease of rice causing yield losses more than 50 per cent. The actinomycetes group of microbes have the ability to suppress the development of diseases caused by plant pathogenic bacteria or fungi (Hasegawa et al. 2006; Lestari, 2006). A study was undertaken to evaluate a biocontrol strategy using Streptomyces of rice ecosystem for management of bacterial blight of rice. Bacterial blight (BB) infected leaf samples were collected from different places of Jorhat and Majuli districts of Assam. Rhizospheric Streptomyces were isolated and purified from rice ecosystem following standard protocol. Biochemical characterization and in vitro analysis of these microbes were also done following standard protocol. Results revealed that two Streptomyces strains could effectively inhibit the growth of Xanthomonas oryzae pv. oryzae (Xoo) significantly depicting their potential use for the biological control of plant diseases.

Keywords: Rice, Bacterial Blight, Actinomycetes, Assam, Biochemical characterization, In vitro tests.

BIOPESTICIDES AND THEIR ROLE IN SUSTAINABLE AGRICULTURAL PRODUCTION IN ASSAM

Kollol Pratim Baruah* & Hrishikesh Hazarika

Department of Plant Pathology, Assam Agricultural University, Jorhat, 785013, Assam
Corresponding
E-mail: kollolpratimbaruah@gmail.com

Ordeals and dilemmas accompany the life of farmers in a flood prone state like Assam. Despite technological advances, their farming wisdom has remained traditional. Chemicals are a mere means of managing pests and diseases in their fields. But with changing times, the preference of consumers towards organic produce is growing day by day as they are becoming more conscious of food quality, their health as well as sustainability of the environment. Organic agriculture is the answer to address the issues thrown up as the after effects of pesticide application are becoming more potent.

Thus, in these changing times, the demand for biopesticides as alternative pest control measures is gaining popularity. Biopesticides are any formulations which are derivatives of biological origin containing either plant products, microorganisms, insects or their combinations which helps in mitigating these pest problems. The sources of biopesticides are readily available and easily

biodegradable, exhibiting different modes of action and are less expensive with low residual toxicity. Neem, Tobacco, Garlic, Onion, Citronella, Jatropha etc are potent sources of biopesticides which are already under commercialization. Different species of Trichoderma, Bacillus sp. Etc. have also been isolated with potent anti-microbial activity.

With the government giving more emphasis on turning the entire North East India into an organic region, the demand for biopesticides have increased manifold owing to increasing pest and disease problems. The locally available producers are not able to provide for even 1 per cent of the biopesticide needs of the state. Thus, this has opened a huge window of opportunity for the development and industrialization of the bio pesticide industry in Assam.

Keywords: anti-microbial, bacillus, biopesticides, industrialization, Trichoderma.

Assessment of Genetic Diversity of Termitomyces found in Assam based on ITS sequences of rDNA.

Lakshmi Rupa Das and Diganta Narzary

Microbiology and Molecular Systematics Laboratory, Department of Botany, Gauhati University

Email id: lakshmidas9990@gmail.com

The termites belonging to the sub-family Macrotermitinae have a unique feature of cultivating a basidiomyceteous fungus, Termitomyces on their underground nest called termitorium. Many species under the genus Termitomyces R. Heim are edible mushrooms and are found growing naturally only in exo-symbiotic association with termites. The fruiting body of this fungus generally comes out above ground during the rainy humid season i.e. from the month of April to October in non-water logging upland forest/sub-forest areas of Assam. The mushroom is consumed mostly by the forest dwellers and people of the adjoining area because of its rich taste and aroma. Apart from being good in taste, it has immense nutritional, medicinal and economic values. Termitomyces is found to occur in many areas of Assam like Kamrup, Goalpara, Nagaon, Sonitpur, Charaideo but species diversity is not yet documented. Hence, our study mainly focuses on the genetic diversity of this mushroom found in Assam. Extensive survey and field exploration was conducted since 2015 in different areas of Assam. A total of forty different Termitomyces samples have been collected from 12 different districts of Assam and all relevant information were recorded as much as possible ranging from forest vegetation type to mushroom macro-morphological characters. However, getting information about the sprouting of this mushroom from the forest dwellers is tough as they generally do not want to share easily. Besides, documentation of phenotypic characters at the primordium state is difficult as the sprouting of the mushroom is only visible when it comes out above ground, and opens up their gills within 2-3 days and starts degrading immediately. Therefore, in addition to the morphological traits, internal transcribed spacer (ITS) regions of nuclear ribosomal DNA (rDNA) was used to estimate genetic diversity and construct phylogenetic relationship among samples. Our molecular study shows four distinct sub-groups in phylogenetic tree revealing wide genetic diversity among the accessions, however species level identification is still a hurdle in molecular analysis due to unavailability of reference sequences in the public databases.

Keywords: Termitomyces, termites, genetic diversity, ITS.

Influence of Lime rates and Organic amendments on Nitrogen Mineralization kinetics in an acid soil series: A laboratory study

Lekhika Borgohain1*, Danish Tamuly2, Niloy Borah3, Samiran Dutta4, R. K. Thakuria5, Karishma Borah6, Hemi Borgohain7
*Email Id: lekhikaborgohain123@gmail.com

A laboratory incubation experiment was carried out to study the Nitrogen mineralization and subsequent release of nitrogen from soil, treated with different doses of lime with organic amendments (FYM and enriched compost). The experiment was laid out in a completely randomized design with 12 treatments replicated thrice to study the nitrogen mineralization kinetics as influenced by co-application of lime along with organic manure over 100 days period. The data were fitted to first-order nitrogen mineralization model since it provided the best fit to the experimental data and also for its simplicity. Result revealed that nitrate nitrogen (NO3--N) and ammonical nitrogen (NH4+-N) release was found to be significant and highest in the treatment T6 (LR 100% + EC @ 5ton ha-1) followed by T5 (LR 100% + FYM @ 5ton ha-1). Release of NO3--N increased linearly with increasing lime dose and the incubation period whereas NH4+-N increased exponentially with time and linearly with increasing lime dose. The values of mineralization rate constant (k) varied from 2.80×10-2 day-1 to 3.60×10-2 day-1 in different treatments. The potential mineralizable nitrogen (N0) varied from 200.98 mg kg-1 to 680.00 mg kg-1 across different treatments.The cumulative nitrogen content varied from 188.70 mg.kg-1to 661.50 mg.kg-1 of soil. The highest rate of change of mineralizable nitrogen was found in treatment T6 (LR 100% + EC @ 5ton ha-1) whereas lowest was found in control. It was found that the rate of change of mineralizable nitrogen (dN/dt) decreased from the first day of incubation up to 100 days. The highest rate constant, cumulative nitrogen, potentially mineralizable nitrogen as well as mineral nitrogen were found to be significant and highest in treatment T6 consisting LR 100% + EC @ 5ton ha-1 than all other treatments.

KEYWORDS: Enriched compost, FYM, lime, N-mineralization, kinetics

Effect of date of sowing and row spacing on growth and yield of baby corn (Zea mays L.) during rabi season.

Lipika Talukdar, P.C. Bora, and K. kurmi

Department of Agronomy, Assam Agricultural University, Jorhat- 785013, Assam, India

lipikatalukdar13@gmail.com, , 8638030219

Maize (Zea mays L.) is the world's third leading cereal crop after wheat and rice. It occupies an important position in the world economy and trade as a food, feed and industrial grain crop Baby corn is a delicious and nutritive vegetable and it is consumed as a natural food. Baby corn production being a very recent development, cultivation practices need to be standardized before it finds a prominent place in most of the intensive cropping systems due to it's short duration nature. Inadequate spacing leads to low productivity along with poor quality. Though spacing requirement of gain maize has been standardized, the information on influence of spacing on yield and quality of baby corn hybrids and composites is lacking. However, the location specific technologies for the crop are not available. Therefore agro-techniques to achieve higher production are the need of the day. Baby corn being a relatively new introduction in our country, the development of suitable production technology for realizing higher baby corn yield and monetary returns is of utmost importance. Sowing time is an important factor influencing the performances of the crop since it is important for better utilization of available moisture and nutrients supplied to the crop. Keeping this in view, various experiments were have been carried out on the effect of plant geometry and different dates of sowing. The information available on growth parameters viz, plant height, no of leaves/plant, LAI, dry weight/plant, CGR,RGR and NAR at various stages of crop growth as affected by plant geometry and in conjunction with different dates of sowing is also reviewed.

Keywords: Sowing time, crop geometry, baby corn

In vitro assessment of effective commercial biopesticides against major soil borne diseases of Assam

Mehjebin Rahman, L.C. Bora and P.K.Borah

Department of Plant Pathology, Assam Agricultural University, Jorhat 785013, Assam

Email : mehjebinr@gmail.com

With Assam being in the growth trajectory of Organic Agriculture, biopesticides became an eco-friendly option as compared to hazardous chemical pesticides. However, limited availability of quality biopesticides in the market it became hurdle to the farmers for organic conversion of their crop as well as their land. The present study was conducted on qualitative evaluation of fifteen biopesticides that are available in the agro-market of Kamrup, Jorhat, Dibrugarh districts of Assam against major soil borne diseases. The highest population count of bioagent was found in Pseudocon from Orgaman R & D Division, Jorhat where the population of Pseudomonas was 3.6 x 107 cfu/ml. Most of the biopesticides failed to show the presence of mentioned bioagents while some contained very less population count. The biopesticides mostly contained Trichoderma and Pseudomonas as active bioagents whose inhibition percentage was also checked .Trichoderma showed greater inhibition percentage against many phytopathogen than Pseudomonas. The inhibition percentage of this two biocontrol agents was checked against Fusarium oxysporium, Sclerotium rolfsii, Collectotrichum lindemuthianum. The highest inhibition percentage was recorded by Trichoderma against Alternaria sesami i.e., 95% while the lowest inhibition percentage was recorded as 41% by Pseudomonas against Collectotrichum lindemuthianum.

Response of Aluminium toxicity on morphological and yield characters of Lablab purpureus var. Pusa Sem 3

Mohd Talha Ansari* and A.S. Mailappa

College of Horticulture and Forestry, Central Agricultural University, Pasighat-791102, Arunachal Pradesh, India

*Corresponding author email: ansari.talha0@gmail.com

Nutrient deficiency is major problem under acidic soil condition. In highly acidic soil aluminium toxicity is a major problem for plant production. Therefore, the present investigation was carried out in pot containing experimental soil to study the response of aluminum on morphological and yield characters of dolichos bean (Lablab Purpureus L. Sweet) var. Pusa Sem 3. The seedlings were given varying level of aluminium treatments (0, 15, 30 and 45 mg/kg soil) using AlCl3.6H2O. Significant result was obtained on all the studied parameters. From the present investigation it was revealed that increasing Al treatment significantly reduced root length by damaging it which results in inefficient absorption of water and nutrients from soil resulting in reduced biomass, root and shoot length, dry matter and yield characters in treated plants. The post soil parameters shows that Al binds with phosphorus and renders it unavailable to the plants and the pH of the soil decreased with the increasing level of Al treatment. Overall aluminium showed negative influence on the growth and yield of dolichos bean.

Key words- Aluminium, soil acidity, lablab, yield

In vivo Evaluation of Carbendazim, Commercial bio-formulation and Musatard Oil Cake against Fusarium wilt of Patchouli (Pogostemon cablin)

Monuj Gogoi and D.K. Sarmah

Department of Plant Pathology, Assam Agricultural University, Jorhat-785013, Assam, India.

E-mail: monujgogoi36@gmail.com

Pot experiment was conducted to study the effect of Carbendazim, bio-formulation (Biofor-pf-2) and mustard oil cake for the management of wilt disease of patchouli caused by Fusarium solani. Pot experiments were maintained under net house condition. In sterilized soil experiment, the PDI ranged between 22.22 to 44.40 per cent in various treatment combinations compared to the inoculated control (100%). Among them, MOC @ 50 g/pot, root treated and soil drenching with Carbendazim @ 0.1% + MOC @ 50 g/pot and Biofor-pf-2 @ 100 g/pot + MOC @ 50 g/pot respectively, was best with minimum disease incidence (22.22%) as compared to the inoculated control. Root dipping and soil drenching with Carbendazim @ 0.1% (T1) and Biofor-pf-2 @ 100 g/pot (T2) respectively, was found less effective with higher per cent disease incidence (44.40%), respectively.

APPLICATION OF REMOTE SENSING IN SERICULTURE

Nawab Tasmin Hussain

Department of Sericulture
Assam Agricultural University, Jorhat 785013

Sericulture is one of the important sector of economy in India. Compared to agricultural crops, sericulture provides more employment all round the year and fetches higher income for rural farm families. It is essentially a village-based industry. It is also environmental friendly farm activity because the silkworm food plants like mulberry, som, etc are perennial crops protecting the soil from erosion. Adoption of sericulture as an alternative to agriculture is possible under suitable agro-climatic conditions all over India. Identification of potential areas for sericulture development involved evaluation of land, water resources and climatic requirements for growing silkworm food plants as well as rearing of silk worms. The assessment of suitability of land for sericulture involves matching the land qualities with requirements of silkworm food plants and matching of environmental conditions for silk rearing. Considering the need for more silk production to fill the gap between demand and supply, potential areas for expansion of sericulture in 108 selected districts covering 24 states in the country were mapped using remote sensing, GIS and GPS tools. To provide information on sericulture and spatial information on potential areas for the selected 108 districts, a geo-portal titled 'Sericulture Information Linkages and Knowledge System' (SILKS) was conceptualized and developed using open source GIS, and put in the public domain'(Handique et al., 2016). Two case studies were carried out for site suitability analysis for silkworm host plant cultivation in Uttarakhand as well as Goalpara and Sibsagar districts of Assam using Remote Sensing and Geographic Information System (GIS). Within three years, the portal named SILKS could make a significant impact in the country particularly in NE states and a number of sericulture expansion activities have been taken up based on the study. Thus the study reflects how a substantial portion of area out of the total geographical area has been brought under the sericulture plantation with the application of geospatial tool especially remote sensing.

REFERENCE:

Handique, B. K., Das, P. T., Goswami, J., Goswami, C., Singh, P. S., Prabhakar, C. J., Bajpeyi, C. M., and Raju,P.L.N. (2016) Expansion of sericulture in India using geospatial tools and web technology. Current science.111:1312-1318.

KEYWORDS:

Remote sensing, sericulture, suitability of land, potential areas, spatial information, site suitability analysis, Geographic Information System (GIS)

Preparation and characterization of MgO Nanoparticle incorporated Poly vinyl alcohol/Carboxy Methyl Cellulose films for skin tissue regeneration.

Skin being the protective layer of body is very prone to damage due to burn, trauma, accidents etc. Tissue engineered skin is useful to overcome the conventional grafting techniques required for skin tissue repair. Novel composition of PVA and CMC blend films have been prepared by solvent casting/solvent evaporation method at different ratios of 30:70,50:50 and 70:30. PVA/CMC blend films crystallinity, hydrophilicity, antimicrobial activity, morphology, compositional analysis and mechanical property has been studied by performing contact angle analysis, XRD, AFM, antimicrobial assay, ESEM , FESEM, EDS, tensile measurement respectively to find best out three ratios. The antimicrobial activity of blend films is performed by well diffusion and disc diffusion method against gram positive and gram negative bacteria. The best one is selected to be used for skin tissue graft application. MgO is incorporated to the best film ratio to form CMC/PVA/MgO composite. The composite films prepared have antimicrobial properties, high water absorption capacity and biodegradable in nature. CMC/PVA have cell attachment properties and also help in cell growth which would be helpful for tissue regeneration.

Nutrient content and uptake in rapeseed as influenced by soil moisture conservation and INM practices

Nitumoni Mahanta
PhD Scholar,

Department of Agronomy
Assam Agricultural University, Jorhat-13

Email: Nitumon154@gmail.com

During the rabi season of 2017-18, a field experiment was conducted in the Instructional cum research farm, Assam Agricultural University, Jorhat to evaluate the performance in respect of nutrient content and uptake and final yield of late sown variety of rapeseed var. toria var. JT-90-1 (Jeuti) to different practices of soil moisture conservation and INM practices. The experimental area was laid out in a split plot design consisting of three replications and keeping tillage practices and mulching in the main plots and INM practices in the sub plots. The main plot treatments consisted of two tillage practices (P1: Conventional tillage and P2: Reduced tillage) and two mulching practices (M1: No mulching and M2: Mulching with paddy straw) and the sub plot treatments consisted of four nutrient management practices (N1:100 % Recommended Dose of NPK i.e. RDF through chemical fertilizer, N2: 50 % Recommended Dose of Nitrogen (RDN) through chemical fertilizer + 50% N through FYM, N3: 50 % RDN through chemical fertilizer + 50% N through Vermicompost and N4: 50 % RDN through chemical fertilizer + 50% N through Enriched Compost). Among all the treatments, the mulching treatment showed significant influence on seed and stover N content and the treatment mulching with paddy straw brought significantly higher N content in seed (2.59 %) and stover (0.57 %). Similarly, the reduced tillage and mulching treatments showed significantly higher uptake of N, P and K in the crop. The influence of different nutrient management treatments was found to be significant on both NPK content and uptake in rapeseed. Application of 50 per cent N through recommended chemical fertilizer and 50 per cent N through FYM showed the highest content and uptake of N, P and K in rapeseed as compared to other three treatments. As a result, the crop showed highest seed, stover and oil yield under the treatments of reduced tillage, mulching with paddy straw and INM consisting of 50 per cent N through recommended chemical fertilizer and 50 per cent N through FYM.

Key words: uptake, rapeseed, INM, tillage, mulching, FYM, stover

CHEMICAL AND BIOLOGICAL INVESTIGATION OF POND QUALITY IN GUWAHATI AREA

Parimeta Dutta
b.Borooah college,Guwahati

anumeta2@gmail.Com

Water is one of the most important compounds to the ecosystems better quality, which is described by its physical, chemical and biological characteristics. Due to urbanization the pond on the roadside is highly contaminated. The present investigation is on the water quality in around the Guwahati area. The sample was collected from different ponds in Guwahati they are Silpukhuri, Dighalipukhuri, Deepor beel, Jorpukhuri and Nakkatapukhuri. They were undergone through physio-chemical analysis of the water sample.

In the study the physio-chemical variables of water like colour, Dissolved Oxygen, Biological Oxygen Demand (BOD), pH, Metal Detection Analysis, Bacteriological Analysis. The result of the water sample varies with location. The pH is highly found in Dighalipukhuri (pH=7.99), the Biological Oxygen Demand is highly found in Deepor Beel (4.1 mg/l), Dissolved Oxygen is high in Deepor Beel (11.8 mg/l),Chemical Oxygen Demand (COD) is highly found in Silpukhuri (17.5 mg/l). The metals like Zn, K, Fe etc. are mostly present in all the samples and the water sample of Deepor Beel contains a little amount Arsenic in it. However, from the study showed that the water bodies near the road side were contaminated and quick actions is required to sustain the health of the wetlands. The main aim of the experiment was to evaluate the environmental quality and make Guwahati protected from the external effluents, dumping sites, automobile contamination etc.

METABOLITE PROFILING OF ENDOPHYTIC FUNGI ISOLATED FROM Dillenia indica

Pinky Bora* and N.Nirjanta Devi

Department of Molecular Biology and Biotechnology
Cotton University, Guwahati

Endophytic fungi are a diverse group of organisms colonize the living tissues of host plants without causing apparent symptoms of diseases. Medicinal plants are valuable sources for exploring endophytes. Endophytes are a promising source of bioactive metabolites.Endophytic fungi from D. indica were isolated and three isolates were subjected to molecular identification based on rDNA ITS sequence analysis and sequences were submitted in Genbank.The fungal isolates were identified as Aspergillus niger, Aspergillus fumigatus and Aspergillus flavus . The fungal cultures were grown in potato dextrose broth and were extracted by ethyl acetate. Phytochemical screening revealed the presence of varied secondary metabolites. Antibacterial screening was carried out by agar well diffusion method against three pathogenic bacteria. All extracts showed inhibitory activity on atleast one pathogenic bacteria. Aspergillus niger showed the highest activity against Staphylococcus aureus showing 10mm zone of inhibition. Antioxidant assay were performed by DPPH method. Aspergillus flavus exhibited the highest scavenging activity. Results showed that these extracts have antioxidant activity. Total phenol content was estimated, and a strong positive correlation to antioxidant activity was observed. The extracts were subjected to GC/MS to identify the active bioactive metabolites. These results indicates that endophytic fungi associated with D. indica could be a potential source of bioactive metabolites.

Keywords: Dillenia indica, Endophytic fungi, GC/MS, Metabolites

Study on biological characterization of Pipli (Piper longum) germplasm of Assam

Debashree Baruah1, Plabita Borah1, B.K. Saod2 and Sangeeta Das1.

1 Department of Botany, Bahona College, Jorhat, Assam, India. PIN: 785101
2 Department of Horticulture, Assam Agricultural University, Jorhat, Assam, India. PIN: 785013

Corresponding email ID: sangeeta.ranidas@gmail.com

Piper longum is an important medicinal plant user as a 'Rasayana' in the treatment of respiratopry disoprders and also as an important constituent in digestive formulations. Ayurveda used it as an ingradient of Trikatu (Three pungent trends). The antibacterial and antifungal activities of various solvent extracts of Piper longum were determined against a wide variety of pathogenic bacteria and fungi respectively. In the present study, biological characterization of 34 germplasm of Pipli was done. Observation of antibacterial and antifungal activities were taken for each of the germplasm. All the germplasms were found to vary in size, leaf length, length:breadth ratio, etc. The work is still under progress.

Key Words: Pipli, characterization, antibacterial, germplasm.

Axial Flow Hollow Fiber Cell Culture Bioreactor

P. Agarwal, S. Maheshwari, P.S. Agarwal and S.K. Mahto

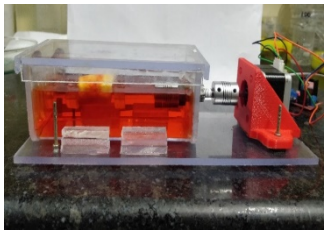
Tissue Engineering and Biomicrofluidics Lab
School of Biomedical Engineering, IIT(BHU) Varanasi
Email:pradyumn.agarwal.bme16@iitbhu.ac.in

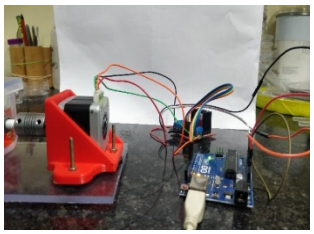
Tissue engineering is being used in developing organs for replacement, offering alternatives to fight morbidity, organ shortages and ethic-social problems associated with allotransplantation.

The application of Tissue Engineering in the construction of Artificial Trachea has gained a sustainable ground over the years. Although small volumes of tracheal cartilage generation have been done over the years, the progress has been limited.

Hence, to initiate the development of these organs the bioreactor environment was set up.

There are many important considerations in the design and construction of a bioreactor for growing hollow cells. The growth of the new organs requires a specialized container that provides sterility and an environment conducive to cell-seeding and attachment onto a three-dimensional bioabsorbable scaffold, incubation, and maturation. The material selection, dimensions, designing, and testing are factors to be considered in designing a bioreactor.





Side View (Bioreactor Assembly)Stepper Motor with driver

METHODOLOGY

There are a variety of materials appropriate for designing which depends upon cost, usage, transparency needs and quantity. Keeping all the factors into consideration the material used was: Polycarbonate.

The bioreactor body, fixed end cap, center axis, and removable lid were made from polycarbonate sheet.

3-D printing was used to develop the Stepper motor bracket.

Adhesive – Epoxy adhesive

SPECIFICATION:

Bioreactor body: Depth – 5 cm, Length – 15.8 cm, Width – 7 cm

Fixed end Cap: Length – 7 cm, Breadth – 7 cm

Centre Axis: Length – 10.8 cm (to hold the scaffold)

Removable Lid: Depth – 1.5 cm, Length – 17 cm, Breadth – 8.2cm

CONCLUSION

A bioreactor is a system that supports a biologically active environment. In a bioreactor, in which the goal is to grow cells or tissues, the design is significantly different from an industrial one. They are in vitro culture systems that have been designed to alter basic physiological phenomenon.

The organ requires an environment of controlled temperature and gas mixture and appropriate cell seeding which was arranged in the bioreactor.

An optimum design was fabricated such that the scaffold sterilized in the bioreactor supports:

Cell Seeding

Maturation

A sampling of contents by designing a functionally closed system.

SEED ENHANCEMENT THROUGH NANOMATERIAL

Pratiksha Gogoi*1 and Meghali Baruah2

1M. Sc., Department of Seed Science and Technology, 2Assistant Professor, Department of Plant Breeding And Genetics, Assam Agricultural University, Jorhat- 785013, Assam.

Nanomaterials are extremely minute chemical substances or materials which function at nano scale. Application of nanomaterials for agriculture is relatively new as compared to their use in biomedical and industrial sectors. During the past decade, a number of patents and products incorporating engineered nanoparticles(NPs) into agricultural practices have been developed with the collective goal to promote precision farming and generating less waste than conventional products & approaches e.g. nano-pesticides, nano-fertilizers, and nanosensors.The effects of nanoparticles on various seeds have been studied by researchers in recent years. Applications of nanoparticles in improving seed germination, emergence and growth of seedlings, thwarting pest attack and for early pathogen detection are few of the multifarious beneficial interventions in the field of seed science. It has opened up a large

scope for crop specific dosage fixation of nanoparticles, refinement of technologies like barcoding, aerial seeding and nanosensors. More researches needed in identification of mechanism of action and application of nanoparticles on seed.

Keywords: Nanoparticles, nanopesticides, nanofertilizers, nanosensor

Comparative analysis of hesperidin estimation in Assam lemon using Reverse Phase High-performance Liquid Chromatography

Raja Ahmed, Rupam Jyoti Sarma and Sofia Banu*

Department of Bioengineering and Technology, GUIST,
Gauhati University, Guwahati, Assam, 781014, India

Email: araja2257@gmail.com, sofiabanu2@gmail.com

Citrus is the most economically important fruit crop in the world. Citrus is categorized in the family Rutaceae and subfamily Aurantioideae. The state of Assam has as many as 17 species, 53 varieties and 7 probable hybrids of citrus out of which 8 species including Citrus limon are commonly cultivated in this region. The variety 'Assam Lemon' is present throughout Assam and other north eastern states. The Assam lemon possesses different types of flavonoids possessing different health related properties including antioxidant, anticancer, anti-inflammatory, anti-allergic, analgesic and anti-microbial. Moreover they also have the ability to reduce capillary fragility and to inhibit human platelet aggregation and also equally used in food and cosmetic industries. Among these flavonoids the flavone analog hesperidin are common constituents in many citrus species. It also enhances microcirculation, possess antioxidant effect, improve venous tone, anti-inflammatory, analgesic, blood lipid lowering, assist healing of venous ulcers, also used for the treatment of haemorrhoids, chronic venous insufficiency and exhibit pronounced anticancer activities which adds to its growing demand. Moreover it is very challenging to deal with such flavonoids in terms of extraction, purification and storage. Therefore this study has been made to extract and estimate hesperidin from Assam lemon fruit with help of reflux condenser considering different districts of Assam in order to make a comparative analysis of their hesperidin content using Reverse Phase High-performance Liquid Chromatography (RP-HPLC). Maximum yield of hesperidin (640.25 ug per 1gram of fruit extract) was estimated using our modified protocol.

BIOPHARMING-HOW MUCH WE KNOW ABOUT IT?

Rajashree Chetia

Assam Agricultural University, Jorhat-13, Assam

*Email: rajashreechetia10@gmail.com

Biopharming is the use of genetically modified (GM) plants or animals as production systems for therapeutic proteins. It is an emerging technology that offers a low-cost, large-scale alternative to current methods. Molecular farming / biopharming represents a novel source of molecular medicines, such as plasma proteins, enzymes, growth factors, vaccines and recombinant antibodies, whose medical applications are understood at molecular level (Raskin, 2002). Plant biopharming is defined as the

farming of transgenic plants genetically modified to produce “humanised” pharmaceutical substances for use in humans. The most common plants currently being researched for biopharming include corn, soybeans, rice, tobacco, and potatoes,modified to produce the substance, usually a protein, vaccines, in their fruit, leaves, seeds or tubers etc. Recombinant proteins such as vaccines and antibodies can be produced in plants via two systems: stable genetic transformation and transient expression. Stable transformation is included of integrating a gene into the plant nuclear or chloroplast genome. The transient expression can be resulted by using plant viral technology. The use of biopharming technology to produce vaccines in plants overcomes some of the major problems of traditional vaccination. This technology eliminates hazard of contamination with animal pathogens and provide a cheaper and safer alternative method. However, the cultivation of pharmaceutical GM crops may pose risks such as the contamination of the food or food chain. A number of methods such as growing crops in containment can be employed to limit the risks but these can increase the cost of production.

Hormonal regulation of growth and yield of rice , with special reference to cytokinin.

Rajasmita Hazarika , Dr. Bhagawan Bharali

Assam agricultural university, jorhat -13
Phone no-7896917382

Email- rajoyhazarika77@gmail.com

Rice (Oryza sativa L.) is the main staple crop in the world. It is the primary source of food and calories for about half of world population . The demand of rice continues to increase as consumption is outstripping the current production. A number of approaches have been reported to yield of rice. The use of phytohormones is highly effective in obtaining high yield.The development and growth of plant organs is regulated by phytohormones, which constitute an important area of plant science. The last decade has seen a rapid increase in the unravelling of the pathways by which phytohormones exert the influence on rice crops. Phytohormones function as signalling molecules that interact through a complex network to control development traits. They integrate metabolic and developmental events and regulate plant responses to biotic and abiotic stress factors. As such, they influence the yield and quality of rice crops. Auxins (i.e., NAA) and gibberellins (i.e., GA3) being well known plant growth promoting hormones has shown to be involved in a variety of growth and development processes (Frankenberger and Arshad, 1995). Ethylene regulates many aspects of growth, development and responses to environmental stresses in rice. Abscisic acid (ABA) is a plant stress hormone and one of the foremost important signaling molecules in plants, which plays versatile functions in regulating many developmental processes and adaptive stress processes (Santner et al., 2009; Cutler et al., 2010)

Cytokinins are plant hormones known as key regulator of plant growth and development, including cell division, chloroplast biogenesis, bud and root differentiation, shoot meristem initiation and growth, stress tolerance specially drought, organ senescence and nutrient mobilization. Cytokinin played an important role in regulating tiller bud growth and grain filling in alternate waiting and drying irrigation system. Exogenous supply of cytokinin or its precursors in the root zone could improve the growth and yield of treated plant. Cytokinin plays an important role in rice growth and development by delaying senescence, forming crown root and also by chloroplast development.

References

Bouman, B. A. M., Peng, S., Castañeda, A. R. and Visperas, R. M. 2005. Yield and water use of irrigated tropical aerobic rice systems. Agric. Water Manage. 74:87-105

Frankenberger, Jr. W.T. and M. Arshad, 1995. Phytohormones in Soil: Microbial Production and Function. Marcel Dekker Inc., New York, USA., ISBN: 0824794427, Pages: 503.

Santner A, Calderon-Villalobos LI, Estelle M: Plant hormones are versatile chemical regulators of plant growth. Nat Chem Biol 2009, 5: 301–307. 10.1038/nchembio.165

Detection and Characterization of Potato Virus Y (PVY) in Potato (Solanum tuberosum) of N. E. India.

R. Gowtham kumar1, Dr.Sundaresha.S2, Dr.M.borah1 and Sai Durga Siva Roopa Kumar K1

1Department of Plant Pathology, Assam Agricultural University, Jorhat 785013, Assam
2Central Potato Research Institute, Shimla 171001, Himachal Pradesh

Email Id: gowthamkumaraarta@gmail.com

Potato is the most value added crop among the horticultural crops in the North Eastern region of India. It occupies about 10% of potato acreage with a contribution of 4% total production in India. Potato is a host of many viruses, in which Potato virus Y (PVY) is one of the most significant virus with world-wide distribution and causes yield loss up to 10-80%. Occurrence of PVY was found in all the potato growing areas of Jorhat district through DAS-ELISA test. PVY also causes severe worldwide damage in other Solanaceous crops including tomato, tobacco and pepper. Virus infected samples were collected from various parts of the N.E.India and PVY was successfully detected by single step Reverse Transcriptase PCR (RT- PCR) by using coat protein gene specific primers. The Coat Protein gene (CP gene) was successfully isolated and cloned into pTZ57R/T vector and transformed into DH5α E.coli cells. The cloning was confirmed by Restriction digestion analysis and then the samples were sent for sequencing. The NCBI and Blast analyses showed 93% similarity with other sequences of the world.

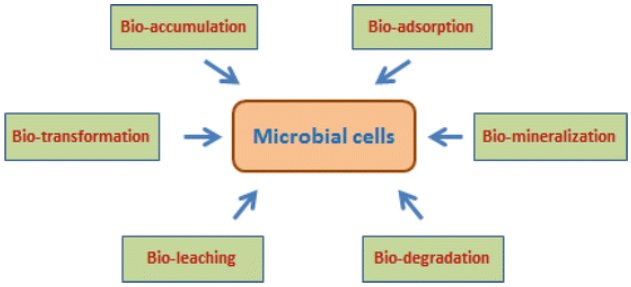
Keywords: potato, PVY, NE India, RT-PCR, cloning, pTZ57R/T

Bioremediation: An approach for ecological restoration by using smicroorganisms.

Sagarika Pala and Nazrana Tobosum Beguma

aDepartment of Botany, Cotton University, Guwahati-781001, Assam, India
.
Correspondence: sagarikaime@gmail.com, Mobile No: +919436583899, +919101049223

The impact of microbes on earth's environment have been continued to be substantial. Polluted wastelands are actually due to dumping of industrial effluents which are highly contaminated by heavy toxic metals and inorganic and organic toxic compounds [1]. Microbial bioremediation brings together experts in relevant fields to describe the successful application of microbes. Bioremediation in broad sense means improvement of the environment with the help of microbes, thereby, restoring it to an ecologically secured and safe state, making it fit for habitation of living organisms. Such microbes normally affect bioremediation by absorbing and accumulating harmful substances in their body, thereby, physically removing the harmful compounds or transforming the harmful compounds into harmless compounds [3]. Microorganisms have developed various strategies for the survival in heavy metal habitats, these organisms are known to develop and adopt different mechanisms such as bio-adsorption, bioaccumulation, bio-transformation, bio-mineralization, bio-leaching, etc.



Bioremediation has emerged as a natural, economical, sustainable approach by using biological agents specifically microbes or their enzymes [1]. This is because of their reusability, diversity, cost effectiveness and as microbes can use diverse noxious elements as their nutrient source [1]. Some bacteria belonging to the genus Pseudomonas has high potentiality to tackle heavy metals like Hg, Ni, Co, etc. in pollutant affected soil environment [3].This process of uptaking of heavy metals is mainly enhanced in the rhizosphere zone [3]. The rhizosphere bacteria are also capable of removing of toxic heavy metals and other pollutants which indirectly help in the growth of the stress tolerant higher plants. Direct stimulation of plant growth and development of plant growth promoting bacteria can occur in several ways. The bacteria can fix atmospheric Nitrogen, synthesis of siderophores and synthesis of plant hormones and also enzymes. Some filamentous fungi also show high level of metal and metalloids resistance [3].

Keywords: - Wastelands, Bioremediation, Pollutants, Rhizosphere, Pseudomonas.

References:-

[1]Surajit Das et al. Microbial Biodegradation and Bioremediation. Ch-2, page no. (1-21) (23-54)
[2]Adams GO, Fufeyin PT, Okoro SE, et al. Bioremediation, Biostimulation and Bioaugmention: A Review. International Journal of Environmental Bioremediation & Biodegradation. 2015;3(1): 28-39
[3]http://shodhganga.inflibnet.ac.in/bitstream/10603/32545/9/09_chapter%20i.pd

Transportation of Docetaxel Loaded Nanoliposome across the Blood Brain Barrier

Sahajit Mallick, Bhabani Sankar Satapathy, Biswajit Mukherjee*

*Department of Pharmaceutical Technology, Jadavpur University, Kolkata- 700032, India
*Corresponding author: Biswajit Mukherjee, Phone: 033-24146677,

E-mail: biswajit.mukherjee@jadavpuruniversity.in ; biswajit55@yahoo.com

Keywords: Brain cancer, Blood-brain barrier, Nanolipid carrier, Docetaxel

In the field of neuroscience research, the treatment of brain cancer remains a challenge due to poor permeation of conventional chemotherapeutic drugs across the blood–brain barrier (BBB). After optimization of various process parameters, we have developed docetaxel (DTX) encapsulated phospholipid based nanolipid carrier (NL) and evaluated its potential to cross BBB, both in vitro and in vivo. The size of the optimized NLs were below 100 nm with smooth surface and intact lamellarity, 7.8±0.2% drug loading and a sustained drug release profile in vitro. The pharmacokinetic and biodistribution data revealed that the drug resides in the blood for an extended period of time and efficient permeation of drug was observed from the DTX loaded NL across the BBB, in comparison to free DTX. The technetium-99m labeled NL significantly crossed via BBB and accumulated in the brain in a time dependant manner as compared to technetium-99m labeled DTX. Therefore, it could be concluded that NL might prove to be a promising candidate for an effective management of brain cancer and this will be a new era of treatment over the existing.

References

Stamatovic SM, Keep RF, Andjelkovic AV. Brain endothelial cell-cell junctions: how to “open” the blood brain barrier. Current neuropharmacology. 2008; 6(3):179-92.

Venishetty VK, Komuravelli R, Kuncha M, Sistla R, Diwan PV. Increased brain uptake of docetaxel and ketoconazole loaded folate-grafted solid lipid nanoparticles. Nanomedicine: Nanotechnology, Biology and Medicine. 2013; 9(1):111-21.

Shekhar Dey N, Mukherjee B, Maji R, Sankar Satapathy B. Development of linker-conjugated nanosize lipid vesicles: a strategy for cell selective treatment in breast cancer. Current cancer drug targets. 2016; 16(4):357-72.

Medicinal plant used in the preparation of Apong and Photika by the Mishing Tribe of Majuli, Assam.

Hrisikesh Borah1, Rajashree Borah1, Porismita Kolita, Swarajdeep Saikia1 and Sangeeta Das1.

1 Department of Botany, Bahona College, Jorhat, Assam, India. PIN: 785101

Corresponding email ID: sangeeta.ranidas@gmail.com

The work was carried out in three villages viz., Dambukial gaon, Lahon gaon and Karkichuck gaon of Majuli district of Assam during the period of August, 2018 to January, 2019. The people from these villages prepare their own household liquors, mostly by using rice grains as the substrate. Each of these tribes also prepares their own unique starter cultures to carry out fermentation and each type is a mixture of different parts of various plant species. There are all total of 30 medicinal plants are documented here. This research work reflects the rich ethno-medicinal values of the herbs. The informations were collected by field survey method and also through the available literatures. This work is an attempt to document and report the various medicinal herbs used in the preparation of Apong and Photika by the Mishing community people. However, further scrutiny and evaluation of the safety parameters of each component of the herbs used in the preparation of Apong and Photika may be done to develop a pharmaceutically potent leading molecule.

Key Words: Apong, Photika, Medicina plant, Mishing, Majuli.

Molecular detection of Cucumber Mosaic Virus in Capsicum annum var. Dalle Khursani and characterization of its sequence

*Bhattacharjee S. and Meetei N.T.

School Of Crop Improvement
College Of Post Graduate Studies In Agricultural Sciences
Central Agricultural University (Imphal), Umiam-793103, Meghalaya

*Corresponding author email: sash0502@gmail.com

Chilli (Capsicum spp.) belonging to the Solanaceae family is an important and highly cultivable spice crop of the temperate and sub-tropical countries with India being its largest producer. It is a self-pollinating dicot plant having originated in the American tropics. Capsicum (Latin) is derived from 'capsa' which means chest or box and refers to the enclosure of chilli seeds within its capsule. For its strong pungency attributes (Capcapsaicin pigment) and its bright colour (Capsanthin pigment) chilli is widely cultivated all across the country. The North East Region is considered as a hotspot for chilli diversity. Dalle Khursani (Capsicum annum) one of the popular chilli cultivar of the hills regions of Sikkim, best known for its pungency is used for pickle and chilli powder production. One of the major drawbacks of chilli cultivation is its wide susceptible to a wide variety of pathogen infection of which Cucumber mosaic virus (CMV) belonging to Bromoviridae is listed as one of the most destructive causing damage losses of upto about 60- 90%. It has been found to infect about more than 1000 host species in 85 families. This huge havoc caused by the virus causes yield loss and quantity. Commonly visible symptoms for CMV like mosaic, yellow discolouration, vein-clearing, curling, distortion, inward rolling of leaves are symptoms which can be associated with other biotic or abiotic factors of nutrition deficiency, attack by other pathogens thus making the detection of virus based on only visible symptoms quite unreliable. Molecular basis of detection hear creates a huge advantage as it is a highly sensitive method and using specific coat protein primers can give proper and accurate results of virus infection. The coat protein gene in viruses is highly conserved and is the most common method of virus detection through Reverse Transcription Polymerase Chain Reaction (RT-PCR) and Polymerase Chain Reaction (PCR). The Dalle Khursani plants cultivated in Umiam, Barapani have been checked and analysed for the presence of single stranded RNA CMV virus using RT-PCR. The infected samples showed amplifications using CP-TALL and CMV complete and partial coat protein specific primers. Specific sequences of CMV were then later identified and compared with earlier sequences of CMV obtained.

Key words: Chilli, Dalle Khursani, Cucumber Mosaic Virus, RT-PCR, Coat protein

In vitro efficacy of bacterial endophytes from medicinal plants against Fusarium oxysporum f.sp. cubense

Sharanya. R1*, Ashok Bhattacharyya2

Department of Plant Pathology, Assam Agricultural University-Jorhat-785013
*
Corresponding author: sharanyaramkrishna595@gmail.com

Fusarium wilt caused by Fusariumoxysporumf. spcubense (Foc) is one of the most devastating disease affecting commercial and subsistence of banana production throughout the world. It is ranked as one of the top six important plant diseases in the world, with existence of different races (Race 1, 2, 3, 4) threatening the banana cultivation. The chlamydospores can survive in the soil for more than two decades. Prolonged survival coupled with different mode of spread made chemical management

difficult.The scientists all over the world are following alternative methods for the control of disease. The management of disease through endophytes from healthier plants have been successfully carried out.An endophyte is an endosymbiont, often a bacterium or fungus, that lives within a plant for at least part of its life cycle without causing apparent disease.However, the exploration of endophytes from medicinal plants has not been explored yet. In present study leaf samples from medicinal plants like Centella asiatica, Ocimum sanctum, Rauvolfia serpentina, Acorus calamus, Withania somnifera were collected randomly from upper Brahmaputra zone of Assam. Bacterial endophytes were isolated by following standard protocols. A total of 87 bacterial endophytes were obtained from 110 samples. These endophytes were evaluated against Foc by dual culture technique. Out of 87 endophytic bacteria only 2 bacteria showed 60 per cent and above inhibition and other bacteria showed less inhibition.Further the multiple mode of action of these bacterial endophytes like ammonia, Siderophore, Phosphate solubilization, HCN were assessed.

A Molecular breeding approach of eri silk worm (Samia cynthia ricini) using non-lethal DNA sampling method

Jigyasa Somani1,2, Sahin Nazbin1,2, Priyodarshini Hazarika1,2, Sourabh Kr Das1, Nilave Bhuyan1,2

1Department of Biotechnology, Jagannath Barooah College, Jorhat, Assam
2 Department of Zoology, Jagannath Barooah College, Jorhat, Assam

Email: njbc@rediffmail.com

Sericigenous worm Samia cynthia ricini can be breed and reared under domesticated condition. Traditionally the selection of parents is done using morphological characters and feeding habits, which raises the chance of eliminating important genotypes with better adaptation. In a breeding program, selection of parents plays an important role in enhancing the genetic base. Selection of parents from wild or domesticated habitat with wide genetic makeup and better adaptive characters requires long term observation and DNA based molecular breeding approach.

The basic problem with molecular genetic studies of sericigenous insects like eri silk worm is that all available DNA isolation procedures are invasive and kills the worm during the isolation process. If the insect is killed during the isolation procedure, then any important character that was tagged with DNA based marker system will be of no use for further incorporation into available domesticated cultivars.

Therefore, we collected wild and domesticated genotypes of Samia cynthia ricini from Jorhat district of Assam and tested their genetic diversity using nonlethal DNA collection method. The most genetically diverse wild and domesticated genotypes were used as parents for a breeding experiment. From the offspring obtained, DNA was collected noninvasively and genetic diversity was tested against a normal population, where the parents were selected on the basis of traditional knowledge. The results showed a marked variation of genetic distance among the members of the two populations. Our result establishes the importance of use of nonlethal DNA isolation methods in molecular breeding and use of DNA based molecular marker system for selecting genotypes with wider genetic base.

Hormonal crosstalk: A tool for defense in plants

Subrata Bora (Corresponding author)
Department of Plant Pathology, Assam Agricultural University, Jorhat, Assam
Phone: +91-8638044534
E-mail id: subratastars@gmail.com

Plant defense is correlated with the activation of diverse set of mechanisms. Fast and strong activation of the plant immune responses aids the host plants to win the war against the pathogens. Plant defense is correlated with the activation of a diverse set of mechanism out of which phytohormones play a significant role. Hormonal crosstalk is the energy -saving strategy that provides the defense associated fitness cost. The collective contribution of these different hormones provides the plant with a powerful capacity to finely regulate its immune response and cross-communicate in an antagonistic or synergistic manner. Disease resistance is a continuum of responses ranging from immunity (complete lack of any symptoms) to highly resistant to highly susceptible. Specific signalling pathway has to be activated to confer resistance against specific pest or pathogen in a particular host. Crosstalk in plants helps to minimize the energy costs and create a flexible signalling network that allows the plant to finely tune its defense response to the invaders encountered (Koorneef et al., 2008). These networks are mainly dependent on the environmental factors, pathogen type, host type, age, etc. Understanding of the coordinated regulation of plant defense mechanism by hormones can lead for a new pathway of disease management strategy in an environmentally safe and sound manner. Salicylic acid, Jasmonic acid and ethylene are associated with defense responses against pathogens, but in the past decade several pieces of events demonstrate the abscisic acid, gibberellic acid, Cytokinin, Auxin and brassinosteroids, typically associated with abiotic stress or developmental processes are also key components of the immune response of plants (Shigenaga et al.,

(2016). Crosstalk is needed to design the engineering strategies in disease resistance of crops.

Understanding of the coordinated regulation of plant defense mechanism by hormones can lead for a new

pathway of disease management strategy in an environmentally safe and sound manner.

Keywords: Phytohormones, signalling network, pathogens, disease resistance

SURAJ KUMAR SINGH

Neurodegenerative diseases like Alzheimer's disease and Parkinson's disease are very debilitating and incurable with high prevalence. Therefore, it is important to develop new and more effective therapeutic approaches to combat these disorders. Parkinson's disease is a progressive and chronic disorder which develops gradually over time eventually leading to death of the dopaminergic neurons of substantia nigra in the brain. Previously we identified the role of caspase-2 as an initiator of mitochondrial oxidative stressed induced apoptosis in primary neurons. Further, inhibition of apoptosis at an early stage protected the neurons from undergoing apoptotic cell death in the presence of mitochondrial oxidative stress. Interestingly, these neurons demonstrated up-regulation of autophagy that provided survival advantage to these oxidatively stressed neurons. In the present study, we have shown that inhibition of apoptosis promotes accumulation of oxidative stress as indicated by enhanced lipid peroxidation, protein carbonylation as well as accumulation of ubiquitinylated protein in the surviving neurons. Inhibition of autophagy further promoted the oxidative damage. When the neurons were exposed to mitochondrial induced oxidative stress for variable durations and allowed to recover in the absence of the stressor, it was observed that the inhibition of apoptosis had a protective effect only when the stressor was exposed for a shorter duration of time. However, inhibition of apoptosis did not provided any survival advantage when the neurons were exposed to the stressor for a longer duration and allowed to recover. Overall our finding suggests that inhibition of apoptosis and the up-regulation

of autophagy provides survival advantage to the neurons in a time dependant manner and may not be effective if the neurons are exposed to the stressor for a longer duration.

Taken together it can be concluded that autophagy plays a role in adaptive stress response, thus for therapeutic advantage combinational approach is required to be considered to study its effect on the types and duration of stressor to enhance the therapeutic approach and to overcome the current challenges.

POTASSIUM SOLUBILIZING BACTERIA : AS FARMERS FRIEND AND ITS POTENTIAL IN INCREASING ENTREPRENEURSHIP

Suravi Nandi 1 & Aanganjyoti Swarup 2

Department of Soil Science1 ; Department of Tea Husbandry and Technology2
Assam Agricultural University, Jorhat-785013

Email Id – 95survinandi@gmail.com1

Potassium (K) is considered as an essential nutrient and a major constituent within all living cells. Naturally, soils contain K in larger amounts than any other nutrients; however most of the K is unavailable for plant uptake.Application of chemical fertilizers has a considerably negative impact on environmental sustainability. It is known that potassium solubilizing bacteria (KSB) can solubilize K-bearing minerals and convert the insoluble K to soluble forms of K available to plant uptake. In India, the cost of K-fertilisers is very high because there is no reserve of K-bearing minerals for manufacturing of conventional K-fertilisers and the whole consumption is imported, costing huge amount of foreign exchange. In this context, it is important to see the microbial solubilisation of K-bearing minerals in soils and their potentiality as K-fertiliser in sustainable crop production and in maintaining K status in soils (Basak et al 2010). Hence use of KSB can bring the cost of cultivation down and help the farmers by improving plant health and increasing the production. With the increasing popularity of organic agriculture, bio- fertilizer industry is also an innovative industry which is emerging and flourishing rapidly leading to increasing entrepreurship options. Development of effective strains , commercial propagation of KSB, producing affordable biofertilizers are some of the future prospects which can be taken as opportunities and the new generation can get employed. Advancement of the knowledge in this field will not only contribute to a better understanding of complex natural processes, but also will help to, achieve sustainable and environmental friendly practices in agriculture as well as develop new industrial applications, commercial production of bioferlizers and generation of employment. These technologies

are becoming vital in modern day agricultural practices.

References

1. Basak, B.B., Biswas, D.R. 2010. Co-inoculation of potassium solubilizing and nitrogen fixing bacteria on solubilization of waste mica and their effect on growth promotion and nutrient acquisition by a forage crop. Biol. Fertil. Soil. 46, 641-648

2. Etesami H., Emami, S. and Alikhani H. A. (2017) Potassium solubilizing bacteria (KSB): Mechanisms, promotion of plant growth, and future prospects - a review. Journal of Soil Science and Plant Nutrition, 2017, 17 (4), 897-911

Comparison of LC50 values of Biopesticide with Conventional Insecticide against Chilli aphids, Aphis gossypii.

Tanjil Rahman1, Swagata Saikia2

1Department of Entomology, Assam Agricultural University, Jorhat, Assam
2Department of Plant Pathology, Assam Agricultural University, Jorhat, Assam

Email: tanjilrahman6766@gmail.com

Considering the importance of organic farming and the demand for safe food globally, this present study was conducted in the Department of Entomology, Assam Agricultural University, Jorhat with an objective to evaluate and compare the LC50 values of biopesticide with conventional pesticides against chilli aphids, Aphis gossypii. The third instar aphids were exposed to different concentrations of the selected biopesticide as well as the selected insecticide for 24 hours. It was found that LC50 value of the selected biopesticide (OH) and insecticide(Imidaclorprid) was 2.322% and 0.900% respectively.

Manipulation of fatty acid biosynthesis for designer Brassica oilseeds

Smrita Gogoi*, Dr. Purna K. Barua

Department of Plant Breeding and Genetics
Assam Agricultural University, Jorhat, Assam

*Corresponding author: smritagogoibaby@gmail.com

Brassica sp. is a member of family Brassicaceae, mainly cultivated as oilseed crop. Seed oil content in Brassica is 40–42%. It is the 2nd most important oilseed in the world. But it's popularity being declined from the mid-nineteenth century due to presence of erucic acid 20–55% and glucosinolates. Canola oil on the other hand contains less than 2% erucic acid (Dupont et al., 1989). But the canola variety upon field trial in India is poor yielder (reviewed by Kumar et al. 2004), as the traits are unstable in Indian agro-climatic conditions. The nutritional quality of edible oils is determined by the presence of a few long chain Saturated fatty acids e.g. palmitic acid, stearic acid, long chain unsaturated fatty acids e.g. oleic, linoleic and linolenic and absence of very long chain unsaturated fatty acids(VLCUFA) e.g. erucic acid. The linoleic (omega 6) and alpha-linolenic (omega 3) are essential fatty acids for human. A balanced omega-6:omega-3 ratio in the dietary fat is important. WHO recommend less than 10 % consumption of saturated fats & a ratio of 1:1:1 between Saturated, Monounsaturated and Polyunsaturated Fatty acids to be the most suitable for human consumption. But most of the commercial oilseed crops do not have this ideal proportion. Therefore to generate the desirable genetically modified designer plant by manipulating fatty acid biosynthetic pathway through Transgene introduction using Agrobacterium-mediated transformation system , Altering the carbon flux in the metabolic pathway of fatty acid biosynthesis through regulating the activities of the key and Single gene manipulation at a critical metabolic branch point or gene pyramiding to overcome multiple steps. Where main aim to decreasing the VLCUFA content by diverting the carbon flux towards oleic acid, fatty acid elongase (FAE) gene silencing and increasing the amount of ''neutral'' SFA i.e. stearic acid, use highly in industrial purpuses. Also High Erucic Acid Rapeseed cultivars are also regained interest for industrial purposes. Brassica also has some medicinal property and highly using as biodiesel which is renewable and eco-friendly in nature. So from the above study we can conclude that, by a coordination of plant breeding, food processing and nutritional science it has possibility to get healthy and acceptable oil by overcoming the shortfalls and we will get new designer Brassica oil according to our need.

Key points: Brassica, Fatty acid, Erucic acid, Glucosinolate, oil quality

Site Specific On-Demand Delivery of Anticancer Drug Using Multi-Responsive Silk Based Nanocomposite Hydrogel

Ankit Gangrade and Biman B Mandal*

Biomaterial and Tissue Engineering Laboratory, Department of Biosciences and Bioengineering, IIT Guwahati, India

*E-mail: biman.mandal@iitg.ac.in, mandal.biman@gmail.com

Stimuli responsive biomaterials have been recognized as an important tool in the healthcare sector. Present work explores the prospects of a multiple stimuli responsive nanocomposite hydrogel composed of carbon nanotubes deposited inside a silk matrix. The surface of single walled carbon nanotubes (SWCNT) was modified with folic acid and loaded with anticancer drug doxorubicin, before its encapsulation into silk hydrogel. Silk fibroin is a naturally occurring, FDA approved protein polymer with various desirable properties such as biocompatibility and biodegradability, however, it does not respond to any external stimuli. The SWCNT on the other hand has also been explored for its various properties such as its near infrared (NIR) light, pH, temperature and electrical field responsiveness to release drug; however, its biocompatibility is questionable. We amalgamated these two and developed a biocompatible and external stimuli responsive smart biomaterial. The release of DOX from nanocomposite hydrogel was governed by payload concentration, rate of silk degradation, pH of the medium and its incubation temperature. Further, the intermittent exposure of near-infrared light and electric field to the hybrid gel system stimulated on demand DOX release. Our in vitro and in vivo data suggested that the therapeutic drug retained its functional activity after release. The nanocomposite silk hydrogel showed injectable properties, which allowed its implantation near to the tumour in a minimally invasive way through syringe. For cancer therapy, the implanted hydrogel was stimulated from outside using NIR light and electric field. A significant tumour regression was then observed in 21 days externally treated (NIR light and electric field) animals. The localized delivery of anticancer drug also minimizes the systemic side effects and showed an efficient way to treat the cancer.

Keywords – Silk hydrogel, Nanocomposites, Carbon nanotubes, Smart Biomaterials, Localized drug delivery.

Harnessing naturally derived silk biomaterials to develop smart wound care matrices

D. Chouhan and B. B. Mandal

Biomaterial and Tissue Engineering Laboratory, Department of Biosciences and Bioengineering, IIT Guwahati, India

E-mail: biman.mandal@iitg.ac.in

Skin wounds represent a major healthcare problem owing to an increasing number of trauma and pathophysiological conditions like burns and diabetic wounds. Such conditions hamper the normal self-healing pattern of skin and their treatment has been a foremost clinical challenge since decades [1]. Herein, we have explored the healing properties of naturally derived silk materials to develop various types of wound dressing materials and artificial skin grafts. In the course of developing strategies for wound repair and regeneration, our main aim is to develop pro-regenerative matrices using cost-effective approach to bridge the gap between need and the demand. Our research focusses on harnessing the regenerative properties of naturally available silk biopolymer to aid wound healing through various strategies. In the process of fabricating a suitable matrix for enhanced wound healing, we have explored various types of silk biomaterials ranging from silkworm silk fibroin to recombinant spider silk proteins. Considering the natural wound milieu, instructive biochemical cues were recapitulated in the developed matrices such as cell adhesive sites and growth factors using bioactive molecules or functionalized recombinant spider silk motifs. In addition, the wound healing matrices were developed considering ideal physical properties like antibacterial properties, moisture retention properties, and suitable mechanical properties. For example, to develop a wound dressing for treating chronic diabetic wounds, electrospun nanofibrous matrices were fabricated that consists of nanofibers ranging from 50 to 300 nm to mimic the natural skin architecture [2]. The nanofibers functionalized with growth factors enhanced cell recruitment and cell migration during the wound healing process, thereby accelerated the wound healing rate as seen in diabetic animal models [3]. By exploring silk-silk interaction between silkworm silk and spider silk, we also functionalized the nanofibrous mats with spider silk fusion proteins containing cell binding RGD (Arg-Gly-Asp) peptide, growth factor peptide and an antimicrobial peptide, which bestowed multifunctional bioactive properties to the silk based wound dressings [4]. In another objective, efficient skin substitute was developed in the form of an in situ forming hydrogel that was applied at the wound site via one-step grafting surgery [5]. The microporous network of the hydrogel helped in enhanced migration of cells within the construct and thereby aided in skin regeneration of critical 3rd degree burn wounds. We developed in situ forming injectable silk hydrogel using a cross-linker free approach, which self-assembles to form a hydrogel within 10 minutes of application at the wound site as examined in burn rat model. Conclusively, the inherent regenerative properties of silk biomaterials were efficiently utilized using various strategies to develop bioactive matrices for wound repair and regeneration.

References:

Bhardwaj, N., Chouhan, D., Mandal, B.B., Tissue Engineered Skin and Wound Healing: Current Strategies and Future Directions. Curr. Pharm. Des. 23, 3455–3482, 2017.

Chouhan, D., Chakraborty, B., Nandi, S.K., Mandal, B.B., Role of non-mulberry silk fibroin in deposition and regulation of extracellular matrix towards accelerated wound healing. Acta Biomater. 48, 157–174, 2017.

Chouhan, D., Janani, G., Chakraborty, B., Nandi, S.K., Mandal, B.B., Functionalized PVA-silk blended nanofibrous mats promote diabetic wound healing via regulation of extracellular matrix and tissue remodelling. J. Tissue Eng. Regen. Med. 12, e1559–e1570, 2018.

Chouhan, D., Thatikonda, N., Nilebäck, L., Widhe, M., Hedhammar, M., Mandal, B.B., Recombinant Spider Silk Functionalized Silkworm Silk Matrices as Potential Bioactive Wound Dressings and Skin Grafts. ACS Appl. Mater. Interfaces 10, 23560–23572, 2018.

Chouhan, D., Lohe, T.-U., Samudrala, P.K., Mandal, B.B., In Situ Forming Injectable Silk Fibroin Hydrogel Promotes Skin Regeneration in Full Thickness Burn Wounds. Adv. Healthc. Mater. e1801092, 2018.

Microfluidics in bioelectrochemical system: Technological considerations and future prospects

Surajbhan Sevda

Department of Biosciences and bioengineering, IIT Guwahati. Guwahati-781039

Email id: sevdasuraj@iitg.ac.in

In the past decade, a remarkable progress is carried out in the field of bioelectrochemical system for energy production, wastewater treatment and new product formation. This advance revolution in microbial fuel cell deals a multidisciplinary approach to achieve a high efficiency and high wastewater treatment rates. However this technology are still at the lab scale, so for further understanding of this microfluidics plays an important role. The use of microfluidic in BES shows much advantage over macroscale system such as need of less space and less time with need of less reagent. The Y-shaped design, giving advantage of using different streams of oxidant and it prevent the anode from any interfering reaction with oxygen at anode electrode. Microfluidics and μ-reactors offer miniaturization of experiments by a very little expense of solvents; energy and time with higher precision results. The series or parallel connection of microfluidic MFC, integrated in lab on chip device offer a significant application in real life applications this. With these connections, higher power and cell voltage can be achieved and these can easily scalable. The microfluidic MFCs technology in current structure need more improvement for translating it to practical integration.

Assembly Defects Abrogate Proofreading by Initiation Factors and License the Entry of Premature Ribosomes into the Translation Cycle

Himanshu Sharma, B Anand

Faithful protein synthesis is ensured by extensive quality control checkpoints using components of the translational machinery. However, the implications of defective ribosome assembly on protein synthesis and the associated translation quality control mechanisms in bacteria remain grossly unaddressed. In this study, using E. coli as a model organism we show that premature ribosomes evade proofreading by initiation factors during translation initiation, and make way into the translation cycle with severely compromised decoding and protein synthesis capabilities. This enfeebled binding to initiation factors also licenses the rapid conversion of the 30S (pre) initiation complex to 70S initiation complex. Overall, our work highlights that a mass balance deficit between premature ribosomes and initiation factors steers the entry of premature ribosomes into the translation cycle.

3D Bioprinted Silk Polymer Based Alcoholic Liver Disease Model

V. Monisha and B. B. Mandal

Biomaterial and Tissue Engineering Laboratory, Department of Biosciences and Bioengineering, IIT Guwahati, India

E-mail: biman.mandal@iitg.ac.in

Liver, a multifunctional organ with enhanced regeneration ability is severely affected by alcohol consumption. Detoxification of consumed alcohol affects liver by interfering and initiating cascade of reactions which increase oxidative stress, form immunogenic protein and release endotoxins from gut bacterium into bloodstream. Commonly used animal models of alcoholic liver disease do not act as suitable platform for studying disease progression and mechanism. Thus, in vitro liver disease models are essential for better understanding of disease biology and drug testing applications[1]. In this study, an in vitro alcoholic liver disease model was developed by exposing co-cultured HepG2 (Human Hepatocarcinoma cell line) and HDF (Human Dermal fibroblast) cells to ethanol and lipopolysaccharide. Cells were cultured in a 3D printed scaffold made of silk fibroin and galactosylated gelatin[2]. Unique characteristics of silk fibroin[3] render as a suitable biomaterial in liver tissue engineering[4]. Scaffolds were prepared by printing the characterized bioink in a specific pattern designed using 3D computer aided design (CAD) program. Physical characterization of the 3D printed scaffold showed optimal pore size, stability and good resolution. Distribution and proliferation of cells in the printed scaffolds were ensured by FESEM, alamar blue proliferation assay and live/dead staining. Also, liver specific function of cultured cells was measured in terms of albumin synthesis, urea synthesis and cytochrome P450 enzyme activity. Alcoholic liver disease was developed by treating the cells with ethanol and LPS at 24-hour interval to mimic the biological condition and observed by biological changes and fibrotic markers expressed by cells. The present study proposes an affordable scaffold based alcoholic liver disease model with a potential application in drug screening and research of disease mechanism.

References:

1. Lee, J., et al., A 3D alcoholic liver disease model on a chip. Integrative Biology, 2016. 8(3): p. 302-308.

2. Garg, M., et al., Galactosylated gelatin nanovectors of doxorubicin inhibit cell proliferation and induce apoptosis in hepatocarcinoma cells. Anti-cancer drugs, 2012. 23(8): p. 836-845.

3. Mandal, B.B. and S.C. Kundu, Cell proliferation and migration in silk fibroin 3D scaffolds. Biomaterials, 2009. 30(15): p. 2956-2965.

4. Janani, G., S.K. Nandi, and B.B. Mandal, Functional hepatocyte clusters on bioactive blend silk matrices towards generating bioartificial liver constructs. Acta biomaterialia, 2018. 67: p. 167-182.

Functional in vivo performance of adipose stem cells seeded small diameter silk vascular grafts

P. Gupta1 , K.L. Lorentz2,3, D.G. Haskett2,5, E.M. Cunnane2,3,4, A. Ramaswamy2,3, J.S. Weinbaum2,3, D.A. Vorp2,3,5,6,7 #, B.B. Mandal1 ##

1 Biomaterial and Tissue Engineering Laboratory, Indian Institute of Technology Guwahati, Assam, India 2 McGowan Institute for Regenerative Medicine, University of Pittsburgh, U.S.A. 3 Department of Bioengineering, University of Pittsburgh, U.S.A. 4 Tissue Engineering Research Group (TERG) Royal College of Surgeons in Ireland (RCSI), Dublin, Ireland 5 Department of Surgery, University of Pittsburgh, U.S.A. 6 Department of Cardiothoracic Surgery, University of Pittsburgh, U.S.A. 7 Department of Chemical and Petroleum Engineering, University of Pittsburgh, U.S.A.

Authors for correspondence: #biman.mandal@iitg.ac.in, ##vorp@pitt.edu

Peripheral artery diseases (PAD) are one of the major cause of cardiovascular malfunction and nearly 50% of mortality is caused by coronary artery anomalies. Blockade of coronary artery leads to limited supply of oxygenated blood to the heart muscle leading to myocardial infarction or heart attack. Currently available clinically viable options include angioplasty, placement of vascular stents and synthetic grafts and bypass surgery. Synthetic vascular grafts made from expanded polytetrafluoroethylene or polyethylene terephthalate have been successfully used to replace large diameter blood vessel implants in clinical studies. However, taking the risks of thrombosis, calcification, and restenosis into consideration, they are unsuitable replacements for small diameter blood vessels (< 6 mm) vascular grafts using mulberry (Bombyx mori-BM) and Indian endemic non-mulberry (Antheraea assama-AA) silk. The inner lyophilized porous silk layer (~1 mm luminal diameter) is coated with a silkPCL (Poly-caprolactone) electrospun layer to provide mechanical resilience. SEM imaging and micro-CT analysis of scaffolds revealed highly interconnected pores with average pore size 50 ± 20 μm, sufficient for cell seeding. Scaffold degradability is another important criteria that allows neo-tissue formation with time, hence we investigated the degradation profile of these scaffolds and observed 60-80 % weight loss after 30 days. Moreover, these scaffolds were found to be mechanically suitable for implantation as their mechanical properties were found to be comparable with that of human saphenous vein. When seeded with stromal vascular fraction (SVF) cells (isolated from human adipose tissue), a homogenous distribution was observed throughout the scaffold porous layer. Cell seeded scaffolds showed long-term patency (8 weeks) after implantation in rats as aortic interposition graft, as suggested by angiography. Animal viability (6/7 vs. 5/9) and patency (3/7 vs. 3/9) analysis of SVF seeded BAES (BM/AA composite) vs. BMES grafts revealed better performance of BAES grafts. Immunofluorescent analysis of explanted grafts revealed neo-tissue formation along the lumen with continuous presence of vWF positive endothelial cells. Presence of smooth muscle cells (SMCs) in the porous layer of explants suggested the host cell infiltration. Moreover, the graft remodeling was attested by deposition of extracellular matrix proteins (Collagen and Elastin). Altogether, the SVF seeded tubular silk scaffolds represent a viable option as tissue engineered vascular grafts. References: (1) Gupta P, Kumar M, Bhardwaj N, Kumar JP, Krishnamurthy C, Nandi SK, et al. Mimicking form and function of native small diameter vascular conduits using mulberry and non-mulberry patterned silk films. ACS applied materials & interfaces. 2016;8:15874-88. (2) Gupta P, Moses JC, Mandal BB. Surface Patterning and Innate Physicochemical Attributes of Silk Films Concomitantly Govern Vascular Cell Dynamics. ACS Biomaterials Science & Engineering. 2018. (3) Haskett DG, Saleh KA, Lorentz KL, Josowitz AD, Luketich SK, Weinbaum JS, et al. An Exploratory Study into the Preparation and Evaluation of a “Same-Day” Adipose Stem Cell-Based TEVG. The Journal of Thoracic and Cardiovascular Surgery. 2018.

Evaluation of silk as a bioink component for 3D printing of mechanically robust hierarchical cardiac tissues

Shreya Mehrotra1, Su Ryon Shin 2 and Biman B. Mandal1*

1 Department of Biosciences and Bioengineering, IIT Guwahati, India
2 Division of Engineering in Medicine, Harvard Medical School, Brigham's and Women Hospital, Cambridge, MA 02139, USA

*E-mail: biman.mandal@iitg.ac.in

A large number of extra cellular matrix (ECM) mimicking materials have enabled the fabrication of biomimetic constructs via 3D printing which are similar to the hierarchical structure of the native myocardium.[1,2] Such ECM mimicking materials, modified chemically to serve as efficient bioinks for the printing process, provide a myriad of cues (such as chemical, electrical and topographical) for facilitating cellular function.[3,4] However, most of these naturally derived natural materials lack the mechanical properties which are much required for both implanting the fabricated constructs in vivo as well as for supporting the cyclic elastic nature of the heart tissue. In this regard, we have explored the potential of silk as a bioink component in combination with other natural materials for engineering mechanically stable cardiac constructs. Silk as a natural biomaterial is mechanically robust and possesses high resilience to stretch and fracture.[5] In this work, a bioink comprising of Silk-GelMA and PEGDMA was formulated to provide suitable biophysicochemmical characteristics similar to the comprehensive set of cues provided by the native ECM in the heart tissue. The formulated bioink material exhibited mechanical properties which were significantly ($p \leq 0.01$) better than GelMA (a well-known biomaterial for cardiac tissue). High cellular attachement, cell viability and maintainance of functional attributes (~75 beats per minute) was also displayed by the human iPSC derived cardiomyocytes growing on the 3D printed constructs using the bioink. Further, the ability to use this bioink into developing vascularized constructs attested the ability of this bioink as an efficient cardiac repair material.

References

[1] S. R. Shin, S. M. Jung, M. Zalabany, K. Kim, P. Zorlutuna, S. B. Kim, M. Nikkhah, M. Khabiry, M. Azize, J. Kong, K. T. Wan, T. Palacios, M. R. Dokmeci, H. Bae, X. S. Tang, A. Khademhosseini, ACS Nano 2013, 7, 2369.

[2] M. J. Dalby, N. Gadegaard, R. O. Oreffo, Nat Mater 2014, 13, 558; B. K. Teo, S. T. Wong, C. K. Lim, T. Y. Kung, C. H. Yap, Y. Ramagopal, L. H. Romer, E. K. Yim, ACS Nano 2013, 7, 4785.

[3] A. J. Engler, S. Sen, H. L. Sweeney, D. E. Discher, Cell 2006, 126, 677.

[4] J. W. Nichol, S. T. Koshy, H. Bae, C. M. Hwang, S. Yamanlar, A. Khademhosseini, Biomaterials 2010, 31, 5536

[5] M, J. C.;Reardon, P. J. T.;Konwarh, R.;Knowles, J. C.; Mandal, B. B.. ACS Applied Materials & Interfaces 2017, 9, 8000-8013.

An approach for simultaneous detoxification and increment of cellulase enzyme production by Trichoderma reesei using rice straw

Suraj K. Panda & Soumen K. Maiti*

Dept. of Bioscience and Bioengineering, IIT Guwahati

Agricultural waste rice straw has been used for the production of cellulase enzyme required for bioethanol production via Trichoderma reesei. Pretreatment of lignocellulosic rice straw is required for this process which releases the toxic inhibitors along with soluble sugars. Simultaneous biological detoxification and enzyme production using rice straw as cellulose source have been investigated. T. reesei has shown capability of complete consumption of all the inhibitors along with cellulase production. A feeding approach of pretreated solid bagasse in liquid hydrolysate–grown culture has been developed to optimize the enzyme production, concomitant reduction of inhibitors and xylose utilization. Using this feeding strategy, FPase and CMCase production increased by 7 and 6 folds, respectively, compared to culture grown in whole slurry mixture (Rice straw control (RSC)). With early feeding approach, filter paper activity (FPase) and carboxymethyl cellulase activity (CMCase) production also increased by 14 and 10 folds, respectively, compared to late feeding.

KEYWORDS: Cellulase, lignocellulose, pretreated solid feeding, rice straw, detoxification

Implant Design and Stability Analysis

Post-surgery stability and load transfer play a significant role in determining the success of a hip stem. We are using 3-D modelling software Rhinoceros® for designing a cementless hip stem and finite element analysis(FEA) for prediction of load transfer and micromotion using an analysis tool called Ansys. Different materials with varying mechanical properties shall be used to model the bone-implant construct. We will calculate micromotion at the bone-stem interface with the help of Ansys by defining a frictional contact condition. Simultaneously, the load transfer mechanism of the implanted construct shall be assessed in comparison with the intact condition. Finally, a one-to-one comparison with a plane model with no groove shall be carried out to predict the efficacies of corrugated cementless stem with regard to load transfer and stability.

Red wine health benefits: evidence based study

Disha1 and Shabir Sidhu1

Department of Food Science & Technology, IKG Punjab Technical University, Main Campus, Kapurthala

Wine is an alcoholic beverage made with the fermented juice of grapes. Two types of wines are available depending upon juice derived from grapes with skin or without skin. Red wine made from juice of grapes with skin and white wine from juice without skin. The red wine is famous for its organoleptic properties and presence of antioxidant compounds. Apart from the colour difference, red wine and white wine differ in polyphenolic concentrations. Red wine has around 10 times more polyphenolic compounds than white wine. Major bioactive polyphenols in red wine are flavanols,

flavonols, anthocyanin's, and resveratrol. Table 1 presents the typical phenolic composition of red wine and white wine.

Table 1: Major phenolic compounds in red and white wine

Component	White Wine (mg GAE/L)	Red Wine (mg GAE/L)
Catequin	35	191
Epigallocatechin	21	82
Gallic Acid	7	95
Cyanidin-3-glucoside	0	3
Malvidin-3-glucoside	1	24
Rutine	0	9
Quercetin	0	8
Myricetin	0	9
Caffeic Acid	2.8	7.1
Resveratrol	0	1.5
Total Phenolics Content	239	2567

(Source: Markoski MM., et al., Molecular properties of red wine compounds and cardiometabolic benefits, Nutrition and Metabolic Insights 2016:9 51–57)

A number of studies are available in literature showing a negative correlation between wine consumption and ischemic heart diseases, which is thought to be responsible for number of health benefits of red wine. The higher amounts of polyphenolic compounds in red wine are advocated for benefits associated with red wine. On the other hand, a parallel body of literature is available which shows that cardiovascular effects shown by red wine are at par cardiovascular effects with other alcoholic beverages. Studies with dealcoholized red wine have shown that alcoholic content per se is responsible for the beneficial effects of red wine. Studies comparing beneficial effects of red wine, beer and other alcoholic beverages have shown that cardio-protection offered by red wine is comparable with other alcoholic beverages. In the present study, the available literature showing beneficial cardiovascular effects of red wine and literature showing cardiovascular benefit due to alcohol per se were reviewed. Based upon the evidence available in literature it is concluded that although red wine has higher amounts of polyphenolic compounds but currently the form in which these compounds are present in red wine have poor bioavailability. Hence are not able to exerts there beneficial effects.

The distribution and diversity of microorganisms in some selected regions of Kamrup district of Assam

Lubna Choudhury1 Guided by Dr. Rezina Ahmed

Department of botany, Cotton University

Every environment is found to be present with microbes, but depending upon the composition and properties of soil, the diversity and distribution of microbes varies. The relationship of the microbial diversity and ecosystem functions are not well understood, particularly in soil environment, due to the limitations in technology and the vast diversity of microorganisms. Microbes play an important function in regulating productivity and nutrient cycling by mineralization of nutrients with plants. Mineralization of nutrients from organic materials occur via enzymatic reactions, the product of these enzymatic reaction can be used for microbial growth, respired as CO2, or released back to the environment as enzyme or other products. The soil microbes are an important controller of soil CO2 emission and carbon storage. Thus due to the importance of microbes in the environment as well as commercial production an attempt has been made to study the diversity and distribution of microbes in some selected regions of Kamrup district of Assam.

Keywords: diversity , microbes , soil, Kamrup district.

Identifying target for Kala Azar – A theoretical approach using systems biology and Molecular Dynamics simulations

Nikita Bora1 and Anupam Nath Jha1

1Department of Molecular Biology and Biotechnology, Tezpur University, India

E-mail: niki24@tezu.ernet.in, anjha@tezu.ernet.in

With the evolution of pathogens, drug resistance has increased to a level whereby newer approaches are required to treat infections. Visceral leishmaniasis caused by the protozoan species Leishmania donovani is one such disease effecting millions of people worldwide. Approaches are mostly directed for target exploration from the available proteome data. The available three dimensional protein structures in L. donovani offer ways in analyzing the proteome of the parasite and assist in marking the conformational changes when free or bound to ligand. The focus of the work is to ascertain and reduce the functionality of a potent target, through in-silico mutation and molecular dynamics. The integrative approach includes the selection of a target, identification and mutation of crucial residues to induce changes in the target. To weight up the selection of proteins as a target, we have used the protein-protein interaction (PPI) information and building of a PPI network. We did comprehensive topological analysis on the knowledge-based PPI network, built from available information and filtered out a promising target “Adenylosuccinate lyase” (ADSL) having higher connections in the network. Structurally and Functionally important amino acids have been identified and mutated for the selected target. The native and the mutated proteins are subjected to Molecular Dynamics (MD) simulations for a total time-span of 600ns to trace their dynamic behavior. Comparative analysis of the native and selected mutated structures exhibits that the catalytic region of the target protein has undergone changes with respect to time. The changes in the orientation of catalytic residues like His118 and His196 has brought unfavorable interactions in the mutants as compared to the native, resulting into a reduced specificity for ligand-binding. In summary, this integrative approach is able to challenge the functionality of selected target protein against.

References:

Alvar, J., Yactayo, S., & Bern, C. (2006). Leishmaniasis and poverty. Trends in parasitology, 22(12), 552-557.

Bhavna Chawla and Rentala Madhubala. (2010). Drug targets in Leishmania. J Parasit Dis, Springer, 8, 1-13.

Butcher C Eugene, Berg L Ellen & Kunkel J Eric (2004). Systems biology in drug discovery. Nature Biotechnology. 22(10), 1253-1259.

Bora N. & Jha A. N. An integrative approach using systems biology, mutational analysis with molecular dynamics simulation to challenge the functionality of a target protein. Chemical Biology & Drug Design. (Accepted)

Abstract

Microbial Antagonist in Management of Pathogenic Flora Causing Root Decay of Lettuce under Hydroponic Culture Parveen Khan, L.C. Bora and P.K.Borah Department of Plant Pathology, Assam Agricultural University, Jorhat 785013, Assam E-mail: 2009parveenkhan@gmail.com Effectiveness of biointesive management of fungal rot and bacterial wilt of lettuce (Lactuca sativa L.) incited by Fusarium oxysporum f.sp. lactucae (Fol) and R. solanacearum, was evaluated under hydroponic culture tank system. Compatibility of four potential microbial bioagents viz. Trichoderma viride, Bacillus thuringiensis, Pseudomonas fluorescens and Metarhizium anisopliae were tested in vitro and the positively compatible bioagents were further assess their antagonistic properties against Fol and R. solanacearum. T. viride exhibited significantly highest antagonistic activity (68.56%) against Fol and the combination of T. viride, B. thuringiensis and P. fluorescens was found significantly effective (70.27%) in suppressing growth of R. solanacearum in vitro. When these effective bioagents were applied alone or as consortia, significant reduction of fungal rot and bacterial wilt incidence was observed in hydroponically grown lettuce crop with considerable increase in healthy harvest as compared to control (untreated). T. viride (108 cfu/ml) was found to suppress Fol infection in lettuce exhibiting lowest root infection (15.39%), lowest leaf infection (18.09%) as well as least fungal rot infection (17.29 %) with highest crop growth attributes and yield (251.25 g /plant). In respect to suppression of bacterial wilt of lettuce application consortial formulation of T. viride, B. thuringiensis and P. fluorescens (108 cfu/ml) exhibited lowest root infection (20.40%), lowest leaf infection (16.55%) as well as least wilt infection (18.57 %) with highest crop growth attributes and yield (242.50 g/plant)

Evaluation of antibacterial activity of some traditionally used medicinal plants against a plant pathogenic bacteria Ralstonia solanacearum

Sonal kumar1* , Praveenkumar2 and Dr. A. Bhattacharyya3

1 Department of Plant Pathology 2 Department of Plant Breeding and Genetics 3Director of Research (Agri.)
Assam Agricultural University, Jorhat-13, Assam, India

E-mail: sonalkumarchandrakar@gmail.com

Antibiotics have been used since the 1950s to manage certain bacterial diseases of high-value fruit, vegetable, and ornamental plants. The present study aimed at evaluating in vitro antibacterial activity of aqueous extracts of 10 different traditionally used medicinal plants of Assam against plant pathogenic bacteria Ralstonia solanacearum using agar well diffusion method. To get a local strain of Ralstonia solanacearum isolation was done from infected ginger rhizome collected from Jorhat market. Morphological characterization followed by 16S rRNA based sequencing was done to confirm the bacterial species. Aqueous extract of medicinal plants were prepared by following standard protocol. Evaluated plants species were found to exert a range of in vitro growth inhibitory action against the tested bacterial species. Initial screening has been done at 20% concentration by using agar well diffusion method and garlic (Allium sativum) showed the highest inhibition against Ralstonia solanacearum followed by other plant extract. Further three plant extract showing the highest inhibition zone during screening were tested on different concentrations viz. 5%, 10%, 20%, 30% and 40%. The effective plant extract at suitable concentration can be test for management of disease in vivo.

SREE LATHA K

srinivasprabhu78@gmail.com

Cymbopogons are aromatic grasses known for the bioactivity of their secondary metabolites. Different species of Cymbopogons are identified through distinguished morphological characters and the presence of characteristic compounds in their secondary metabolites. Wild Cymbopogon martini was collected from Bangalore University Campus, Bangalore. The plant leaves were subjected to Soxhlet extraction using Methanol as the solvent. The Methanol extract was subjected to GC-MS analysis which witnessed the presence of 45 compounds among which Oxalic acid, Cyclohexyl Isohexyl ester are present in highest concentration (11.88%) followed by 1,3-di Tert-butylbenzene (11.85%). The Methanol extract was further subjected to Cytotoxic studies in MCF7 cell lines. The plant extract with an IC 50 320 ug/ml has shown an inhibition of 52.53% and with an IC 50 173.5ug/ml exhibits zero cytotoxicity in MCF7 cell lines.

Genetic Diversity of Wild Cymbopopogon Martinii (Roxb.) in different ecotypes using Isoenzymes as Molecular Markers

Author1: Vijayalakshmi T.N (Research Scholar, Department of Microbiology and Biotechnology), Email ID: vijayabiotech23@gmail.com

Author2: Prof. Thara Saraswathi K.J (Professor, Department of Microbiology and Biotechnology, Bangalore University).

The elite and popular wild species of Cymbopogon martiniiwere examined for genomic and expressed molecular diversity through enzyme (protein) polymorphisms. Overall occurrence of band types were subjected to computation of gene diversity, expected heterozygosity, and similarity matrix. These in-turn provide inputs to derive primary account of variability, genetic bases of the wild martinii germplasm, putative need for gene/trait introgression from the geographically diverse habitat. The genebank is an incredibly valuable resource for the scientific community and the world at large. The germplasm diversity evaluation has been tremendously empowered by invoking bimolecular analytical techniques like isoenzymes, polypeptide and DNA polymorphism profiling, thus, facilitating direct and reliable measurements of genetic divergence (Andeson& Fairbanks, 1990)

Plant derived essential oil form the bases of large chemical, pharmaceutical and perfumery industries worldwide. Palmarosa (Cymbopogon martinii), also popular as Russa/Rosah grass, yields oil of commercial value andis accredited as the modern cash crop. Its oil is one of biggest base of exported agro chemicals from developing agrarian nations. Amongst Cymbopogons, palmarosa is most adapted to diverse edapho-climatic conditions and occurs widely in tropics and subtropics (Soenarko,1977; Boelens et al., 1994)

Wild species are rich sources of genetic diversity, wild species have co-evolved with changing diseases and environmental stress. As a collective, they offer rich genetic diversity that can be mined for cultivated crops. Understanding the genetic diversity found in wild relatives is important in helping our plants adapt. As the global climate changes and our crop plants face new challenges from pests and diseases, we need genetic variation that will improve the adaptability and resilience of the plant. Wild species are genetic treasure troves of diversity. We also have molecular approaches these days that allow us to clone genes from wild species and transfer that particular genes. There are new technologies for gene-editing that allow us to understand the genetic diversity of alleles, disease resistances alleles in wild species, and then edit existing alleles in the plant genome as well, so that they look like the wild species. We have a rich toolbox of methods to transfer genes between wild relatives of plants (Jim Bradeen).

Isoenzyme polymorphism was studied in Cymbopogonmartinii (wild)species of six ecotypes selected in different regions of Karnataka, India. The purpose of the study is to understandthe genetic affinities and variation among six verities of same species by means of isoenzymes namely Esterase, Lactate dehydrogenase (LDH),Glutamate oxaloacetate transaminase (GOT) and Glutamate dehydrogenase (GDH) were studied using the method of polyacrylamide gel Electrophorsis into separate molecular forms and isoenzymic patterns detected. The number of isoenzymes and their electrophoretic mobilities varied among the different plant studied, and this polymorphism allowed unique identification of six genotypes.

NUTRITIONAL VALUE, POLYPHENOLS AND ANTIOXIDANT PROPERTY OF Kaphal (Myricaesculenta)

Abhishek sharma

Department of Food Science & Technology, IKG Punjab Technical University, Main Campus, Kapurthala

Myricaesculenta (Myricaceae) commonly known as kaphal is an important Indian medicinal plant. It is found in foothill tracks of Eastern Himalayas. The plant is primarily sourced for the fruits, which are one of the tastiest wild fruits of the sub-Himalayan region and have recognized for its nutritional and therapeutic potential. It contains nutritive components essential for health. The proximate analysis of nutrients such as crude fibre, crude protein, crude fat, crude carbohydrates, ash value, moisture content and mineral contents such as Na, K, Ca, Mg, Fe, Zn, Mn, Cu of M. esculenta fruits were evaluated Ash 2.18(%),Moisture72.33%Crude fat 4.93%, Crude Protein 9.62%,Crude fiber5.22% Carbohydrates78.03%, Energy 395.04(Kcal/g). It is also rich source of polyphenols and can act as antioxidant. In addition, the harmful effects of free radicals which are known to be associated with several diseases.Phytochemical studies showed the presence of various bioactive phytoconstituents such as phenolic compounds, alkaloids, glycosides, triterpenoids and volatile oils. The plant is also reported to have innumerable significant pharmacological activities like analgesic, anxiolytic, antiallergic, antidiabetic, antimicrobial, antihypertensive, antiulcer, antioxidant and antiinflammatory evaluated by using various animal models.It is also useful in regeneration of nitrogen depleted soils. It is the rich source of vitamin C and polyphenolic compounds such as tannins, phenols, flavonoids and flavonols. Local tribes utilize tree as timber, fuel, fodder, wood as well as used for tanning and obtaining yellow colored dye. The fruit of M. esculenta have high amount of phenolics, flavonoid and natural antioxidants which can play vital role in reducing the oxidative stress and preventing from certain degenerative diseases and possess anti-inflammatory and antimicrobial properties.

MANAGEMENT OF DAY LENGTH FOR REARING OF ERI SILKWORM Philosamia ricini Boisd. AND ITS IMPACT ON LARVAL, PUPAL AND COCOON WEIGHT (LEPIDOPTERA:SATURNIIDAE).

In order to fulfill the experimental criteria the eggs of the eri silkworm are divided into three groups. The 1st group was exposed to 16 hours of continuous day light and 8 hours dark, the 2nd group was exposed to 12 hours of continuous day light and 12 hours dark and the 3rd group was exposed to 8 hours of continuous day light and 16 hours dark.

The overall result of the effect of photoperiodism on larval growth and cocoon weight of eri silkworm, Philosamia ricini are as follows:-

In the 1st instar equal larval weight was recorded in 16h L-8h D and 14h L-10h D. While in the 2nd, 3rd, 4th and 5th instars the highest weights were recorded in 16h L-8h D and the lowest were recorded in 14h L-10h D.

While the highest cocoon weight was recorded in 4h L-20h D and the lowest was recorded in 14h L-10h D. The pupal weight was also recorded highest in 4h L-20h D and lowest in 14h L-10h D. While the weight of cocoon without pupa was recorded highest in 16h L-8h D and lowest in 14h L-10h D.

Understanding the Impact of Environmental Variation on the Quality Characteristics of Tea.

Angshuman Bezbaruah[1]
[1]M.Sc Student

Department of Tea Husbandry and Technology
Assam Agricultural University,Jorhat -785013

Email Id – angshuman.bezbaruah@gmail.com

Tea (Camellia sinensis (L.) O. Kuntze) is the most consumed beverage in the world, next to water.Besides being a rejuvenating fluid,it has numerous health properties ranging from providing nerve stimulating effects to having anti-oxidant properties,anti-bacterial properties.It mostly grown as a monocrop,mainly because of its diversification,adaptability to different conditions. Tea production is driven by the interaction of genotype (G),environment (E) & management(M). Presently,the impact of the environmental variation is posing a major threat to the resilience of the tea cultivation. In the last three decades, more extreme weather events have been witnessed compared to early and mid twentieth century, while the last decade has been reported as one of the harshest years of extreme weather events. Increasing temperatures, changes of rainfall amount and distribution have already complicated the production process, The possible fallouts of the variation are already witnessed in the loss of yields,the functional quality of tea & increased management costs for developing coping strategies. While it is well understood that more frequent and intense climate events in many areas are resulting in a decline in crop yields, the impact on crop quality is less acknowledged.Environmental variation influences tea functional quality that is largely determined by the concentrations of secondary metabolites such as caffeine and various polyphenolic catechin compounds that are respectively responsible for tea's stimulant,antioxidant, anti-inflammatory, and cardioprotective properties. Therefore, this study emphasises the impact of the changes in the functional quality of tea as a result of the ever increasing climatic variations,which is already felt all across the globe.

Keywords – Functional Quality,Climate change,Tea Secondary Metabolites,Polyphenolic Catechins.

References -

Bhagat, R. M., Ahmed, K. Z., Gupta, N. and Barua, R. D. 2016. Impact of climate change on tea and adaptation strategies (India). Report of the Working Group on Climate Change of the FAO Intergovernmental Group on Tea. Food and Agriculture Organization of the United Nations,Rome, pp 3–26

Potentiality of Underutilized and Neglected Crops

Angshuman Borah* and Kollol Pratim Baruah**
B.Sc. 3rd Year* and Ph.D. Scholar**

Assam Agricultural University, Jorhat-785013, Assam

Corresponding Email ID:angshumanborah228@gmail.com
Contact Number: 8812807054

The dependence of humankind on plant resources is inevitable. Since the dawn of agriculture, domestication and gathering of desired plant species have helped in the evolution of the modern day world to our advantage. Globally, there are around 75,000 edible plant species, out of which around 150 have been widely used and again. And out of these, about 30 species provide 90% of the world's food. Therefore, there has been a certain attention and emphasis given by the researchers to the underutilized and neglected food crops. Underutilized crops constitute the lesser known species in terms of trade and research. The plants are often well adapted to marginal and stress conditions and possess a promising nutritional and industrial value. These crops have the capacity to substitute the known crops but are neglected due to various reasons such as limited germplasm, lack of research, lack of physiological information, lack of interest of the researchers, etc. The world today relies on a small number of crop species for food, mainly major cereals (wheat, rice and maize), leaving an abundance of genetic resources and potentially beneficial traits neglected. Exploiting the large reservoir of minor and underutilized crop plants would provide a more diversified agricultural system and food sources necessary to address food and nutritional security concerns in the face of climate change.

Key Words: Climate Change, Domestication, Nutrition Security, Substitute, Underutilized.

Entomopathogenic Fungi – An Alternative for Chemical Pesticides

Anindita Saikia* and Kollol Pratim Baruah**
B.Sc. 3rd Year* and Ph.D. Scholar**

Assam Agricultural University, Jorhat-785013, Assam

Corresponding Email ID:aninditasaikia722@gmail.com
Contact Number:9101403163

Synthetic chemical pesticides have been the mainstay of insect pest control for over 50 years. In 1962, Rachel Carson's 'Silent spring' had awakened the world about the harmful effects of chemical pesticides as well as its dangerous consequences. Since then, the search for alternative products for insect pest control which is effective, efficient and safe to the environment has been prioritized. This review outlines the current state of knowledge of insect fungal pathogens as it relates to their present use and future potential as mycoinsecticides. The most widely used entomopathogenic fungal species are Beauveria bassiana, Metarhizium anisopliae, Verticillium lecanii, which have been found very effective and efficient in controlling insect pests of economic importance in agriculture. However, there are different constrains due to which successful marketing and utilization is very low due high cost of product, low performance under challenging conditions, lack of immediate knock down effect, apprehension of the grower about the efficacy of the product and lack of awareness. But now, biopesticides are gaining an increasing importance and moreover, Asia pacific and Europe are expected to be the fastest growing markets for biopesticides in near future due to stringent regulations for use of chemical pesticides and increasing demand for organics.

Key words: Beauveria bassiana, Biopesticides, Entomopathogenic fungus, Metarhizium anisopliae, Mycoinsecticides, Verticillium lecanii.

Detection and identification of moderately halophilic microorganism for synthesis of commercially competent product

Ankur Das, and B. Dr. Mahua Gupta Choudhury
Department of Bioengineering and Technology, GUIST,
Gauhati University, Guwahati, Assam, 781014, India
Email: nkrdas2@gmail.com

Halophilic microorganisms are dominant in saline environment such as Dead Sea, saltern crystallizer ponds, hypersaline soils, salt mines, food, and salt secreting plants and are known for their adaptation, enzymatic potential, and production of competitive products, compounds and biotechnological implications. Among extremophiles, halophiles are comparatively less investigated and can be used for betterment of human life with their vast application in today's world. Therefore, this study was designed and focus has been made on the isolation of halophilic bacteria from extreme saline environment followed by their qualitative and potential screening. Pure isolates were used for morphological, biochemical, molecular (16s rDNA) and evolutionary characterization and further tested for osmolyte secretion using SDS-PAGE. Osmolytes were known for their properties of maintaining osmotic equilibrium, protein stabilizing and providing protection against heat and freeze and thereby osmolyte synthesizing ability of the isolates were also explored. Interestingly, four identified isolates namely, Oceanobacillus oncorhynchi, Jeotgalicoccus huakuii, Micrococcus yunnanensi, and Staphylococcus cohnii were found to be moderate salt tolerant and has potential to synthesize one industrially potent and competitive osmolyte. This investigation is a good approach towards production of such products commercially.

Synergistic effect of Terminalia arjuna, Terminalia chabula and Paederia foetida on anti-inflammatory activity evaluated by using egg albumin denaturation assay

Anuja Bora, Jyotchna Gogoi

Department of Biochemistry, Assam down town University, Panikhaiti-781026

Email: bora.boraanuja@gmail.com, Contact No. 7002037978

Inflammation is a localised protective reaction of cells, tissues of the body to allergic or chemical irritation, injury and infections. The present study was designed to evaluate anti-inflammatory property of Terminalia arjuna, Terminalia chabula and Paederia foetida. These are the plants which have been used in various pain relieving conditions like pain during menstrual cycle. Plant parts used for the study were bark of T. arjuna and T. chabula. Fresh matured leaves of P. foetida were used for study. Phytochemical activity study was done by using methanol as the solvent for extraction. The methanolic extracts of the above mentioned plants showed good presence of flavonoids, terpenoids, tannin, saponins and alkaloids. Out of all the three mentioned plants best individual anti-inflammatory activity of T. Chabula, 60.3±3.60% at 300 µg/ml and 48.6±7.7% for P. foetida at 300µg/ml was observed. But, combination of T. chabula and P. foetida at 300µg/ml increased the inhibition percentage to 79.6±13.8%. Also, 92.7±0.98% inhibition was observed at 1000µg/ml of above mentioned combination. Hence it could be concluded that synergistic effect of above mentioned plants could be

used for formulating better anti-inflammatory drugs for validation and future use. It also validates the traditional herbal use of the plants, pain during menstrual cycle.

Keywords: Inflammation, T. arjuna, T. chabula, P. foetida, phytochemical, synergistic effect

Effect of Vanillic acid and Iso-Vanillic acid on Hen Egg White Lysozyme Amyloidogenesis

Arbin Basak, Subhankar Paul, Nandini Sarkar*

Department of Biotechnology and Medical Engineering,
National Institute of Technology Rourkela, Rourkela, Odisha, India.

Amyloidosis is the condition of deposition of protein fibrils in various tissues and is a major cause of many systemic and neuro-degenerative diseases like Alzheimer's disease, Parkinson's disease, Prion diseases, Type II diabetes, etc. Among the therapeutic approaches, the use of natural products as anti-aggregating compounds has grabbed much attention recently. In our present study, we investigated the mechanism of interaction of two naturally occurring polyphenols namely Vanillic acid and Iso-vanillic acid with aggregating Hen Egg White Lysozyme (HEWL) in vitro and verified both to be effective in inhibiting aggregate formation to different extent. Herein, a range of techniques like Thioflavin T(ThT) and ANS fluorescence assays, Dynamic light scattering, Zeta potential, Circular dichroism(CD) and Electron microscopy have been employed to study the efficacy of these polyphenols on inhibition of fibrillogenesis of model HEWL protein. Apart from inhibition of fibril formation, these polyphenols also exhibited significant disaggregation effect when applied to mature fibrils, and therefore can be exploited for the design of future de novo inhibitors as therapeutic agents for the treatment of amyloid-related diseases.

Keywords: Amyloidosis, polyphenols, Thioflavin T, ANS fluorescence, Circular dichroism.

INTEGRATED FARMING SYSTEM- A MULTIDISCIPLINARY APPROACH (A Review)

Aliva Dutta and Archita Goswami

College of Agriculture, AAU, Jorhat, Assam

Corresponding author email ID: flyingaliva@gmail.com, architagoswami13@gmail.com

IFS can be proved as a viable approach, represents an appropriate combination of farm enterprises viz., crop production, horticulture, livestock, fishery, forestry, poultry in specific farming situation to address the problems of sustainable economic growth of the Indian farming communities alongwith the problems of small & marginal farmers. An interrelated set of enterprises are used so that the waste from one component becomes an input for another part of the system which reduces cost and improves production and income. Addition of organic residues in the form of animal and plant waste also helps in improving the soil health and thereby productivity over a longer period of time with lesser environmental hazards. It offers unique opportunities for maintaining and extending biodiversity. IFSs are often less risky; if managed efficiently, they benefit from synergisms among enterprises, diversity in produce and environmental soundness. For example, the by-product of dairy (cow dung) and paddy fields (straw) forms a major raw material for bio gas plant and mushroom cultivation respectively.

Digested slurry of bio-gas forms a major part of feed in pisciculture for increasing plankton growth as well as supplying valuable manure to raise the productivity of field crops/enrich the soil & straw after use in mushroom production is utilized as cattle feed and compost preparation. Apiary played an important role in the improvement of pollination apart from honey. Thus, IFS acts as potential tool in management of vast natural resources in developing countries.

KEY WORDS: Multidisciplinary, sustainable development, soil health, biodiversity

EVALUATION OF TRANSDERMAL PATCH OF INDOMETHACIN CONTAINING PATCHOULI OIL AS NATURAL PERMEATION ENHANCER

Asha Das[1], Dr. Abdul Baquee Ahmed[2]
[1]Assistant Professor, Department of Pharmaceutics, Girijananda Chowdhury Institute of Pharmaceutical Science, Guwahati.
[2]Associate Professor, Department of Pharmaceutics, Girijananda Chowdhury Institute of Pharmaceutical Science, Guwahati.

E-mail:ashagips@gmail.com.

Aim: To study the effect of patchouli oil as natural permeation enhancer on transdermal patch of Indomethacin across rat epidermis.

Method: In-vitro permeation study of transdermal patch of indomethacin was carried out using Modified Keshary-Chien diffusion cell using rat epidermis. Seven formulations were prepared namely F1 to F7 containing different concentration of patchouli oil, a blank and a control. The transdermal patch of indomethacin were formulated after studying the drug and exipient compatibility studies by differential scanning calorimetry (DSC) and Fourier transform infra red spectroscopy (FT-IR) and were prepared by solvent evaporation method. Rat epidermis was mounted on the diffusion cell and transdermal patch of indomethacin was placed in the donor compartment and the diffusion study was carried for 12 hours with receptor compartment containing 34 ml of Phosphate buffer pH 6.8 maintained at 37± 0.5˚C.The permeation parameters of transdermal patch of indomethacin containing patchouli oil across rat epidermis was compared with an appropriate control. FTIR and SEM (Scanning electron microscope) studies of the rat epidermis were done understand the mechanism of the permeation enhancing effect of the oil from the patch.

Result: Maximum transdermal flux of 59.21±0.89 µg/cm^2/hr was obtained with the formulation F7 (containing 1%w/v of patchouli oil) while in case of standard i.e. formulation F4 (containing standard permeation enhancer) the transdermal flux was obtained to be 47.25 µg/cm^2/hr, showing increase in transdermal flux of Indomethacin with increasing concentration of patchouli oil. FT-IR data of rat epidermis indicated that the patchouli oil enhances the transdermal permeation of indomethacin across rat epidermis by partial extraction of the lipids in the stratum corneum which were further supported by the results obtained by SEM studies.

Conclusion: Thus, the results showed a potential permeation enhancing effect of patchouli oil on the transdermal permeation of indomethacin and may be used as natural permeation enhancer in Transdermal drug delivery systems.

Keywords: Transdermal Patch, Patchouli oil, permeation enhancer, Fourier transform infrared spectroscopy (FT-IR), Scanning electron microscope (SEM), Differential scanning calorimetry (DSC), Keshary-Chien diffusion cell, rat epidermis

Growth and yield of sunflower as influenced by integrated application of organic and inorganic fertilizers (.Helianthus annuus L)

Ashok.S.Dambale[1], A.K.Ghotmukale[2], V.P. Suryavanshi[3] and S.D.Khandekar[4].
[1&4] M.Sc Scholar, Department of Agronomy, College of Agriculture, Latur (VNMKV)
[2 & 3] Professor, Department of Agronomy, College of Agriculture, Latur (VNMKV)
Email: dambaleashok@gmail.com

The field experiment wasconducted during kharif season of 2016-2017 on v e rtisol at Oilseed Research Station, Latur to study the effect of integrated application of organic and inorganic fertilizers on growth and yield attributes of sunflower.The experimental field was levelled and well drained. The soil was clayey in texture, low in available nitrogen (124.77 kgha^{-1}medium in phosphorus (9.45 kgha ,($^{-1}$ and (rich in available potassium (428.03 kg ha^{-1} .and alkaline in reaction (8.0 pH((The experiment was laid out in a Randomized Block Design with 9 treatments replicated thrice. The treatments were T_1- 100 % RDF + SR @ 5 t/ha, T_2- 100 % RDF + FYM @ 5 t/ha, T_3- 100 % RDF + SR @ 2.5 t/ha + FYM @ 2.5 t/ha,T_4- 75 % RDF + SR @ 5 t/ha, T_5- 75 % RDF + FYM @ 5 t/ha, T_6- 75 % RDF + SR @ 2.5 t/ha + FYM @ 2.5 t/ha, T_7- SR @ 5 t/ha, T_8- FYM @ 5 t/ha and T_9- SR @ 2.5 t/ha + FYM @ 2.5 t/ha.

The gross and net plot size of each experimental unit was 5.4 m x 4.5 m and 4.2 m x 3.9 m, respectively.FYM was applied before sowing as per treatments. Sowing was done by dibbling method on 23rd July 2016 as per treatmentat spacing of 60 x 30 cm . The recommended cultural practices and plant protection measures were undertaken. The recommended dose of fertilizer 90:45:45NPK kg ha^{-1} was applied as per treatment half dose of nitrogen along with full dose of phosphorus; potassium as a basal dose and remaining half dose of nitrogen was applied at 30 DAS.The recommended dose of fertilizer was applied as per treatments through Urea and Single Super Phosphate .The crop was harvested on 20 thOctober 2016. Application ofRDF + FYM @ 5t %100 /ha (T_2) recorded significantly higher growth, yield and quality contributing characters followed by application of @ RDF+SR %100 /t/ha+ FYM @ 2.5 t 2.5ha(T_3)

Keyw.ords: Sunflower, FYM, Fertilizer,Soybean residue

Study on Differentiate Procedure of Alkaline Phosphatase Test by Conventional Colorimetric Method and Optimized Standard Method in Pasteurized Milk

Avra Pratim Chowdhury1, Mohammad Abul Manchur2, Kazi Mohammad Rokonuddin3
1. Ph.D. Research scholar, Dept.of Botany, Gauhati University, Assam, India.
(Mail: avranu132@gmail.com)
E-mail: abc.author@iitg.ernet.in

In order to determine pasteurized milk, one of the enzymes milk phosphates, is measured. A negative phosphates' result indicates that any pathogenic bacteria have been destroyed during pasteurization. If it is positive, it means the pasteurization process was inadequate and the milk may not be safe for human consumption and will have a short shelf life. In conventional method the milk samples are diluted with buffer at pH 10.2 and incubated at the temperature at 37ºC for 2hrs.Any alkaline phosphates present in the milk samples will liberate Para nitro phenol from artificially added disodium p-nitrophenyle phosphate which can be compared with the standard color disc. There are differences for measuring the phosphatase activity in between conventional method and Optimized Standard Method. So Chowdhury AP1 et.al., applied " Optimized Standard Method" according to the recommendation of the German clinical chemistry association (Deutsche Gesellschaft fur Klinische Chemie, DGKC) at the purpose of showing its better performance than conventional procedure with in short time.
Objectives: Study on differentiate Results of ALP analysis from Milk samples (Raw, Pasteurized and UHT) distinguishing between conventional method and newly applied DGKC method.

Figure: 1.aSamples for ALP analysis 1.b Samples setup for ALP analysis (DGKC) 1.cSynchronization of Samples 1.d Pour on milk in Home Pasteurizer

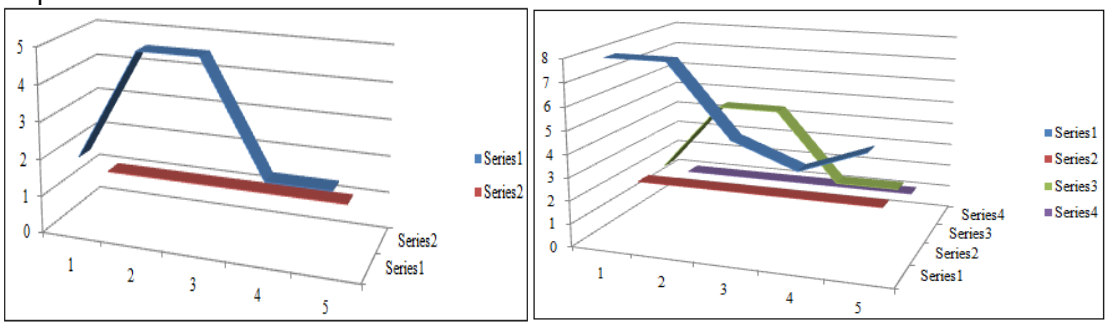


Figure: 2.a Fluctuation of ALP values in Optimized Method (Seres1) accordance with time 1hrs (Seres2) 2.b Comparative study of parameter (ALP values) in Conventional Method (Seres1) accordance with time 2hrs (Seres2) and Optimized Method (Seres3) accordance with time 1hrs (Seres4).

References

[1]Chowdhury AP, et al., (2015), International Journal of Science and Research (IJSR). P:1029-1039 (Paper ID: NOV164207, http://dx.doi.org/10.21275/v5i6.NOV164207)

[2]Cunniff, P. 1995. 16th Ed. Official method of Analysis: Association of Official Analytical Chemists. Washington DC.

[3]De Angelis, M., Di Cagno, R. Gallo, G. Curci, M. Siragusa, S., Crecchio, C., Parente, E. and Gobbetti, M 2007. International Journal of Food Microbiology 114:

[4]Desbourdes,C.and Nicolas M.2008. Discussed about "Phosphatase activity in cheese" 11th Workshop of the EURL for Milk and Milk Products.

[5]Eklund, C. and Lankford, C.E. 1967. Laboratory Manual for General Microbiology.Prentice Hall, Inc Englewood Cliffs, New Jersey, pp. 51-55.

[6]Fernandez-del-pozo,B., Gaya, P., Medina, M. Rodriguez-Marin, M.A., Nunez, M. and Fernandex-del, P.B. 1988. J. Dairy Res. 55(3): 449-455.

[7]Florez, A.B., Delgado, S. and Mayo, B. 2005. Antimicrobial susceptibility of lactic acid bacteria isolated from a cheese environment. Can. J. Microbiol. 51 (1): 51-58.

Urine Powered Microbial fuel cells

Urine Powered Microbial fuel cells that brings out to be positive and efficient technology for the future. Microbial Fuel Cell (MFC) technology is a new form of renewable energy technology that can generate electricity from what would otherwise be considered as waste. It is a bio electrochemical system that harnesses the natural metabolisms of microbes to produce electrical power. This review paper focuses on future and current prospective of urine powered MFC. Within the MFC, microbes consume or degrade the nutrients in their surrounding environment and release a portion of the energy contained in the food in the form of electrons. Every day, we produce a lot of sewage (wastewater full of feces and urine). In fact, it adds up to 6.4 trillion liters of urine alone produced worldwide each year. The sewage is collected and then treated or disposed of. Human urine is rich in nutrients, and some bacteria actually thrive on eating those nutrients. In fact, these bacteria can be used to produce electricity in Microbial fuel cells which can power mobile phones and LEDS at home. 6 modules of novel stacked assembled, connected in series and employed to charge a basic mobile phone, a smartphone and in addition be implemented as a bespoke mobile phone charger, which provided 1 h 45 min of call-time for every 3 h of charging, only consuming 600 mL of urine as fuel every 6 hours. This paper may bring out the research view of the Urine powered Microbial Fuel cells.

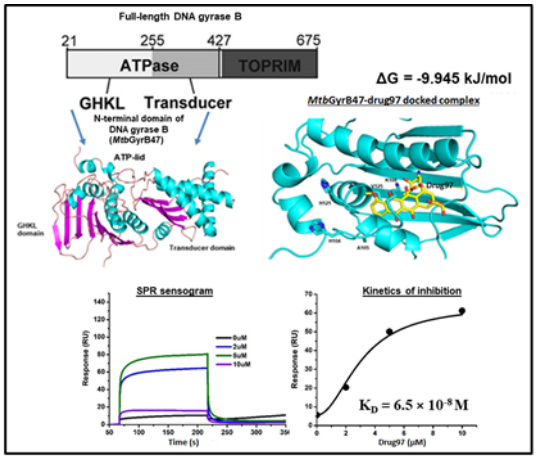
Drug repurposing approach to target DNA gyrase from Mycobacterium tuberculosis

Balasubramani G L[1*], Rinky Rajput[1], Manish Gupta[2], Rakesh Bhatnagar[2]and Abhinav Grover[1]

[1]BioTherapeutics and Molecular modelling Lab, School of Biotechnology,
Jawaharlal Nehru University, New Delhi - 110067. Email: glbala87@gmail.com;

[2]Molecular Biology and Genetic Engineering Laboratory, School of Biotechnology,
Jawaharlal Nehru University, New Delhi, India - 110067.

Owing to the rise in drug resistance in tuberculosis combined with the global spread of its causative pathogen, Mycobacterium tuberculosis (Mtb), innovative anti-mycobacterial agents are urgently needed. To address this problem, we have employed drug repurposing approach to discover novel FDA-approved drugs to inhibit Mtb growth. Here, we have used essential



Mtb enzyme, DNA gyrase, a promising and potential target for novel anti-tuberculosis chemotherapeutics. High-throughput screening of compounds (using FDA-compounds library) was done against the active site of Mtb DNA gyrase, the region of ATP binding (N-terminal domain) pocket on gyrase B subunit. Here, we identified total of four compounds (Drug97, Drug45, Drug77 and Drug38) tightly binds to ATPase binding pocket of N-terminal domain of gyrase B (MtbGyrB47). We

investigated both inhibition of Mtb DNA gyrase and the inhibitory activity against in vitro growth of Mtb and M. smegmatis (Msm) by FDA-drugs. Among which, Drug97, an anthracycline antibiotic (used as an anticancer drug), was found to be a potent inhibitor of Mtb DNA gyrase. Low-µM inhibition of Mtb DNA gyrase was correlated with their low-µM minimum inhibitory concentrations for all screened FDA-drugs. Drug97 exhibited IC_{50} value of 0.6±0.14 µM against MtbGyrB47, kD values of 0.06±0.21 µM and MIC_{90} values of 0.12 µg/ml. Our results strongly suggests that the screened compounds (anthracyclines) target mycobacterial DNA gyarse, inhibits gyrase catalytic cycle and retard Mtb growth. Hence, anthracyclines inhibitors of Gyrase B exhibit many of the characteristics required for their consideration as a potential front-line antimycobacterial therapeutic.

References

1. Agrawal A, Roué M, Spitzfaden C, Petrella S, Aubry A, Hann M, Bax B, Mayer C. Biochem J. 2013 Dec 1;456(2):263-73.
2. Stanger F V, Dehio C, Schirmer T. PLoS One. 2014 Sep 9;9(9):e107289. doi: 10.1371/journal.pone.0107289.

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Drying characteristics and kinetics of Azadirachta indica (neem) leaves drying in a forced convection low cost solar dryer

Debabrata Sarma, Kesavan Radhakrishnan, Prakash Kumar Nayak

Department of Food Engineering and Technology
Central Institute of Technology, Kokrajhar, BTAD, ASSAM-783370

Email: debabratasarma1995@gmail.com

Drying is widely used in a variety of thermal energy applications ranging from food drying to wood drying. Drying can either be done by traditional sun drying or industrially, through the use of solar dryers or hot-air drying. The solar dryers could be an alternative to the hot-air drying and open sun drying methods, especially in locations with good sunshine during the harvest season. In this study, the thin layer drying characteristics in a solar dryer with forced convection and under open sun with natural convection of neem leaves was investigated. The drying data were fitted to the 10 different mathematical models. Among the models, the Wang and Singh model for the forced solar drying and the natural open sun drying were found to best explain thin layer-drying behaviour of the leaves. The safe (final) moisture content of neem leaves after drying reached 0.115 d.b in 380 min and 890 min in solar dryer and open sun dryer, respectively. Quality analyses were performed for fresh, open sun-dried and solar dried neem leave samples. It was found that the anti-oxidant, total phenolic content and flavonoids were rich in solar dried samples compared to that of open sun dried samples.

Keywords: Azadirachta indica; solar drying; thin layer drying; drying characteristics; antioxidants

Usage of Anthropogenic Substances as Nest Building Materials by Urban Avian Fauna of Assam with special reference to Jorhat Town

P. Saikia, N. Borpujari and D. Bhuyan
Q.
R. Department of Zoology, J.B. College (Autonomous), Jorhat, India
S.
E-mail: d.bhuyan04@gmail.com

Structure and composition of nests in nest building birds are specific for a certain species which they collect from their surroundings. Birds generally select the nest building substances based on their structural and thermal properties. Plasticity is often observed in selecting the nest building materials in many bird species, where they use diverse resources available according to the habitat they live. India is undergoing rapid urbanisation from the last two decades and the urban areas are becoming concrete jungles, devoid of greeneries. However, different bird species have been observed to get adapted to dwell in these areas and some of them even thrive here. Studies showed that there is an increased gradient in the use of anthropogenic substances as nest building materials from rural to urban areas, which signifies the adaptive character of nest building behaviour in birds. Study on such adaptability in any bird species may be important from conservation point view.

Considering the above facts and prospects, present study was designed to find out the anthropogenic nest building materials used by the nesting birds of urban areas of Assam by taking Jorhat town as a model, which may shed some light upon the adaptation of these urban birds to their changing habitat pattern. For collection of data, random plots were selected from the town and available bird nests were collected therein to observe and weigh different components of the nests. Percentage compositions of the materials were calculated thereafter. A wide range of anthropogenic materials along with natural

components were found to be used as building materials for the construction of nests by the urban avian dwellers.

Key words: Bird, nest, adaptation, conservation

Identification, occurrence and diagnosis of a mosaic virus in medicinal plant, long pepper (Piper longum)

Lumbini Kalita*, Dikshita Saikia, Hia Kalita and Gowtham Kumar R

College of Agriculture, Assam Agricultural University, Jorhat 785013, Assam

*Corresponding author: lonee2797@gmail.com

Long pepper is a flowering vine in the family Piperaceae. It is cultivated mostly for its medicinal value and also as spice and for seasoning. Unfortunately, there is a heavy loss of long pepper due to the attack of different viruses. Cucumber mosaic virus (CMV) is one of the most important virus diseases of pepper worldwide. The virus exists as a number of strains, but all are apparently capable of infecting pepper and differ only in symptom expression. The age of a plant at the time of infection strongly influences what types of symptoms are manifested. Crop losses vary from year to year depending upon the amount of disease occurrence. Aphids act as a vector for the transmission of the virus. Infection rates may approach 100% when aphid populations increase rapidly in favourable climatic condition. There is often a loss of 10-20% of yield and even if harvested, crops are commonly found in poor condition. There is a need for systematic study, occurrence, prevalence, detection and diagnosis of the pathogen. Field survey was conducted for identification and occurrence of some mosaic virus in 27 different varieties of Piper longum found all over NE India with special reference to Assam. A detailed symptom study was done on all of the 27 varieties in which leaf area of different healthy and infected leaves from different varieties was calculated, yellow mosaic intensity in leaves was estimated from different varieties and the disease intensity was calculated by disease rating of the different varieties by roving survey method. DAS ELISA assay was performed to assess disease incidence of mosaic in crop. Reverse transcription Polymerase chain reaction (RT-PCR) assay was performed to confirm the association of cucumber mosaic virus (CMV) in the disease development. Study revealed lowest disease rating of 1.83 in cultivars JPL-2 and JPL-26, while cultivar JPL-21 recorded the highest disease rating of 8.33. The disease incidence of the different varieties was estimated by counting the total number of plants in a particular variety from which the total number of infected plants was counted and from it, we found JPL-18 to be the highest and JPL-8 variety the lowest in disease incidence.

Innovative Biomimetic Technology Inspired by Butterflies.

Dipanjali Biswas1, Sandex Varghese2

1Department of Zoology, Gauhati University, Guwahati.
2 Butterfly Safari Park, Thenmala Ecotourism, Kollam, Kerala.

Email: dipanjalibsws7@gmail.com

The unique lamellar architecture of the wings of certain butterflies has inspired several innovations leading to designing of artificial nanostructures and materials which are finding their application in the fields of communication, computation, imaging, sensing, security, architecture and many more. Layered structures that give a butterfly's wings its vibrancy, hydrophobic property and structural versatility

inspired scientists and innovators for development of Biomimetic technologies viz, new solar technology, artificial gyroid nanostructures for materials, optical display technology, sensors for gas detection, hydrophobic coating technology, new photonic crystal device and many more. This paper highlights Biomimetic technologies inspired by the blue Morpho butterfly, several Papilio sp., Green hairstreak butterfly and Glass wing butterfly. These review give new insights into the innovations which drive one to look into butterflies, the flying jewels like never before.

Key words: Biomimetic technology, nanostructure, Butterfly, Morpho sp., Papilio sp.

Eco-friendly Management of Sclerotinia sclerotiorum (Lib.) de Bary, which causes White Mold Disease in French bean (Phaseolus vulgaris, L.), by Phytopathogenic Biocontrol Agents and Entomopathogens.

Fahnaz Sultana 1*,Daisy Senapoty2 and P. Dutta2

1MSc.(Agri.) student, Department of Plant Pathology
2Professor,Department of Plant Pathology, Assam Agricultural University, Jorhat-785013, Assam, India.

*Email id: sultanafahnaz@gmail.com

French bean (Phaseolus vulgaris, L.) is an economically important vegetable crop as well as pulse crop grown in India. White mold is a destructive diseases caused by a fungus Sclerotinia sclerotiorum (Lib.) de Bary which can infect all above-ground parts of french bean plants and considerable losses during storage. Control of this pathogen by using commercially disease management methods is very difficult. Therefore, this study was performed to develop an alternative and effective control method for the diseases by using fungal bio-control agents. An investigation was carried out in laboratory condition towards biological efficacy of one phytopathogenic biocontrol agent viz., Trichoderma harzianum and two entomopathogens viz., Metarhizium anisopliae and Beauveria bassiana alone and in combination with others against Sclerotinia sclerotiorum (Lib.) de Bary by “poisoned food technique” and Compared with chemical check (carbendazim@0.1%). Result revealed that when three biocontrol agents were poisoned with PDA media simultaneously the radial growth inhibition of the tested pathogen was found to be the highest as compared to combination of two or individual one. Thus we can conclude that T. harzianum, M. anisopliae and B. bassiana are showed encouraging results regarding their biopesticidal and biofungicidal potential against plant pathogens which may be endorsed to substitute harmful chemical supplements that exists in modern day agricultural practices.

Keywords: French bean, Sclerotinia sclerotiorum ,Poisoned food technique, Biocontrol.

Microbiology and processing technique of Napham - the indigenous fermented fish product of Assam.

Giranjali Biswas, Ashis Borah and Diganta Narzary

Microbiology and molecular systematics laboratory,
Department of Botany, Gauhati University. Guwahati 781014, Assam.

Email: gitanjalibijaybiswas@gmailcom

Napham is an indigenous fermented fish product of Assam used by Bodo community. It is a salt and oil free fish product which is used for its great medicinal value and also used as delicacy. This product is considered to be helpful against many ailments like common cold, fever even in malaria. No study has been made to understand the microbiology and processing techniques of Napham. The present study was carried out with an aim to study the bacterial load found in Napham. 5 Napham samples were collected from various villages dominated by Bodo community. Serial dilution agar plating method was used to enumerate the bacterial load of the product. Pure culture was carried out in three incubation conditions i.e aerobic, microaerophilic and anaerobic conditions. A polyphasic approach was adopted including colony morphology and microscopic observations and 16 rS DNA sequencing to study the bacterial load. Gram positive coccus was the dominant one and Gram negative was very less in number. Understanding the bacterial load will be helpful in strategizing production techniques to obtain consistent product quality and also to ensure food safety.

Key words: Napham, polyphasic approach, 16 rS DNA technology

Exploring the Microbes from Wild and Cultivated Species of Tomato Plants against Bacterial Wilt of Tomato Caused by Ralstonia solanacearum

Gurpreet Kaur Bhamra*, L.C. Bora and P.K. Borah

Department of Plant Pathology, Assam Agricultural University, Jorhat, Assam

*Corresponding author: gurpreetkaurbhamra50@gmail.com

Tomato (Solanum lycopersicum L.) is the third most widely cultivated vegetable crop in India and is of major economic importance for farmers as well as the agricultural industry. Wild species of tomato (Solanum pimpinellifolium) popularly known as currant tomato is reported to be resistant to bacterial wilt and is widely used in breeding programmes. Bacterial wilt caused by Ralstonia solanacearum is one of the most devastating diseases affecting yield of tomato in India (upto 100%) due to its destructive nature, wide host range and geographical distribution. For managing the disease now days, there is a shift from chemo-intensive control to biological control. Under biological control, the antagonistic potential of endophytic and rhizospheric microorganisms is successfully being explored. An experiment was conducted to compare the antagonistic potential of endophytic and rhizospheric microbes isolated from both wild and cultivated species of tomato plants against R. Solnacearum. The results revealed that microorganisms isolated from the wild species of tomatoes comparatively had greater antagonistic potential against the bacterial wilt pathogen. The highest inhibition percentage observed was 72.5% in microorganism isolated from wild tomato compared to 63.8% in microorganism isolated from cultivated species of tomato.

Keywords: Tomato, Endophyte, Rhizosphere, Ralstonia solanacearum, Antagonism

Phytochemical Analysis and Anti-inflammatory property of dry Naga Chili (Capsicum chinense) of Khanapara and Kolongpar area

Hashinur Alom, Jyotchna Gogoi

Department of Biochemistry, Assam down town University, Panikhaiti-781026

E-mail: hashinuralom278@gmail.com; Contact No.: 7005174516

Dry Naga Chili, which belongs to the plant genus Capsicum, is among the most heavily consumed spices in the North Eastern state of India and is also recorded as the hottest chili of the world. The most active component of these chilies is Capsaicin. Capsaicin has been reported to exhibit anti – inflammatory property. The present study was performed to evaluate the anti- inflammatory property of Capsaicin extracted from dry Naga chili collected from Khanapara and Kolongpar area of Guwahati. 350 gms of sample from each area was taken for the study. Methanolic extraction was done for the samples and further used for the study. The methanolic extract was tested for the presence of potent phytochemicals such as flavonoids, alkaloids, saponin, terpenoids, phytosterols, tannins, phenols. Anti-inflammatory property was evaluated by using egg albumin denaturation assay. The extract showed good presence of flavonoids, terpenoids, phenols and alkaloids. Saponin was sparingly present. Anti-inflammatory study showed inhibition of 68.5±0.7% at 300 µg/ml as compared to standard Diclofenac of 92.1±1.41% at 2500 µg/ml concentration. Hence the study showed that methanolic extract of dry naga chili has anti-inflammatory property which can be further validated by using animal models to claim its folklore saying that naga chili has no stomach irritation issues and its popularity in North-east India.

Keywords: Capsaicin, anti-inflammatory, phytochemicals,

Synthesis, Structural Elucidation, DNA/HSA binding studies of isomeric Pd (II) antitumor complexes using spectrophotometry techniques

Hina Kabeera*

a*Department of biochemistry, Aligarh Muslim University, Aligarh 202002, India.

Two new Palladium(II) isomeric complexes of the types, [Pd(L1)2]; 1, [Zn(L1)2]; 2, [Cu(L2) H2O]; 3 and [Zn(L2)(H2O)]; 4 were synthesized by the interaction of ligand , L1 2-(((2- hydroxynapthalen-1-yl) methylene)amino)-2-methylpropane-1,3-diol and L2 4-(1-((1,3-dihydroxy-2-methylpropane-2-yl) imino)ethyl)benzene-1,3-diol have been synthesized and characterized by elemental analysis, molar conductivity measurements, FT-IR, 1H NMR, and UV-Vis. The crystalline nature of the ligand, L1 has been ascertained by X-ray crystallography. The synthesized ligands and their metal complexes were characterized by elemental analysis, ESI-MS, FT-IR, UV-Vis, magnetic moment and 1H and 13C NMR spectroscopic studies. HSA (Human serum albumin) binding profiles of the metal complexes were monitored using biophysical techniques viz., absorbance, fluorescence, circular dichromism (CD) and foster resonance energy transfer (FRET). In-vitro DNA and HSA binding profiles of complexes were analysed by different biophysical measurements. The intrinsic binding constant (Kb) demonstrated substantial binding propensity of L1 linked complexes in comparison to L2 complexes, suggesting L1 to be more bio-active pharmacophore due to higher planarity and conjugation as compared to L2 ligand. The result of DNA florescence quenching study of complexes was quantified by Kb values, 1.36× 6.28 × 104(L1pd), 2.68 × 104 (L1Zn), 9.18 × 102(L2pd), and 4.3 × 102 (L2Zn) while HSA binding florescence quenching study of complexes having Kb values;2.94× 103(L1 Cu),2.26×103(L1Zn),1.79×103(L2Cu) ,9.80 × 102 (L2 Zn).

Keywords: X-ray crystallography, imine, DNA binding and HSA binding

Phytophthora infestans: A Re-emerging Plant pathogen

Hrishikesh Hazarika*, Kollol Pratim Baruah

Department of Plant Pathology, Assam Agricultural University, Jorhat, 785013, Assam

Corresponding E-mail: hhazarika.cronos@gmail.com

Worldwide, the diseases caused by plant pathogens result in major economic losses. Among plant pathogens, Phythophthora infestans has emerged a major threat to global food security. The pathogen derives its generic name from the Latin language, which literally translates into “The Plant Destroyer”. The pathogen finds its place in world history as the reason behind the infamous Irish famine (1845-1852) that brought widespread devastation to the potato crop in Ireland, where it was staple. Even now, the pathogen emerges again and again in epidemic form and cause seasonal loss, mainly to the tomato and potato industry. Several reasons can be attributed to the re-emergences of the pathogen. Climate, diverse sources of inoculum, migration, pathogen’s ability to overcome control measures are some of them. Another reason attributed is the Psychological impact on the world left behind by its wrath in the great Irish famine, which leads to its comparison with the “Black Death”. The fast evolving nature of the pathogen makes it hard to control as new strains of the pathogen emerge every now and then, owing to plastic nature of its genome. It is very fast adapting and unfortunately, the rate of its evolution exceeds far more than the rate at which new strategies of control are coming up. New diagnostic tools and efficient forecasting systems could be answer to the threat raised by the pathogen. But, without active surveillance and real time models to study the changes in pathogen’s behaviour, it will not be possible to actively predict its incidence and aggressiveness. Pre-existing models of forecasting late blight will have to adapt to the pathogen’s interaction with environmental and climatic factors.

Keywords: Phytophthora infestans, The Plant Destroyer, Potato, Ireland.

Yield, nutrient content and uptake of organic baby corn (Zea Mays L.) as influenced by nutrient management and moisture conservation practices in sandy loam soils of Assam

Jami Naveen1, M. Saikia2, N. Borah3, K. Pathak2 and R. Das4

1Ph. D. Scholar. Department of Agronomy, Assam Agricultural University, Jorhat
2Principal Scientist. Directorate of Research (Agri). Assam Agricultural University, Jorhat
3Professor. Department of Soil Science. Assam Agricultural University, Jorhat
4Professor, Department of Crop Physiology, Assam Agricultural University, Jorhat

Corresponding Author email: jaminaveen17@gmail.com

A field experiment was conducted at the Assam Agricultural University, Jorhat during the rabi season of 2016-17 to study the effect of nutrient management and moisture conservation practices on yield, nutrient content and uptake of organic baby corn grown in a sandy loam soil under rainfed condition. The experiment was laid out in RBD factorial design with three replications. PAC 321 was used as the test variety of baby corn. Among the manures, the highest amount of N (2.30 %), P (2.10 %) and K

(2.20 %) content was observed in enriched compost. In the nutrient treatments enriched compost @ 2.5 t ha-1 has shown the significantly better results with respect to cob yield, corn yield green fodder yield nutrient content and uptake of corn and stover. Treatments with straw mulch @ 2 t/ha recorded significantly higher results with respect to cob yield, green fodder yield, nutrient content and uptake.

Keywords: Baby corn, organic, mulch, enriched compost, nutrient uptake, nutrient content

Evolution of methane:The antagonistic character of paddy fields

Jishnu Pratim Mudoi* ,Merajul Hussain

Students from the Department of Agronomy, Assam Agricultural University,Jorhat-785013,Assam,India
*corresponding author email- jishnumudoi@gmail.com

Rice is one of the widely produced and consumed cereal crop all over the world. In fact, about 90% of the rice production takes place in Asia with more than half of the rice grown and consumed in China and India. Even though paddy cultivation has many beneficial nutritional properties and provides livelihood to millions of farmers, it has also got antagonistic side to it that has tremendous effect on climate change.Paddy cultivation under water logged or submerged condition is one of the leading producer anthropogenic methane in the world. Methane is a very harmful greenhouse gas and is a significant contributor to global warming. Methane is produced in the fields due to methanogenic or anaerobic bacteria as a result of anaerobic respiration which occurs in flooded field conditions. When fields are flooded with water, organic material are decomposed by the process of methanogenesis by this bacteria. This results in the production of methane instead of CO2(produced during aerobic condition). Methane is more harmful than CO2 in terms of intensity of affect. In fact not even in our vague concerns can we realize that organic fertilizers and rice straw too contribute a great deal to methane emission.Methane emissions increase due to the use of organic fertilizers and straw instead of chemical fertilizers during flooded or submergent field conditions due to their anaerobic decomposition.

This therefore makes it clear that standing water in rice field is the main culprit that leads to increase in methane release. Therefore the extra water should be taken care of in order to reduce methane emissions .The most successful mitigation measure is reducing submergent condition of rice fields. If intermittent flooding is maintained unlike standing water, less methane emission takes place. Secondly, there should be more planting of upland rice. The flooded conditions can be taken care of by efficient drainage thereby removing the excess water from the field. China which is the largest producer of paddy is also the largest contributor to methane through paddy cultivation. However in the recent years it has shown concern on the rise of methane emission and has taken mitigation measures of draining water in the middle of the growing season which not only reduces water but also helps in saving water. Thus time has come for India too which is the second largest producer of rice and have highest area under rice cultivation to become aware and check themethane emissions and follow the footsteps of China and may even better it by improved cultivation practices in tackling methane emissions.

Keywords: paddy, methanogenesis, global warming,methane emission,anthropogenic, aerobic bacteria, anaerobic, submerged, drainage

References :

Ito A.; Inatomi M.(2012). Use of a process-based model for assessing the methane budgets of global terrestrial ecosystems and evaluation of uncertainty. Biogeosciences, 9: 759–773

Suna M.; Zhangd H.; Dongd J.; Gaoe F.; Lib X.; Zhanga R. A comparison of CH4 emissions from

coastal and inland rice paddy soils in China.Catena,170:365-373

Akopova, 2010 Gazprom activities on methane emissions reduction, Gazprom Moscow 2010.

M. Saunois et al.: The global methane budget 2000–2012.

Minamikawa K.;Sakai N.;Yagi K.(2006).Methane emission from paddy fields and its mitigation options on field scale.Microbes Environ.,21:135-147

MEDICINAL EXPLORATION AND HYPERLIPIDEMIC ANTAGONISM OF AUTOCHTHONOUS PLANTS OF ASSAM

Abbas Alam Choudhury1, Kayeen Vadakkan1, G. Ramya1, J. Hemapriya2, S. Vijayanand3

1Ph.D Research Scholars, Bioresource Technology Lab, Dept. of Biotechnology, Thiruvalluvar University, Vellore
2Assistant Professor, DKM College for Women, Vellore
3Assistant Professor, Bioresource Technology Lab, Thiruvalluvar University, Vellore

abbas.choudhury@gmail.com

The contributions of plants is indispensable for human life. Medicinal plants have been used in healthcare since time immemorial. Hyperlipidemia, a metabolic disorder of lipids, is a well-known risk factor of cardiovascular events and metabolic syndrome. Hyperlipidemia disease has afflicted human beings since antiquity. It has been characterized by higher levels of lipids (cholesterol and triglycerides) in blood circulation. It is considered as one of the five leading causes of death in the world. Currently, a number of anti-hyperlipidemic agents have been introduced for the treatment of hyperlipidemia. One of the most widely used anti-hyperlipidemic agents are medicinal plants have always been rich sources of biologically active compounds vital to human health. It is believed that the unique climatic condition of North East (Assam) India, have made this region one of the biodiversity hotspots of the world. Autochthonous plants from Assam were selected in this study as it possess effective anti-hyperlipidemic activity. Out of various plants, Capsicum species exhibits superior activity against hyperlipidemia. Capsicum species (Bhut Jolokia, Assamese Name) is commonly known as Ghost chilli, found in North East India was recorded as the naturally occurring hottest chilli in the world by the Guinness Book of World Records in 2006. Performing molecular sequencing by rbcl gene sequencing method, the source plant was identified as Capsicum annuum and the sequence were submitted to NCBI under the GenBank accession number MF780875. Extracts obtained from polar solvents found to possess higher activity. Factors influencing the activity of the extract was optimized and found to be directly proportional to concentration.

Keywords: Bhut Jolokia, Capsicum annuum, Cholesterol, GenBank, Hyperlipidemia, NCBI

Metal Impregnated Nano-assemblies for Heavy Metal Removal from Water

Vivek Prakash, Sajitha Sasidharan, Vibin Ramakrishnan*

Department of Biosciences and Bioengineering, IIT Guwahati, India

E.mail: vivekprakash@iitg.ac.in, s.sajitha@iitg.ac.in, vibin@iitg.ac.in*

Water pollution by heavy metal is increasing at an alarming rate in recent years due to the establishment of industries like tanneries, electroplating, automobile etc., which release heavy metals in the water bodies. Heavy metals like chromium (Cr), arsenic (As), lead (Pb), mercury (Hg) etc. rank among the priority metals that concern public health because of their high degree of toxicity. Synthesis of a cost effective, eco-friendly material for heavy metal removal is still a challenge. Our lab has reported first single crystal organic nano flower 1, 2-bis(tritylthio)ethane which possess the potential of heavy metal removal from contaminated water. We have synthesized a hybrid material, with magnetite impregnation on the single crystals which not only removes heavy metal like Cr from water but also reduced it into less toxic Cr(III). In this work we have also used a cost effective adsorbent for heavy metal (Cr) removal which shows more than 90% removal efficiency. Heavy metal removal experiments were done in batch adsorption mode and analyzed by UV-vis spectroscopy and atomic adsorption spectroscopy..

Investigations into α-synuclein assembly using p-cyanophenylalanine as an intrinsic fluorescent and infrared probe

Anshuman Mohapatra, Nitin Chaudhary*

Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati – 781 039, India

m.anshuman@iitg.ac.in, chaudhary@iitg.ac.in

Alpha synuclein is a Parkinson's disease model protein sequestered mainly in the pre-synaptic terminals of the neurons. In light of the recent structural insights obtained from the solid-state NMR and Cryo-transmission electron microscopy of fibrillar α-synuclein, we investigate its aggregation behavior.[1, 2] Aggregation of alpha synuclein under various conditions has been extensively investigated, the intrinsic sequence feature that propels the aggregation, however, remains unclear. Here, we have introduced the unnatural amino acid, 'p-cyanophenylalanine' (pCNF) into different regions of the protein. The moderate polarity of the cyano group in pCNF allows us flexibility to incorporate it into a hydrophobic patch.[3] As a reporter, pCNF renders fluorescence and infrared signatures specific to the local environment thereby allowing understanding the dynamics of aggregation.[4, 5]

1. Guerrero-Ferreira, R., et al., Cryo-EM structure of alpha-synuclein fibrils. Elife, 2018. **7**.
2. Tuttle, M.D., et al., Solid-state NMR structure of a pathogenic fibril of full-length human alpha-synuclein. Nat Struct Mol Biol, 2016. **23**(5): p. 409-15.
3. Tucker, M.J., R. Oyola, and F. Gai, A novel fluorescent probe for protein binding and folding studies: p-cyano-phenylalanine. Biopolymers, 2006. **83**(6): p. 571-6.
4. Le Sueur, A.L., et al., Evaluation of p-(13C,15N-Cyano)phenylalanine as an Extended Time Scale 2D IR Probe of Proteins. Analytical Chemistry, 2017. **89**(10): p. 5254-5260.
5. Bazewicz, C.G., et al., Expanding the Utility of 4-Cyano-l-Phenylalanine As a Vibrational Reporter of Protein Environments. The Journal of Physical Chemistry B, 2012. **116**(35): p. 10824-10831.

Chemo-enzymatic saccharification of mixotrophically grown de-oiled microalgal biomass for reducing sugar production

Imran Pancha[a], Sourish Bhattacharya[ab], Sandhya Mishra[ab]*

[a]Division of Biotechnology and Phycology, CSIR- Central Salt and Marine Chemicals Research Institute, Bhavnagar 364002, India
[b]Academy of Scientific & Innovative Research (AcSIR), CSIR- Central Salt and Marine Chemicals Research Institute, Bhavnagar 364002, India
*Author for correspondence
Tel: +91 278 256 5801 / 256 3805 Extn. 6160
Fax: + 91 278 256 6970 / 256 7562

Email: smishra@csmcri.res.in

Due to various environmental issue and limited energy resource major recent research is focused on production of renewable and sustainable energy bioresource. Microalgal biomass seems to be very good resource for the production of renewable biofuels. The present study gives an idea about chemo-enzymatic hydrolysis of mixotrophically grown Scenedesmus sp. CCNM 1077 de-oiled biomass. Among the chemical hydrolysis, use of 0.5 M HCl for 45 min at 121°C resulted in highest saccharification yield of 37.87 % w/w of residual biomass. However, enzymatic hydrolysis using Viscozyme L at loading rate of 20 FBG/g of residual biomass, pH 5.5 and temperature 45°C for 72 h resulted in saccharification yield of 66 % w/w of residual biomass. Further, 78 % ethanol production efficiency was achieved using enzymatically hydrolyzed de-oiled biomass using yeast S. cerevisiae ATCC 9763. Results of present study shows application of de-oiled microalgal biomass for reducing sugar production and subsequent bioethanol production.

Keywords: Microalgae, Mixotrophic growth, Saccharification, Reducing sugar, Biofuel

Mixture of dumbbells and discs flowing through silo

A. Vamsi Krishna Reddy[1] , Sonu Kumar[1] and K. Anki Reddy[1]

[1] Department of Chemical Engineering, IIT Guwahati, India

E-mail: vamsikrishna@iitg.ernet.in

Experiments and numerical simulations of spherical particles discharging through silos has been widely studied. Recently, nonspherical particle flow has garnered more interest due to its complexity and wider applications in industries. However, flow of mixture of different shaped particles is more realistic. In this work, we studied mixture of dumbbells and discs flowing through a silo using discrete element method (DEM) simulations. We probed two flow regimes, steady flow and clogging regime by varying the orifice width. Firstly, in the steady flow regime, we analyzed parameters like velocity profiles, granular temperature and flow rates at different mixture concentrations. These results are compared with systems of pure discs and pure dumbbells. Self-similarity in vertical velocity profiles of particles in the region above the orifice is observed. Secondly, we investigated clogging mechanism at smaller widths of silo by computing clogging probability, ratio of dumbbells to discs in an arch and flow rates.

A study on clarification of sugarcane juice by Ultra Filtration and concentration using Aquaporin membrane

Aanisha Akhtar*, Dr. Senthilmurugan S, Prof. Kaustabha Mohanty

*PhD Scholar Chemical Engineering Department, Indian Institute of Technology Guwahati,

Assam, India

Sugarcane (Saccharum officinarum) juice is one of the prime industrial products that earn a lot of revenue in a majority of countries. The conventional method for production of sugarcane involves crushing of cane fibres and extraction of raw juice, clarification using lime and flocculants, sulphitation, evaporation and crystallization. In this study a chemical free clarification of sugarcane juicewas done using UF ceramic. The feed solution was introduce to shellside of the membrane at flow rate of 40 L/h, pressure 125 psi and temperature 35 °C. The Physiochemical characteristics of sugarcane juice of feed and permeate like particle size distribution, Brix, turbidity, pH, colour, and purity of UF were studied. The feed particle size and permeate are measured. It can be concluded that particle above 70nm are removed by the membrane filtration. The turbidity, colour removal, clarity, pH were measured for both feed and permeate. UF clarified juice was concentrated with aquaporin membrane. The clarified juice was used as feed and draw solution (NaCl) were circulated through shell and tube side of membrane module with an adequate flow rate in co- current mode. The major juice components like sucrose, fructose and glucose were rejected by the aquaporin membrane and this was confirmed by the analysis of draw solution data using HPLC. The major component of sugarcane juice such as sucrose, fructose and glucose were found to be increased. The juice was concentrated in 18 minutes. With time juice concentration increases and draw solution concentration decrease. The reverse solute flux decreased. Water flux decrease during experiment.

North-east Indian ginger: can it be a stand-alone solution to most of the modern day diseases?

Abhishek Shukla[1], Vaibhav. V. Goud[1], Chandan Das[1*]

[1]Department of Chemical Engineering,

Indian Institute of Technology Guwahati,

Guwahati 781039, Assam, INDIA

The favourable agro climatic conditions of North-east India makes it home to innumerable high quality commercial plant species. Through our work, we have been able to find a novel ginger variety, which is possibly the richest source of antioxidants in the world. In our quest for its commercialization, we have developed a green, environmental friendly and sustainable method for producing extracts. The method has been scaled up and tested for repeatability at a commercial scale production facility. The extracts have been engineered for food and pharmaceutical applications, demonstrating anticancer effects and substantial improvement in shelf lives of some common commercial food products.

Bio-mimicking: fabrication of insect eye type polymer structures using spin dewetting

Ankur Pandey 1, Surjendu Maity 2, Partho S G Pattader1,2andDipankar Bandyopadhyay1,2

1Department ofChemical Engineering, IIT Guwahati, India

2Centre for Nanotechnology, IIT Guwahati, India

E-mail:ankur.pandey@iitg.ac.in

The disintegration of a polymer film over a substrate into droplets is known as dewetting. The rupture of the film may be spontaneous known as spinodal dewetting or it may be due to the presence of heterogeneous sites present in the substrate. The phenomenon is widely used to generate intriguing patterns over a substrate. One of the key applications of these patterns can be seen in bioinspired surfaces. Al-Khayat et al. reported that surfaces can be tailored by patterned dewetted droplets for dew harvesting. 1 We on the similar track report bioinspired insect eye like structures over a silicon wafer.

To fabricate such surface a thin film of polystyrene (thickness 54 nm) was coated over cleaned silicon wafer and allowed to dry naturally for 12 h. Over this film a blend of Polystyrene and Polymethyl methacrylate was spin dewetted. Subsequently, film was allowed to dry for 8 h. Next the samples were subjected to rapid thermal annealing over a hot plate and the temperature was raised gradually from room temperature to 310°C and maintained at 310°C for 30 s (Figure 1). After 30 s, the films were allowed to cool down to room temperature. The films were then immersed in 2 ml of acetic acid for 5 min. After immersion was completed, the remaining excess selective solvent was removed by blowing nitrogen gas. This step was followed by vacuum drying at 60°C for 6 h. The AFM images were captured at each step. It was found that initial PS film was stable. After coating of blend over PS under layer, spin dewetting was observed (Figure 2 a). The number of droplets, diameter and wavelength were found to be 384, 0.61 ± 0.18 µm and 1.31 ± 0.27 µm, respectively. After RTA these droplets gets embedded into the PS under layer (figure 2 b). Later, when PMMA was removed using acetic acid, small holes were formed as shown by figure 2 c. When the blend of PS and PMMA was coated over PS film phase separation occurred such that PS component of blend formed continuous film and PMMA got spin dewetted over PS under layer. The dewetting of PMMA over PS is attributed to the fact that surface energy of PS is less than that of PMMA ($\gamma_{PS<}\gamma_{PMMA}$) causing PMMA to form droplets over low energy PS under layer. This phenomenon is reported elsewhere.2 These PMMA droplets were later removed using acetic acid and voids were created on PS under layer. The process can be further optimized for specific application. Moreover, the process can be applied to other polymer combinations.

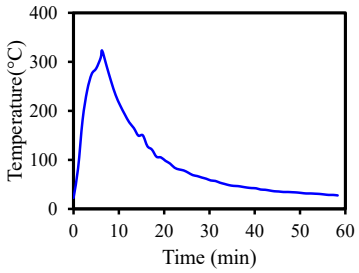


Figure 1 The graph showing temperature profile for Rapid Thermal Annealing.

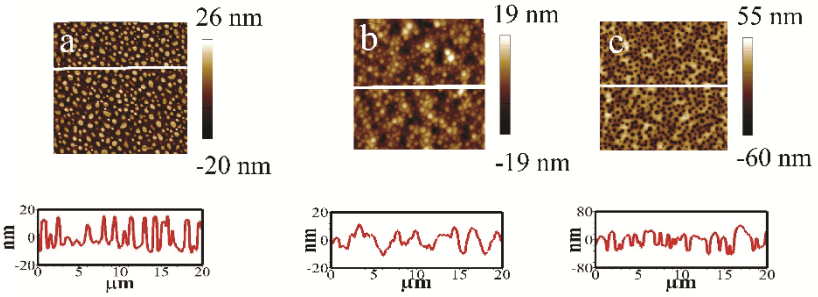


Figure 2 AFM images showing (a) spin dewetted droplets over PS film (b) after RTA and (c) after removal of PMMA using acetic acid.

Reference:

1. Al-khayat, O., Hong, J. K., Beck, D. M., Minett, A. I. & Neto, C. Patterned Polymer Coatings Increase the Efficiency of Dew Harvesting. Appl. Mater. Interfaces9, 13676–13684 (2017).

2. Bandyopadhyay, D., Gulabani, R. & Sharma, A. Instability and dynamics of thin liquid bilayers. Ind. Eng. Chem. Res.44, 1259–1272 (2005).

Water and Wastewater Treatment using Electrocoagulation method

Aviti Katare,

Department of Chemical Engineering, Indian Institute of Technology Guwahati, India

Development of electrocoagulation method was primarily done to mitigate the limitations and pitfalls of conventional water and wastewater treatment methods. The main advantages of this method are high removal efficiency, minimal sludge generation and less time consuming. In this work, Electrocoagulation was investigated for the effective removal of COD, from oily wastewater. Several parameters like electrodes connections (bipolar and monopolar) and number of electrodes (4,6,8, etc.) were found to be dominating in order to remove the above mentioned contaminants from oily wastewater. Removal efficiencies of 67.461% and 80.435% were observed after 30 min with the aluminium electrodes, with six electrodes in monopolar and bipolar configuration respectively, using an initial COD of 700.700 mg L-1 , an initial pH of 7.55, a current supply of 1A. By-products obtained from the electrocoagulation bath were analyzed using FESEM, EDAX, FTIR, XRD and Delsa nano particle analyzer explained. Cost estimation has been done for both the connections and it is found that monopolar connection is more cost effective however removal efficiency is found better for bipolar connections.

Keywords: electrocoagulation, monopolar and bipolar connection, oily wastewater, COD removal.

Removal and recovery of SDS by foam fractionation

A. Awadh Kishor Kumar[1], B. Pallab Ghosh[2]

[1 2]Department ofChemical Engineering, IIT Guwahati,India

E-mail:awadh@iitg.ac.in

Water pollution is one of the major concern in the current scenario for human as well as aquatic life. There is numerous source of water pollution where surfactant and detergents are considered as major pollutants such as laundries, chemical industries (e.g. soaps and detergents, sugar industry, personal care products, food, fabric, and pulp and paper), household washing, and cleaning operation. Some sources are biodegradable, but many of them are resistant to biodegradation.

Treatment of wastewater for reuse is necessary because pure water is the ultimate resource for life. Detergents have the poisonous effect on aquatic life if their concentration is high. They can destroy the external mucus layers, which protect the fish from bacteria and parasites. For removal of non-biodegradable surfactants, standard oxidation methods are not effective. To remove such surfactants from wastewater, one of the promising methods is foam fractionation. Foam fractionation is a simple low cost method based on selective adsorption of one or more solutes on the surface of gas bubbles. The group of adsorptive bubble separation techniques contain the separation process by which surfactant can be remove as well as recovered. In this method, surfactant solution is bubbled with the help of a sparger in a column to adsorb the surfactant molecules at the gas–liquid interface, which are carried along the column to its top in the form of foam. In the present work the removal and recovery of sodium dodecyl sulfate (SDS) from its aqueous solution has been studied. We have investigated the effect of important variables such as airflow rate and surfactant feed concentration in the presence of salt.

Seed Assistant OSDA Free Mordenite Synthesis forCarbohydrate Conversion to Value Added Chemicals

Bharath V1, andN R Peela1

1Department of chemical engineering, Indian Institute of Guwahati, Guwahati, Assam- 781039, India

E-mail:bharathv@iitg.ac.in; peelanr@iitg.ac.in

5-HMF was considered as the platform chemical for the production of plastics, fine chemicals. HMF can be transformed into levulinic acid, formic acid, biofuels like 2,5-dimethylfuran and other alkanes. HMF has been produced by various catalysts like HCl, acid based catalysts, metal encapsulation into the zeolites, Ionic liquids, etc. In this work, 5-HMF was produced using a heterogeneous catalyst. Mordenite is a zeolite with parallel 12 membered ring (MR) and 8 MR channels. This is one of the important zeolites and best catalyst used by the petroleum industry for various reaction like methanol conversion, etc. Here the work explains the efficient method of Mordenite synthesis (i.e., conventional seed assistant method where the target and seed have the same crystal structure). The synthesised catalysts were tested for carbohydrate conversion of Glucose to 5-HydroxyMethylfurfural (5-HMF). Varies parameters were studied such Si/Al ratio, Si/Na ratio, starting precursors, Aging time to identify their effects on the crystal structure formation and acid sites strength. Catalysts were thoroughly characterized using XRD, Py-FTIR, TGA, FESEM, FETEM, N2 sorption techniques. These synthesised

catalysts were tested to investigate their effects on glucose dehydration. The efficient way of conversion of glucose to 5-HMF using the synthesized Mordenite zeolite in a process intensified method. The highest conversion was observed for smaller particle size silica precursor and lower Si/Al ratio. Highest selectivity of 5-HMF was achieved with ageing samples. This work concludes that conversion and yields can be improved by incorporating the mesoporosity with efficient acidity.

Detailed investigation of thermal degradation kinetics of p-kerogen and oil shale of North East India

Bhargav Baruah[1] and Pankaj Tiwari[1]

[1] Department of Chemical Engineering, IIT Guwahati, India

E-mail: pankaj.tiwari@iitg.ac.in

Oil shale is a finely grained, porous, sedimentary rock which contains organic matter known as kerogen, concealed inside a mineral matrix. The most convenient method of production of oil and gases from oil shales is by retorting or pyrolysis. The kerogen on exposure to heating in an inert environment decomposes to produce oil and gas. The present study aims to investigate the maturation kinetics of oil shale and kerogen during slow pyrolysis, by using model free isoconversional methods.

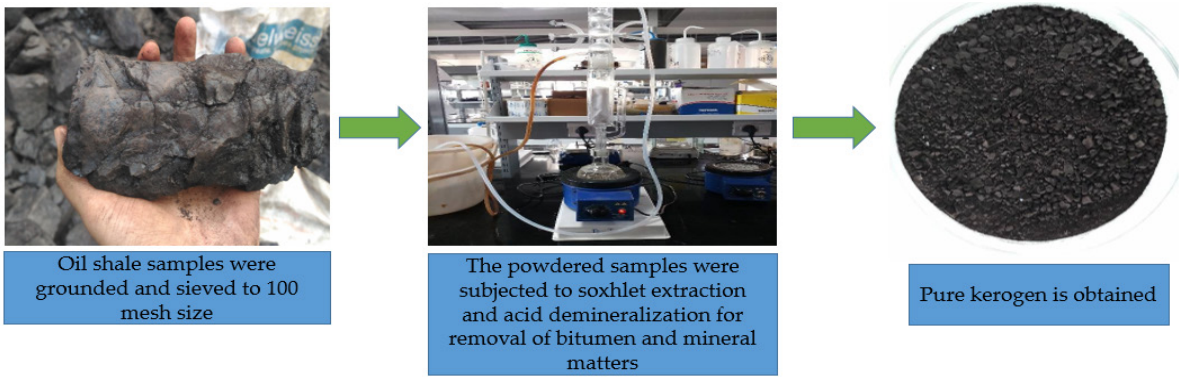


Fig.1: Flow diagram of kerogen estraction from oil shale by solvent extraction and acid demineralization process

The thermal decomposition of the oil shale and kerogen was studied using thermogravimetric analysis (TG) at heating rates of 5, 10 and 15 °C/min. The kinetic study of oil shale and kerogen pyrolysis process was performed on the TG data using three model free isoconversional methods viz. Friedman, Flynn Wall Ozawa (FWO) and Kissinger Akahira Sunnose (KAS). The reaction mechanisms were determined using Criado master plot. p-kerogen showed the occurrence of contracting volume (R3), Anti-Jander diffusion (D3) and Avrami Eroffev (A3) mechanisms. The oil shale sample showed occurrence of Anti-Jander diffusion (D3) and Avrami Eroffev (A3) mechanisms. The determined reaction mechanisms were validated by reconstruction of kinetic data using Matlab.

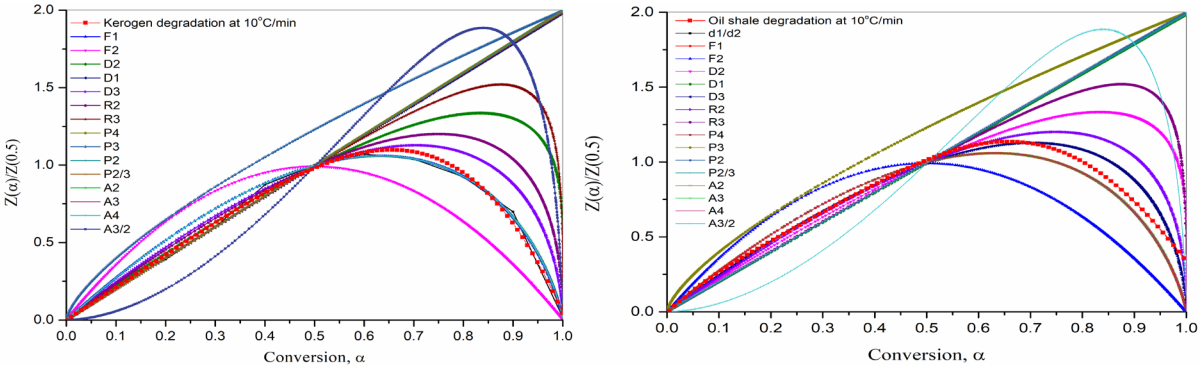


Fig.2: Criado Master plot obtained for KAS method for (a) p-kerogen (b) raw oil shale

A comparison of the determined reaction mechanisms for both p-kerogen and oil shale sample is presented which shows a comprehensive perception on the maturation of organic matter present in the oil shale to oil and gas.

Rise and sink of a wiggling intruder object in a granular medium

Bitang K. Tripura[1], Sonu Kumar[1], K. Anki Reddy[1]

[1] Department of Chemical Engineering, Indian Institute of Technology Guwahati, Guwahati 781039, India

E-mail address: anki.reddy@iitg.ac.in

Granular material is abundant in nature ranging from sand particles to coffee beans. They are one of the most manipulated materials in industry after water. In recent year's studies were performed to understand the forces experienced by a moving object within the granular medium [1-6]. The wiggling of an object within the granular medium, which is the focus of this study, is an important example of localized forcing. This study may provide some insights into animal locomotion [7].

In the present work, discrete-element method(DEM) simulations have been used to investigate the effect of shape of an intruder object(IO) on its rise rate when oscillated horizontally within a granular medium. Four different geometrical shapes have been considered in the present study. All the simulations were carried out in dimensionless units with the physical quantities being scaled by acceleration due to gravity g, average particle diameter d, and density ρ. The intruders were oscillated with different amplitude(A) and frequency(f) within the granular medium. Due to continuous oscillation of the intruder, rise or sink may be observed from its initial position within the granular medium. The rise is observed due to climbing over the particles, which fill voids opening under the oscillating IO. While the sink may occur because of the fluidization of the granular bed beneath the oscillating IO. But it was observed that for velocity amplitude of $1\sqrt{(dg)}$ or less, there was a negligible change from its initial position of oscillation for all the IO. The maximum amount of rise from its initial position was observed for square and inverted triangular shapes. An interesting result is observed for the two triangular shapes used. The equilateral triangle displays negative lift at a higher velocity amplitude($A>1\sqrt{(dg)}$) irrespective of any oscillating frequency, while the inverted-triangle have shown completely opposite result showing positive lift at a higher velocity amplitude($A>1\sqrt{(dg)}$) for all the cases.

Keywords: granular materials, segregation, oscillation, discrete element method

Reference:

[1] K. Wieghardt, Mechanics Research Communications 1, 3 (1974).

[2] J. Geng and R. P. Behringer, Physical review E 71, 011302 (2005).

[3] I. Albert, J. Sample, A. Morss, S. Rajagopalan, A.-L. Barab´asi, and P. Schiffer, Physical Review E 64, 061303 (2001).

[4] Y. Ding, N. Gravish, and D. I. Goldman, Physical Review Letters 106, 028001 (2011).

[5] J. M. Ottino, D. V. Khakhar, Annu. Rev. Fluid Mech. 32:55–91(2000).

[6] V. Garzo, Phys. Rev. E 78, 020301 (2008).

[7] R. Maladen, Y. Ding, P. Umbanhowar, A. Kamor, and D. Goldman, Journal of the Royal Society Interface 8, 1332 (2011).

The inductive effect of nitrate on Pho regulon genes and the subsequent highly accelerated denitrifying biological phosphorus uptake from wastewater with sequestered phosphorus for recycling - A single stage batch reactor study

Chandan Mukherjee1, Rajojit Chowdhury1, Sayak Ganguli2, Ritabrata Basak3, Basab Chaudhuri4, Krishna Ray1*

1Environmental Biotechnology Group, Department of Botany, West Bengal State University, Berunanpukuria, Malikapur, Barasat, Kolkata 700126, India

2Theoretical and Computational Biology Division, AIIST and The Biome, West Bengal, India

3Department of Biochemistry, University of Calcutta, Ballygunge Science College, 35, Ballygunge Circular Road, Kolkata 700019, India

4Vice Chancellor, West Bengal State University, Berunanpukuria, Malikapur, Barasat, Kolkata 700126, India

*Corresponding author

Corresponding author's email: kray91@gmail.com

The bacterial Pho regulon is mainly involved in the biological phosphorus-uptake of the enhanced biological phosphorus removal (EBPR) system. Polyphosphate-accumulating bacteria used in EBPR face natural repression of the Pho regulon, which results in reduced phosphorus-uptake from highly phosphorus-replete waste effluents (having 25-400 ppm of phosphorus). This study demonstrated the unexpected effect of the addition of a minimum of 100 ppm nitrate-nitrogen, which led to the withdrawal of the negative regulation of the Pho regulon via an unknown mechanism and resulted in ~100% phosphorus removal with concomitant escalated polyphosphate accumulation by the established bacterial consortium, even at 1000 ppm of the initial phosphorus concentration within 12 hours of treatment. The consortium displayed the unique character of spontaneous concurrent phosphorus-uptake, accumulation and denitrification, in a simplified single phase anoxic batch reactor, eliminating the need for alternating anaerobic/aerobic or anaerobic/anoxic switches. Hence, this would be the most worthwhile technique for phosphorus removal from wastewater in India and the developing world where the stringency of EBPR and other reactors are prevented due to financial reasons. The recovered polyphosphate from wastewater has good potential for use as a slow-release phosphate biofertilizer that shows a comparable amount of soluble phosphorus release relative to conventional fertilizers.

Plasmonic Ag nanoparticles on TiO2 as a visible active photocatalyst for hydrogen production

Devipriya Gogoi[1], Ponnala Rambabu[1], Animes Kumar Golder[1] andNageswara Rao Peela[1]

[1]Department ofChemical Engineering, IIT Guwahati, India

E-mail:devipriya@iitg.ac.in; animes@iitg.ac.in; peelanr@iitg.ac.in

In the current scenario, it is imperative to search for better alternatives in the category of renewable and clean energy sources to meet energy demands. Hydrogen is a promising energy carrier and can be produced from water using solar energy. However, the commercialization of this process is still not viable economically due to the lower efficiency of the process. The direct splitting of water involving photocatalyst into hydrogen and oxygen is an energy efficient way to produce a sustainable, environment-friendly and a clean energy resource. This triggers the detailed and extensive research in the area of photocatalyst development capable of splitting water directly into hydrogen and oxygen. Herein we report the photocatalytic activities of Ag-doped TiO2 photocatalyst synthesized by immobilization of Ag followed by reduction step technique on the surface of TiO2. The prepared materials are characterized by analytical techniques such as X-ray diffraction (XRD), Field emission transmission electron microscopy (FETEM), Field emission scanning electron microscopy (FESEM), Energy dispersive X-ray spectroscopy (EDX), Fourier transform infrared spectroscopy (FT-IR), Raman spectra, Photoluminescence, UV-visible spectroscopy. The X-ray diffraction and Raman spectra show the anatase phase of the sample. The UV-visible spectra reveal the absorption spectra of Ag/TiO2 shifted towards the visible region and the band gap of Ag/TiO2 reduced to 2.5 eV compare to bare TiO2 (3.2 eV). The synthesized Ag/TiO2 exhibited enhanced photocatalytic activity for the hydrogen production with a quantum yield. The amount of hydrogen was observed about 394 µmol·hr-1·g-1 over Ag/TiO2 in absence of the sacrificial reagent. The effect of sacrificial reagents has also been investigated to increase the Hydrogen yield. An enhancement in hydrogen production of synthesized Ag/TiO2 is mainly attributed to the reduction of recombination rate of photoexcited electron-hole on the surface of the semiconductor.

Solid Dynamics Study in a Gas-Solid Fluidized Bed with Single Nozzle Injection: Experimental and CFD Simulation

Jitendra Singh Rawat*, R. K. Upadhyayand P. Tiwari

[1]Department of Chemical Engineering, IIT Guwahati,India

E-mail:j.rawat@iitg.ernet.in*

The development of CFD-model has become an essential tool for simulating the multiphase reactors to understand the complete phenomena during phase transport and phase contact. As we know that these reactors are the core of the various industries including chemical and petrochemical. In the present case, firstly, we had performed the fluidization experiment in a cylinder column (internal diameter of 0.21 m and height 2.25 m) with the static height of glass bead of 0.75 m. These particles were fluidized at the constant fluidization velocity of 3 Umf (Umf =0.36 m/s). Air was used as a fluidization medium. Simultaneously, a secondary air stream supplied from the compressor is fed into the system through a twin-fluid type nozzle mounted at column wall (z=0.20 m). The nozzle flow rates vary from 40-140 LPM. The movement/positions of the particles were tracked using a radioactive tracer particle mimicking the same physical properties as the solid phase. The tracer particle is kept with glass beads and the radiation was recorded with the array of multiple detectors in the form of counts. This technique is non-invasive in nature and has a higher spatial resolution. The detail information about the reconstruction and post-processing of the counts are available in the literature [1].

To validate the experimental data, we had modeled a 3D model similar to the experimental column. The simulations were carried out for the similar operating conditions to those of experiments in ANSYS Fluent 14.5 ™. The goal of this study is to identify the critical model input in the 3D simulation of gas-solid fluidized bed with side injection, and hence its impact on the final prediction. The final prediction is very sensitive to the various model parameters such as grid sensitivity, restitution coefficient, specularity coefficient (SC) and drag models. Overall, this whole work provides important features for CFD-model parameters selection and fundamental modeling approach for this type of system for the purpose of reactor design and its optimization [2]. Figure [1] shows the comparison of the CFD prediction and experimental data.

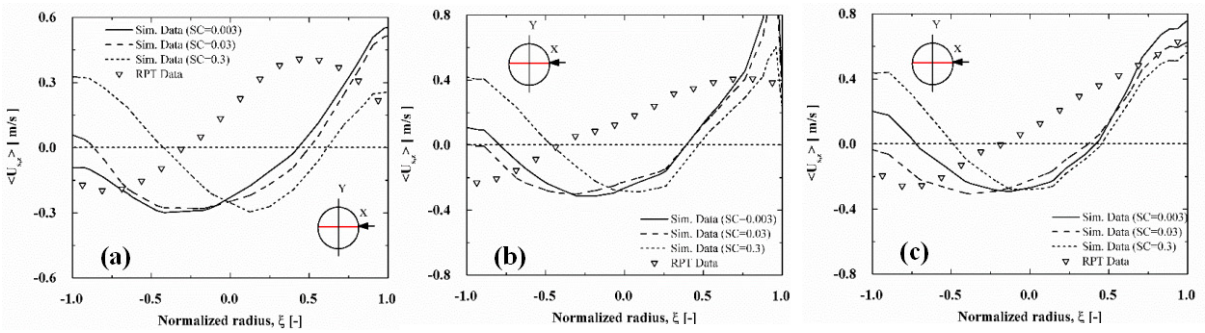


Figure 3 Effect of specularity coefficient (SC) on the lateral profile of the time-averaged mean solid velocity at different axial heights (a) z=0.15 m, (b) z=0.20 m and (c) z=0.25 m. The nozzle flowrate is 80 LPM. Tang drag model was implemented in the current simulation using user-defined function (UDF)

References:

[1] Upadhyay, R. K.; Roy, S. Investigation of hydrodynamics of binary fluidized beds via radioactive particle tracking and dual-source densitometry. The Canadian Journal of Chemical Engineering 2010, 88, 601-610

[2] Wang, S., Yang, Q., Shao, B., Zhao, J., Liu, L., Liu, Y. Numerical simulation of horizontal jet penetration using filtered fluid model in gas-solid fluidized bed. Powder Technol. 2015, https://doi.org/10.1016/j.powtec.2015.02.009.

Lorentz Force Induced Transport and Digitization of Two-Phase Micro-flows

Joydip Chaudhuri,[*1] Tapas Kumar Mandal,[1,2] Dipankar Bandyopadhyay[*1,2]

1Department of Chemical Engineering, Indian Institute of Technology Guwahati, 781039, Assam, India.

2Centre for Nanotechnology, Indian Institute of Technology Guwahati, 781039, Assam, India

*Corresponding author: c.joydip@iitg.ac.in, dipban@iitg.ac.in

Unidirectional or oscillatory Lorentz force can be utilized for pumping and digitization of flow patterns of two-phase flow inside a T-junction microchannel. The proposed non-invasive methodology employs the coupling of the external electric and oscillatory (unidirectional) magnetic field to generate sinusoidal (unidirectional) Lorentz force in the microchannel filled with a pair of Newtonian, immiscible and electrically conducting liquids.

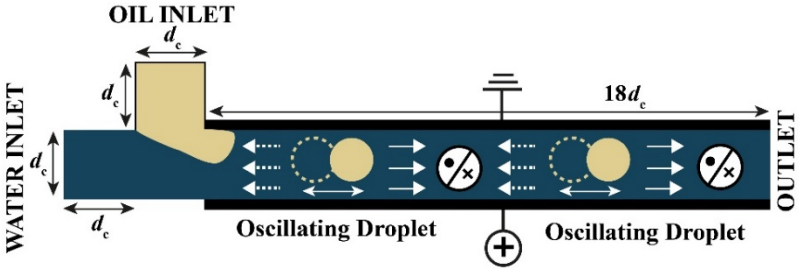


Fig. 1. Schematic diagram of a T-microchannel of diameter dc = 500 μm in which the electric current is flowing in the positive y-direction. A steady or oscillating magnetic field is applied towards positive to negative z-direction, which in conjunction with the electric field generates Lorentz force towards the positive to negative x-direction. The dimensions are given with respect to dc.

Application of steady or oscillating Lorentz force is found to increase the throughput of a pressure-driven flow in conjunction with the mixing of the phases by creating discrete and miniaturized flow structures. Numerical simulations unveil the digitization of a pressure-driven oil-water stratified flow together with enhanced transport due to the magneto hydrodynamic pumping of the fluids. Interestingly, the size and frequency of the flow patterns and the throughput of the micro-flow can be non-invasively controlled by tuning the intensity of the external electric or magnetic field, frequency of the rotating magnetic field, and the fluid properties. Oscillatory Lorentz force with periodic change in direction can lead to time-periodic forward and backward motions of the liquids to prompt a unique reciprocating motion of the flow features while they translate along the channel. The proposed pumping and digitization framework can be of significance for the development of gen-next miniaturized multiphase reactors, mixers, pumps, and MEMS devices with higher efficiency.

References:

1. J. Chaudhuri, T. K. Mandal, and D. Bandhyopadhyay, Phys. Rev. Applied 10, 034057 (2018).

2. P. D. S. Reddy, D. Bandhyopadhyay, S. W. Joo, A. Sharma, and S. Qian, Phys. Rev. E.83, 036313 (2011).

Prospects of CuO, Co3O4 oxygen carriers in Chemical looping with oxygen uncoupling of Indian high ash coal -A thermogravimetric study

Jyoti Rani, Prabu Vairakannu*

Department of Chemical Engineering

Indian Institute of Technology Guwahati, Assam 781039, INDIA

Chemical looping with oxygen uncoupling (CLOU) is a promising technology that allows the combustion of fuel with inherent separation of CO2 using a solid oxygen carrier. This technology uses an oxygen carrier that releases oxygen at suitable temperature and this lattice oxygen reacts with fuel and liberates a CO2 enriched flue gas. In the present study, a high ash Indian coal was used as a solid fuel and CuO and Co3O4 were used as the oxygen carriers. Experiments were performed using a thermo-gravimetric analyzer (TGA) with temperature ranging from 25-1000oC at a heating rate of 10 oC/min in N2 atmosphere. A comparative study on the reactivity of CuO and Co3O4 with high ash coal is conducted with 5:9 mass ratio of metal oxide and coal. The results were shown that both the metal oxides initiated their reduction from 350°C. Also, it was found that the conversion of Cu-based metal oxide is higher than Co-based metal oxide, by about 14.2%. Equivalence ratio for Cu-based oxygen carrier was 0.25 while for Co-based oxygen carrier it was 0.33. It was estimated that the instantaneous reactivity of Co3O4 was 0.5×10-4 s-1 in the temperature range of 550-750oC while it was 1.4×10-4 s-1 for CuO in

the temperature range of 700-1000oC. Thus, it can be concluded that Co-based oxygen carrier could be used for combustion at low temperature ranges in a typical steam turbine boiler operation. Further, the results provide a positive response in using Co3O4 as the oxygen carrier with the high ash coal to achieve high CO2 capture.

A Density Functional Theory Study on Adsorption of Phenol and Guaiacol Over N-doped Graphene

K. Agrawal[1] and N. Kishore[2]

[1]Department of Chemical Engineering, IIT Guwahati, India

E-mail:a.kushagra@iitg.ac.in

With the increase in global energy demand, and polluting nature of conventional sources of energy, biomass energy has emerged as a promising alternative. However, the bio-oil obtained from biomass after thermochemical treatment is inherent with oxy-functional compounds which degrades its fuel quality. Thus, oxy-functionals need to be eliminated from the bio-oil before it can be used as a transport fuel. In this study, considering N doped graphene as a catalyst, the adsorption characteristics of bio-oil model compounds – phenol and guaiacol are studied by quantum simulations using density functional theory. Graphene sheets with single site quaternary and pyridinic doping of N atom are first optimized in a non-periodic system and the charge distribution and spin density distribution is calculated at M06-2x/6-31+g(d,p) level of theory in gas phase. Then, guaiacol and phenol are adsorbed over the high charge and high spin density region of the catalyst surface at the same level of theory. The adsorption energy is calculated after incorporating Grimme's dispersion corrections as well. The adsorption occurs via the oxy-groups and the aromatic ring of both model compounds.

Photocatalytic Degradation of Organic Dye over TiO2 thin films prepared by non-aqueous surfactant assisted Sol-Gel Method

L.P.R Pala and N.R. Peela

Department of Chemical Engineering, IIT Guwahati, India

E-mail:palalpr@iitg.act.in; peelanr@iitg.act.in

Immobilization of TiO2 nanoparticles on a steady substrate has attracted a large scientific interest in recent times. The TiO2 films show good electrochemical and photocatalytic properties for photocatalysis applications. In this work, the TiO2 thin films are coated on glass substrates by the spin coating method using the TiO2sols. These sols are prepared using Sol-Gel technique containing appropriate weights of Titanium tetraisopropoxide (TTIP) as precursor, ethanol as solvent, Acetyl acetone (AcAc) and Acetic acid (AA) as modifiers and Cetyltrimethylammonium Bromide (CTAB) surfactant as pore-forming agent. The coated thin films were first dried in air at room temperature, then in hot-air oven at 110°C for 1 h and finally heat treated by calcination in air at 500°C for 2 h. GIXRD and Raman analysis confirm the presence of anatase phase in the 4 times coated TiO2 thin film. The FESEM analysis showed that the TiO2 thin films uniformity increased with the number of coatings. Photo-degradation of Methylene Blue (MB) in aqueous solution was examined for determining the catalytic activity of the thin films. The TiO2 thin film with 1.34 µm and 1.67 µm thickness showed 42.6% and 58.4% degradation of MB, respectively.

Abstract

As increase, the demand for crude in the market has raised the high naphthenic acid concentration. Naphthenic acid inherently exists in the crude ,considered as a lower quality due to their corrosive character. In refinery processing high acid crude at high temperature(2200C To 4000C) may cause aggressive corrosion attack on the inside of the wall of the equipment,vaccume distillation columns,pumps,transfer lines, andexchangers .Naphthenic acid more corrosive in the vapor phase and velocity has an effect on the corrosion rate through wall shear stress.
For investigation of naphthenic acid corrosion measure to determine of TAN(Total Acid Number),its principle based on potentiometric titration and its calculation depends on mg of KOH required per gram of sample.
Test method to determination of naphthenic acid corrosion usually used in the refinery industry by the weight loss method using rotating cage at high temperature and pressure, using carbon steel coupon.In this method autoclave Parr reactor operate at temperature 2400C and pressure at 0.8bar at 700 rpm run for 4 hours.
Electrochemical method also used to determination of corrosion rate ,it is the fastest method to check the corrosion rate this method is describe in ASTM G-185,ASTM G59.Under this test calculate the polarization resistance(Rp) using Ohm's Low voltage vs current plot and got the corrosion rate using Faraday's low.

Utilization of waste polyvinyl chloride (PVC) as precursor for membrane preparation blended with cellulose acetate

M. M. Aji, S. Narendren, V. Katiyar, M. K. Purkait

Department of Chemical Engineering, IIT Guwahati, India

E-mail:aji176107033@iitg.ac.in

Waste plastic that has generally been considered as a nuisance in the environment is now been converted into useful product. This work presents feasibility study on the utilization of waste polyvinyl chloride (PVC) as a membrane precursor. Waste derived PVC was blended with cellulose acetate to overcome the hydrophobic nature of PVC in membrane preparations. The membranes were fabricated via non-solvent induced phase transformation using N, N-Dimethyl formamide (DMF) as solvent. They were characterized using field emission scanning electron microscopy (FESEM), attenuated total reflectance in conjunction with fourier transform infrared spectroscopy (FTIR-ATR), thermo-gravimetric analysis (TGA), contact angle measurement and the performance was evaluated by pure water flux (PWF) and Bovine serum albumin (BSA) rejection. The outcome shows that the membrane has a PWF of 85 L / m2 h, BSA rejection of 91%, equilibrium water content and hydrophilicity were also improved and the contact angle was decreased to 64.65o. Therefore, this study gives an insight that waste PVC can be use to fabricate membrane.

ynthesis, characterization and CO2 separation performance of novel PVA/PG/ZIF-8 mixed matrix membrane

Mridusmita Barooah and Bishnupada Mandal*

Department of Chemical Engineering, Indian Institute of Technology Guwahati,

Guwahati-781039, Assam, India

mridusmita@iitg.ac.in (Mridusmita Barooah)
bpmandal@iitg.ac.in(Bishnupada Mandal)

This work reports the synthesis of zeolitic imidazolate framework-8 (ZIF-8) having regular pore size (~0.35 nm) embedded to the poly (vinyl alcohol) (PVA)/ piperazine glycinate (PG) solution. High performance mixed matrix membranes (MMMs) prepared by solution coating of PVA/PG/ZIF-8 solution onto a polyethersulfone (PES) support were utilized for CO2/N2 gas separation studies. Detailed thermal, structural and microscopic analysis of the synthesized ZIF-8 particles was conducted. The characterization studies and the performance evaluation tests were performed for the prepared MMMs. The excellent compatibility of ZIF-8 filler in the PVA/PG matrix resulted in enhancement of CO2 permeance and CO2/N2 selectivity. The results depicted that PVA/PG membrane loaded with 5 wt% ZIF-8 (PVA/PG/ZIF-8(5)) showed a high CO2 permeance of 86 GPU and CO2/N2 selectivity of 368 which was 88% and 98% higher when compared to pure PVA/PG membrane. Thus ZIF-8 doped PVA mixed matrix membrane serves as a potential candidate for industrial gas separation studies.
Keywords: Mixed matrix membranes (MMMs); Poly (vinyl alcohol); ZIF-8; Separation Techniques; CO2/N2 gas separation.

Studies on Efficiency of Different Types of Dryers for Food Products

Pranjal Pratim Das[1], Preetisagar Talukdar[1], Manuj Kumar Hazarika[2]

[1]Department of Chemical Engineering, IIT Guwahati, India

[2]Department of Food Engineering & Technology, Tezpur University, India

E-mail:pranjalpratimdas1@gmail.com

The drying efficiency and improvement in the carotenoid content as well as rehydration property of Carrot (Daucus carota L.) was performed by carrying out an analysis of comparison by selected drying processes. Carrot (Daucus carota L.) is taken as the selected sample for the present experiment. At first, the nutritional properties were examined, followed by the drying kinetics of the sample. Different types of dryers viz. hot air and fluidized bed drying methods were used for predicting the drying behavior of the sample. The drying kinetics, rehydration properties, color as well as the carotenoid content of the samples were analyzed for finding the suitable quality determination. Various drying temperatures viz. 45°C, 55°C and 65°C were employed by the dryers, until equilibrium moisture content of the samples has been reached. The rehydration ratio of the fluidized bed drying was found to be higher (R.R. = 3.16 ± 0.22) compared to the hot air drying process (R.R. = 2.02 ± 0.51). The Carotene content was found to be 115 ± 1.68 and 75 ± 2.78 for fluidized bed dryer and hot air drying, respectively. From the experiments conducted, it was seen that fluidized bed dryer gives improved rehydration ratio as well as better retention of carotenoid content compared to hot air drying.

Keywords: Hot air drying, Fluidized bed drying, Drying kinetics, Carotenoid content, Rehydration Ratio.

Thermochemical behaviors and kinetic analysis during co-pyrolysis of defatted microalgae residue

and rice husk

Pravin G. Suryawanshi*, Sutapa Das and Vaibhav V. Goud

Department of Chemical Engineering, Indian Institute of Technology, Guwahati-781039, Assam, India

*Corresponding author, e-mail: pgsuryawanshi@iitg.ac.in

The trends in the demand and consumption patterns of liquid fuels is increasing over the past decade. Worlds' crude oil resources are limited, whereas the oil age is about last somewhere in 21th century. Global CO2 emissions are increasing even after the Paris Agreement of 2015. Therefore, to solve these real problems, alternative energy resources must be explored. Microalgae and lignocellulosic biomass are abundantly available renewable resources. Microalgae is considered as promising source of bio-oil and lignocellulosic biomass is the dominant energy source in non-oil-producing countries. But, the non-sustainable use of these resources are resulting in less energy recovery and residual waste generation. A comprehensive analysis of thermal decomposition of defatted microalgae residue and its mixture with lignocellulosic biomass (i.e. rice husk) is carried out using thermo-gravimetric analysis (TGA). From the knowledge of TGA study, co-pyrolysis of microalgae residue and rice husk with different weight ratios has been carried out at temperatures ranging from 300°C to 500°C under atmospheric pressure conditions using nitrogen gas to study the utilization potential and effect of biomass on the thermal degradation kinetics. A non-isothermal thermogravimeteric analysis carried out to generate kinetic data with heating rates from 10°C min-1 to 50°C min-1. Conventional and advanced isoconversional integral kinetic methods employed to accurately determine the kinetic triplets of the pyrolysis and co-pyrolysis process. From the knowledge of activation energy and pre-exponential parameter, the thermal degradation mechanism of the biomass determined using master plot method. A synergistic effects of microalgae residue on thermal degradation behaviour of lignocellulosic biomass has been observed which is investigated by co-pyrolysis kinetic analysis.

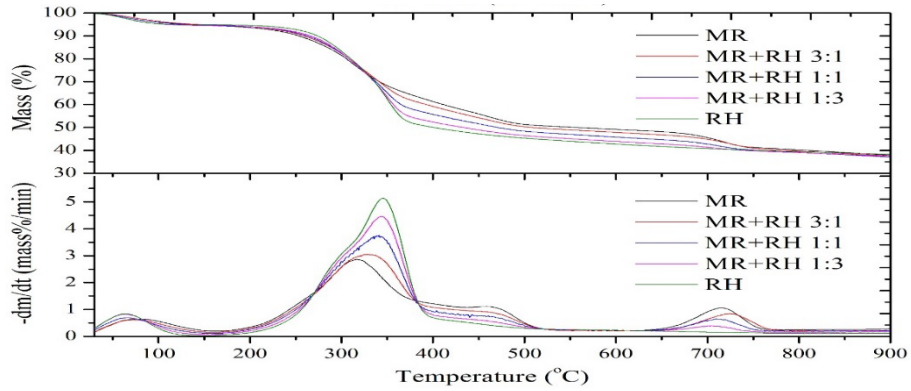


Fig. 1. Mass loss and mass loss rate curve for MR, RH and their blends at 10°C min-1 heating rate. (MR – Microalgae Residue, RH – Rice Husk)

Keywords: Thermochemical properties, lignocellulosic biomass, defatted microalgae residue, co-pyrolysis, kinetic analysis, thermal degradation mechanism.

Modelling of moisture absorption isotherms of Masoor Dal (Lens culinaris)

Preetisagar Talukdar[1], Pranjal Pratim Das[1], Manuj Kumar Hazarika[2]

[1]Department of Chemical Engineering, IIT Guwahati, India

[2]Department of Food Engineering & Technology, Tezpur University, India

E-mail: preetisagar1891@gmail.com

Moisture sorption isotherm modelling by the use of GAB equation and Artificial Neural Network (ANN) in masoor dal (Lens culinaris). The EMC for adsorption were determined by static gravimetric technique. The experiments for masoor dal were carried out in saturated salt solutions at 30oC, 40oC and 50oC till the EMC were obtained. The moisture adsorption data obtained were fitted in GAB equations and artificial neural network (ANN) by using MATLAB. For the ANN modelling 7 input neurons corresponding to the 7 input variables: aw, temperature, ash content, dietary fibre, crude protein, fat content and carbohydrates were considered while the output neuron represented the EMC. The highest R2 value and least RMSE value of both GAB equation and ANN modelling were calculated.
At given moisture content, water activity value was estimated by the fitted GAB model in the moisture range from 5 to 20%, at the three temperatures. In case of the GAB equation the R2 values for 30oC, 40oC and 50oC were 0.9986, 0.9975 and 0.9992 respectively while the RMSE values were 0.1612, 0.2393 and 0.3472 respectively. In the ANN modelling the highest R2 value and the least RMSE value corresponded to the hidden neurons of 8 with the neural network of 7-8-1. The highest R2 value and the least RMSE value in ANN modelling were 0.9979 and 0.08561 respectively. The results indicated that modelling of water adsorption isotherm by using ANN allowed to consider additional parameters like the chemical composition of the sample which is not possible in GAB equation and yet gave better results.

Keywords: GAB equation, ANN modelling, input and output neurons

Residual Crude Oil Recovery by Chemical Injection in Carbonate Reservoir

R. Saha[1,2], R. Uppaluri[1] and P. Tiwari[1]

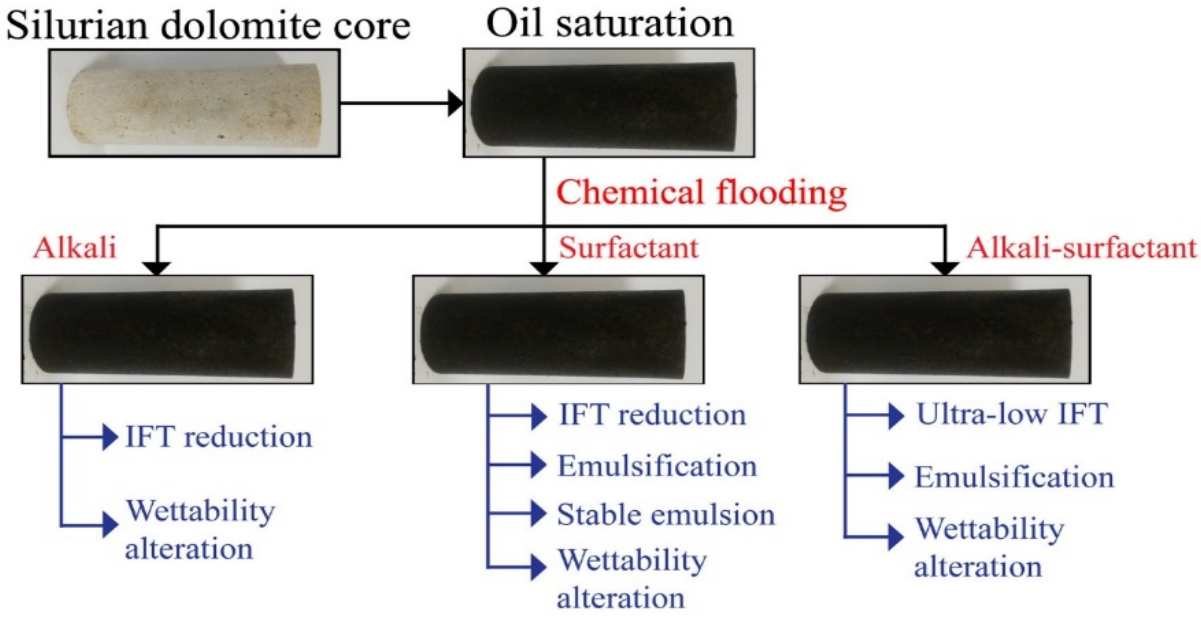
[1]Department of Chemical Engineering, Indian Institute of Technology Guwahati, Guwahati 781039, Assam, India

[2]School of Petroleum Technology, Pandit Deendayal Petroleum University, Gandhinagar 382007, Gujarat, India

E-mail:rsaha@iitg.ernet.in/rahulsaha946@gmail.com

Crude oil is one of the important source of energy worldwide and to overcome the energy demands in future, the oil production has to be enhanced. The current crude oil production from reservoirs accounts only around 25 - 35% original oil in place (OOIP) by primary and secondary methods. The remaining two-thirds OOIP is trapped in the reservoir which is subject towards tertiary techniques to improve the cumulative oil recovery. Chemical-induced oil recovery is one of the tertiary methods which have been focused on the current investigation for Assam oil field. The screening of different alkalis and surfactants at extreme reservoir conditions (30–80 °C temperature and 0–20% salinity) were performed based on the interfacial tension (IFT). An exciting phenomenon of oil layer break time was observed during dynamic IFT measurements which enhances the extent of emulsification. We also detected a linear relationship between IFT and emulsification for eight different surfactants using heavy crude oil. The stability of potential surfactants was identified and their adsorptions on the rock surfaces were estimated. The synergy of alkali and surfactants towards IFT reduction and emulsification showed unfavourable

behaviour because of which the recovery was reduced. The surfactant mixture system at higher surfactant concentration (> 0.1 wt%) resulted in the formation of strong emulsion which severely reduces the sweep efficiency and decreases recovery factor. The effect of alkali and surfactant on contact angle changes indicated the change in wettability of the system from intermediate wet to water wet. Finally flooding experiments at optimum concentrations resulted in an oil recovery of 12.79%, 14.46% and 24.58% for alkali, alkali- surfactant and surfactant mixture respectively.



Porosity (%)	Brine permeability (mD)	Initial oil saturation (%)	Chemical formulation (wt%)	Water flooding recovery (%)	Chemical recovery (IOIP %)	Total oil recovery (%)	Residual oil recovery (ROIP %)
20.8	90.3	80.1	0.6% NaOH (A)	30.16	12.79	42.95	18.31
20.3	92.9	79.9	0.025% CTAB (S)	29.52	16.87	46.39	23.94
19.6	71.9	82.5	0.05% CTAB	30.57	22.58	53.15	32.52
20.9	74.1	79.9	0.1% CTAB	30.13	21.91	52.04	31.36
19.4	66.7	79.4	0.2% CTAB	30.11	20.24	50.35	28.96
20.3	49.2	79.1	0.05% CTAB + 0.05% TX-100 (S_M)	30.72	24.58	55.30	35.48
20.2	82.6	79.6	0.1% CTAB + 0.1% TX-100	30.26	21.75	52.01	31.87
20.3	84.3	80.3	0.6% NaOH + 0.05% CTAB + 0.05% TX-100 (AS_M)	30.78	14.46	45.24	20.89
19.9*	68.4	80.1	0.6% NaOH + 0.05% CTAB + 0.05% TX-100 (AS_M); 0.05% CTAB + 0.05% TX-100 (S_M)	31.07	18.65	49.72	27.06

* Dual slug injected - First chemical slug of 0.5 PV followed by second chemical slug of 0.5 PV and then 1 PV chase water flooding.

Table 3: **The details of the core flooding experiments performed: Residual oil recovery obtained from carbonate Berea cores (at 30°C) using various chemical combinations and compositions.**

References

1. R. Saha, V.S.R. Uppaluri, P. Tiwari, Effect of mineralogy on the adsorption characteristics of surfactant − reservoir rock system, Colloids Surf. A 531 (2017) 121–132.

2. R. Saha, R.V.S. Uppaluri, P. Tiwari, Influence of emulsification, interfacial tension, wettability alteration and saponification on residual oil recovery by alkali flooding, J. Ind. Eng. Chem. 59 (2018) 286–296.

Enhanced CO2 Separation by Carboxymethyl Chitosan/Functionalized Carbon Nanotube Mixed Matrix Membrane

Rajashree Borgohain, Bishnupada Mandal*
Department of Chemical Engineering, Indian Institute of Technology Guwahati, India 781039
Email: r.borgohain@iitg.ac.in, bpmandal@iitg.ac.in*

The separation of CO2 is extensively believed to be an important route for mitigating the issue of global warming. In this regard, separation using mixed matrix membranes has grabbed the attention of researchers owing to its operational simplicity, cost effectiveness and corrosion free nature. In the present study, the acid treated multiwalled carbon nanotubes (AT-MWCNT) are loaded on carboxymethyl chitosan (CMC) membrane and the CO2 separation from CO2/N2 mixture takes place via facilitated transport mechanism. The synthesized membranes have been characterized employing various microscopic and spectroscopic techniques. The water holding behavior of the mixed matrix membrane has also been assessed by the water retention test. The synthesis, characterization and permeation results are shown in Figure 1. The result obtained from the gas permeation study justifies that the proposed membrane can be a potential candidate for CO2 separation application.

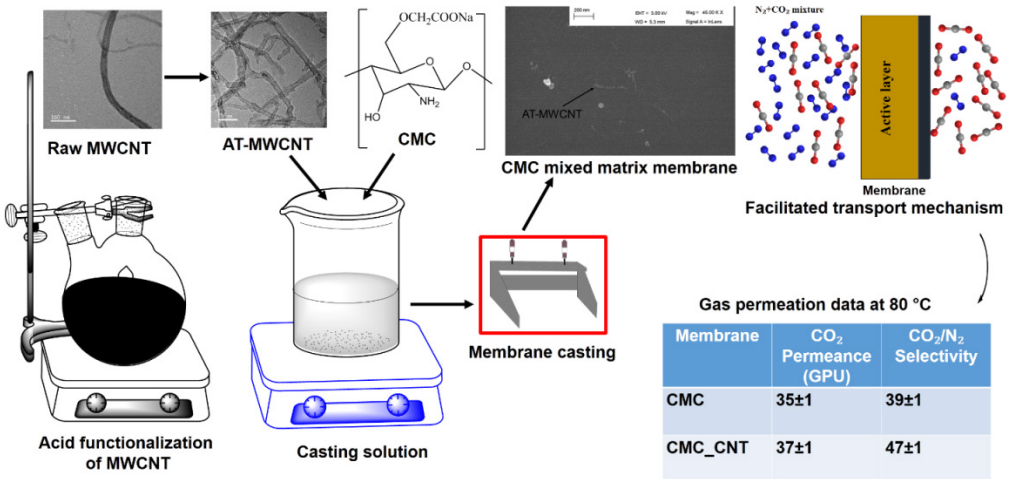


Figure 1. Overall representation of the synthesis and characterization of CMC/MWCNT mixed matrix membrane used for CO_2 separation

Particle-laden bubble size and its distribution in microstructured bubbling bed in presence and absence of a surface active agent

Ritesh Prakash*, Subrata Kumar Majumder and Anugrah Singh

Department of Chemical Engineering, Indian Institute of Technology Guwahati, Guwahati 781039, Assam, India

*Email: ritesh.prakash@iitg.ac.in

This work reports experimental measurements of the bubble size and its distribution in the three-phase (air-water-coal, air-water-coal-surfactant) system. A thorough investigation of the effect of particle concentration, particle size, viscosity, and axial positions on bubble size and its distribution in the presence and absence of the surfactant is reported. Bubble size distribution (BSD) in three different experimental conditions is studied which follows the beta, Weibull, and log-logistic nature of the distribution function. Correlations are developed for estimation of parameters of each distribution

function. A generalized correlation model is also developed for the estimation of the Sauter mean bubble diameter, aspect ratio, and interfacial area in the three-phase system by considering operating, geometric variables, and physical properties of the system. The current work will be useful for process intensification of chemical and biochemical processes based on the interfacial phenomena.
Keywords: bubble size; bubble distribution function; particle concentration; particle size, surfactant

An analysis of frictional pressure drop and bubble-slurry interfacial shear stress in a microstructured slurry column in presence and absence of surfactant

Ritesh Prakash*, Subrata Kumar Majumder and Anugrah Singh

Department of Chemical Engineering, Indian Institute of Technology Guwahati, Guwahati 781039, Assam, India

*Email: ritesh.prakash@iitg.ac.in

In the current work, experiments were performed to investigate the frictional pressure drop and gas-slurry interfacial shear stress in the presence and absence of surfactant in a microstructured slurry column. A mechanistic model was also proposed based on the mechanical energy balance of both the gas and the slurry flow considering the rate of energy loss due to bubble formation, the rate of energy loss due to the slip of gas-slurry interface, and the rate of energy loss due to the wetting of thin liquid layer with the column wall. Thorough investigation of the influence of particle concentration, particle size, bubble size, and surfactant on frictional pressure drop and bubble-slurry interfacial shear stress was conducted. A generalized empirical correlations were also developed based on the dynamic variables, geometric variables, and physical properties of the system which showed that the predicted values of frictional pressure drop and gas-slurry interfacial shear stress was consistent with measured values, where the absolute average relative error was below 6.34% and predicts the experimental data well in the error range of ± 19.95%.
Keywords: bubble-slurry interfacial shear stress, frictional pressure, particle, surfactant

The insight of the droplet splitting at the T - junction of a microchannel

Saikat Biswas[1] Tapas K Mandal[1,2] and Partho S G Pattader[1,2]

[1]Department of Chemical Engineering, IIT Guwahati, India

[2]Centre for Nanotechnology, IIT Guwahati. India

E-mail:mailsaikat16@iitg.ac.in

Droplet miniaturization is very important in microchannel as morphology of multiphase flow is dominated by plug, slug and separated flow. Heat, mass and other interfacial transportation in gas-liquid, liquid-liquid and gas-liquid-solid flow can be enhanced by creating micro or miniaturised droplets. There are various approaches for reducing the size of a droplet in microchannel, namely by changing the fluid properties [1], introducing constriction into the channel [2], creating pattern on inner wall of the channel [3], diverting the flow through T and Y channel or through channel network [4], etc. Researches have tried it in both the way, - through experimental [5] and numerical [1]. Mostly they have discussed the droplet breakage mechanism based on the change in flow patterns. The insight physics of the phenomena like influence of velocity field, pressure field, etc. are not well explored till date.

Therefore, the present work aims to find out the role of pressure field, velocity field and stream function on droplet miniaturization in a T-shaped micro channel. For this purpose, a numerical approach, VOF in ANSYS FLUENTTM 14.5 has been adopted in the present work. The micro channel is made of quartz and water and mineral oil (MARCOL – 82) are selected as process fluids. To validate the results, predicted flow patterns has been compared with the experiment done by Salim et al. (2008) [4].

The 2 – D geometry was divided into 36,000 orthogonal mesh cells. The inlets and the outlets were modelled with velocity inlet and pressure outlet boundary conditions respectively. No – slip and impermeable conditions were implemented on the walls of the microchannel. The unsteady governing equations together with the boundary conditions were solved using CFD solver ANSYS FLUENTTM 14.5. A time step of 0.0001 s is chosen for droplet and slug flow simulations with a courant no. of 0.25. For pressure interpolation - PRESTO scheme is employed, for pressure – velocity coupling – SIMPLE scheme is used and QUICK scheme is used for upwinding the convective terms of the momentum equation. The surface tension model uses the CSF (continuum surface force) model. To reconstruct the interface in every time step, geometric reconstruction model along with implicit body force treatment were employed. Contact angle of 55.2º and interfacial tension of 0.0301 N/m is implemented.

Droplets and slugs were generated by varying the inlet velocities of the two phases. The continuous phase is the mineral oil and the dispersed phase is the water. At the junction, the droplets get split into two portions and proceed in the two opposite directions. Double vortex formed at the middle of the T – junction when a droplet starts splitting.

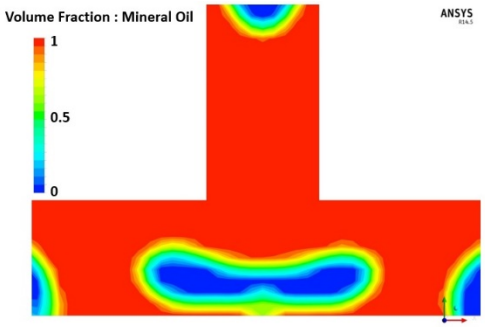


Fig 1. Volume fraction of Mineral Oil - Water

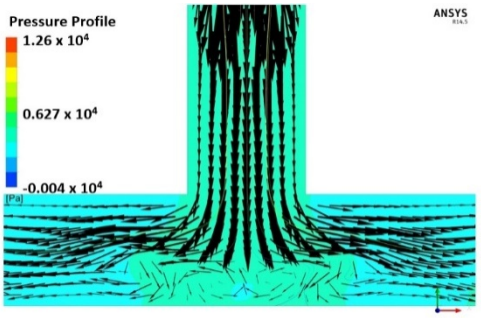


Fig 2. Pressure profile, Velocity field and Streamline

The present work has successfully predicted flow patterns in a T-shaped microchannel which accord with the available data in the literature [4]. It is observed that the vortexes formed at a region of relatively high pressure zone in the middle of the T – junction is the main cause of splitting of a droplet.

References:

[1] S. Timung, V. Tiwari, A. K. Singh, T. K. Mandal, D. Bandyopadhyay. The Canadian journal of chemical engineering (2015) 9999.

[2] Z. Liu, J. Zhao, Y. Pang, X. Wang. Microfluidics and Nanofluidics (2018) 22:124.

[3] Y. Yamasaki, M. Goto, A. Kariyasaki, S. Morooka, Y. Yamaguchi, M. Miyazaki, H. Maeda. Korean J. Chem. Eng., 26(6), 1759-1765 (2009).

[4] A. Salim, M. Fourar, J. Pironon, J. Sausse. The canadian journal of chemical engineering, volume 86, december 2008.

[5] C. Yao, Y. Liu, C. Xu, S. Zhao, G. Chen. AIChE Journal, January 2018 Vol. 64, No. 1.

CHOLINE CHLORIDE GRAFTED ZEOLITES FOR THE PRODUCTION OF 5-HYDROXYMETHYLFURFURAL FROM CARBOHYDRATES CONVERSION

Santosh Kumar Yedla,[a*] Animes Kumar Golder[a] and Nageswara Rao Peela[a@]

[a]Department of Chemical Engineering, Indian Institute of Technology Guwahati, Guwahati – 781039, Assam, India

*Presenting Author Email: k.yedla@iitg.ac.in,

[@]Corresponding Author Email: peelanr@iitg.ac.in,

Choline chloride (ChCl) grafted zeolites (HMOR, HZSM5, HBeta, NaY, and HY) have been synthesized and tested for the conversion of biomass derivatives (cellulose, glucose, and fructose) to 5-Hydroxymethylfurfural (5-HMF). The thermo gravimetric analysis indicates that interaction strength decreases with silica-to-alumina ratio and also varies with the type of zeolite framework type or framework cation (Na+ or H+). The Solid State (SS) NMR data reveals the existence of ionic and Lewis interactions between the ChCl and the zeolite. An ionic interaction appears to be stronger in case of ChCl/HZSM5. The activity of the zeolites with moderate silica-to-alumina ratios (SAR) is found to be enhanced by the grafted with ChCl and is attributed to better interaction between ChCl and the zeolite, as depicted from SS NMR spectra. However, the effect was negligible for the zeolites with either low or high SAR. The ChCl grafted HZSM5 showed a synergistic effect in enhancing the 5-HMF yield and is stable for five recycles.

Keywords: Carbohydrate conversion; Choline chloride grafted zeolites; 5-Hydroxymethylfurfural; Reactive extraction; Ionic and Lewis interactions.

Electric Field Mediated von Kármán Vortices in Stratified Microflows: Transition from Linear to Coherent Vortices

Satarupa Dutta,[*1] Partho Sarathi Gooh Pattader,[1,2] Dipankar Bandyopadhyay[*1,2]

[1]Department of Chemical Engineering, Indian Institute of Technology Guwahati, 781039, Assam, India.

[2]Centre for Nanotechnology, Indian Institute of Technology Guwahati, 781039, Assam, India

[*]Corresponding author: satarupa.dutta@iitg.ac.in, dipban@iitg.ac.in

Instabilities are induced in a pressure-driven flow of a pair of viscosity stratified dielectric miscible fluids inside a microchannel on the application of electric field, due to injection of ions from the electrodes into the fluids. Experiments uncover distinctive instability regimes with an increase in electric field Rayleigh number (Ra^{ψ}) – linear-onset regime, time-periodic non-linear regime analogous to von Kármán vortex street at the downstream, and a regime with coherent flow patterns. The experiments also reveal that such linear and nonlinear instabilities can be stimulated non-invasively in a microchannel to mix or de-mix fluids simply by turning the electric field on or off, indicating the suitability of the process for on-demand micromixing. Non-linear CFD simulations also qualitatively validate the experimental observations. The onset conditions of the instabilities predicted by the simulations are in reasonable agreement with the experimentally observed values. The reported phenomena can be of significance in the domains of microscale mixing, pumping, heat-exchange, mass transfer, and reaction engineering.

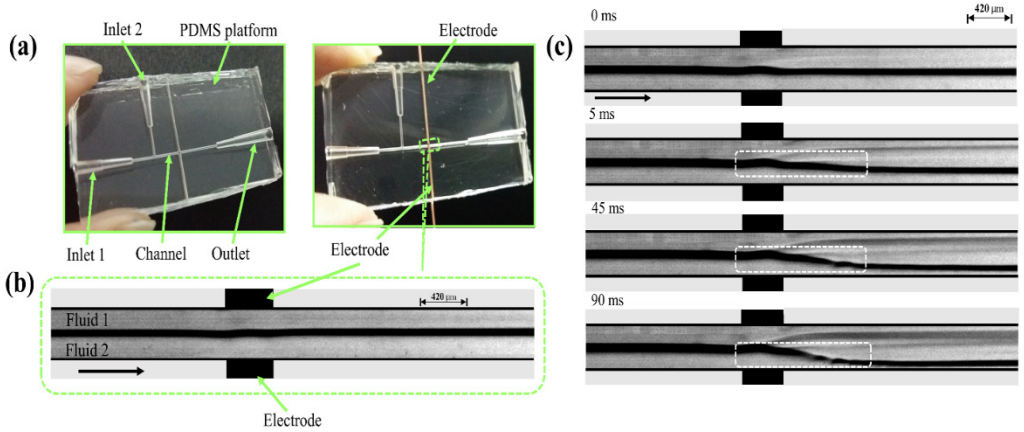


Fig. 1.Image (a) shows the top-view of the experimental microchannel on a PDMS platform. Image (b) shows the experimental micrograph of the top view of the of the region marked in the image (a). Fluids 1, and 2 formed a stratified flow in the channel (side by side). and were subjected to an electric field via copper wire electrodes. The arrow in image (b) indicates the direction of the flow. The average Re of the flow was maintained at 0.5. (c) Schematic illustration of the theoretical framework for linear stability analysis. (d) The computational domain for the non-linear CFD simulations. Images in (c) show the experimental snapshots after 0 ms, 5 ms, 45 ms, and 90 ms, respectively, depicting the response of a stratified flow of benzene-silicone oil system through the microchannel under applied potential of 300 V (Raψ = 225). The arrow indicates the direction of flow.

References:

1. Sahu, K. C. & Govindarajan, R. 2016 Linear stability analysis and direct numerical simulation of two-layer channel flow. J. Fluid Mech. 798, 889–909.

2. Zhang, M. 2016 Weakly nonlinear stability analysis of subcritical electrohydrodynamic flow

subject to strong unipolar injection. J. Fluid Mech. 792, 328–363.

3. Dutta, S., Ghosh, A., Pattader, P. S. G. & Bandyopadhyay, D. 2019 Electric Field Mediated von Kármán Vortices in Stratified Microflows: Transition from Linear Instabilities to Coherent Mixing. J. Fluid Mech.

COMPARATIVE STUDY OF PLASMA GASIFICATION OF SOLID WASTES

Shiv Kumar, V. Prabu

Department of Chemical Engineering, IIT Guwahati

In this study, plasma gasification of various feedstock, i.e. low ash coal, high ash coal, coconut fibre, municipal solid waste (MSW) and plastic waste with air and steam as the gasifying medium is considered. Performance parameters like syngas composition and lower heating value (LHV), plasma torch power consumption and cold gas efficiency are assessed. Plasma gasification is considered instead of conventional gasification because it is superior to later in a way that it can handle not only biomass but also harmful waste which can be completely converted into outputs having considerable amount of energy content. Plasma gasification process is modelled in Aspen Plus software with the help of non-stoichiometric Gibbs free energy minimization approach. The results of the plasma gasification are calculated on the basis of product gas from the gasifier. Results shows that coconut fibre yields highest cold gas efficiency of 62.12 % because of its low torch power consumption of 5.9 MW. Low ash coal (44 %) yields better efficiency than high ash coal (33.1 %) mainly because of high ash content in the

high ash coal. Plastic waste yields highest calorific value syngas mainly because of high amount of C and H in its elemental analysis. MSW yields an intermediate cold gas efficiency of 42.3 % but it yields an excellent CO and H2 content of 53.89 and 42.23 % respectively in the product gas. The results from this study are compared with the already existing literature on plasma gasification and are found in good agreement with the same.

Caffeic Acid-A promising natural compound to disaggregate Amyloid beta fibrils thereby curing Alzheimer's disease

Shivani Gupta*, Ashok Kumar Dasmahapatra

Department of Chemical Engineering, IIT Guwahati, Guwahati-781039, India

E-mail:shivanicl16@iitg.ac.in

Aggregation of amyloid beta protein proposed to be the major reason behind etiology of Alzheimer's disease causing dementia across the globe. Natural compounds owing to their inherent biocompatibility and intoxicity to human system have been tested for their potential to disrupt the amyloid beta by various in vitro and in silico studies. The therapeutic strategy involving disaggregation of Aβ firbils so as to prevent neuronal deposition seems to be a promising one. The in silico MD simulation study conducted on Caffeic acid and Aβ firbils gave a holistic view about its potential to disrupt Aβ fibrils and thereby curing AD. Our studies conducted on Aβ firbils in the presence of Caffeic acid for 100 ns clearly indicated the disruption, as observed by higher RMSD value. The structural instability is further explained by higher radius of gyration in the presence of Caffeic acid. The disorganisation of the Aβ pentamer was attributed to disruption of Hydrogen bonds between peptide chains, and shift of β- sheet configuration to turn and 310 helix arrangement. Additionally, loss of β-sheet structure inhibits formation of higher order aggregates.

Acoustic Wave Catalyzed Urea Detection Utilizing a Pulsatile Microdroplet Sensor

Siddharth Thakur [1], Mitradip Bhattacharjee [2], Ashok Kumar dasmahapatra[1,2]andDipankar Bandyopadhyay[1,2]

[1]Department ofChemical Engineering, IIT Guwahati, India

[2]Centre for Nanotechnology, IIT Guwahati,India

E-mail:dipban@iitg.ac.in

Variations in the electrical resistance across a conducting water microdroplet resting on a glass substrate was observed when mechanically vibrated at its natural frequency with the help of an external acoustic source. The sound waves induced a controlled vibration to the substrate on which the droplet was placed, which eventually transmitted the time-periodic oscillation to the droplet-surface causing the variation in resistance. The reduction in the resistance across the droplet magnified owing to the formation of vortices inside the drop-matrix when the periodic oscillation of the drop-surface increased due to the acoustic vibrations. The variation in the resistance could be tuned with the frequency of the sound source and found to be maximum when a 10 μL droplet was vibrated with acoustic wave of frequency 320 Hz.

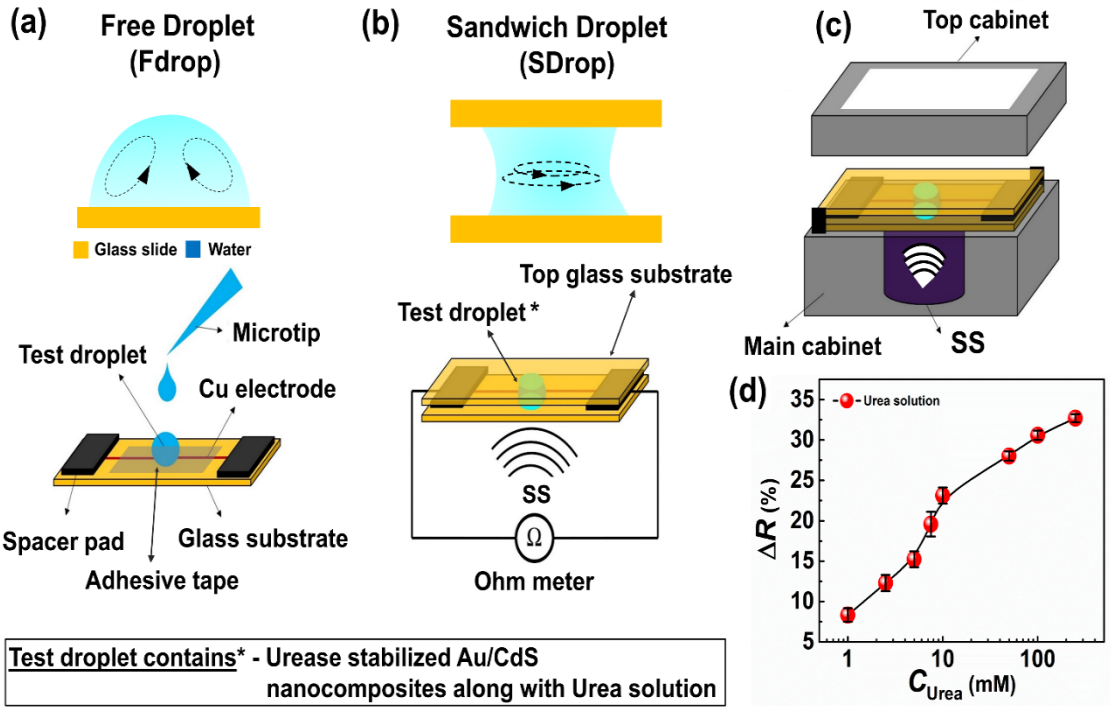


Figure 4: Schematic diagram of the different configurations of the droplet based resistance system. (a) FDrop configuration has been employed for external sound detection and (b) SDrop confguration has been employed for urea biosensing. (c) Entire experimental set-up for the urea biosensor is shown. (d) Plot shows the variation of droplet solution resistance with varying urea concentrations.

Interestingly, the variation in resistance of the oscillating droplet could follow and distinguish the musical notes in the octaves – "Swar" or rhythmic cycles – "Taal" originating from the musical instruments such as flute, harmonium, whistle, and tabla. Further, when a suspension of urease-stabilized gold-cadmium-sulfide nanocomposite was suspended inside the droplet and then mixed with an analyte such as urea-solution, the change in the resistance during the oscillation was found to monotonically vary with the amount of urea in the analyte. The enzymatic reaction between urea and urease was found to follow a faster first order chemical kinetics than the commonly observed Michaelis–Menten pathway owing to the presence of the moving nanocomposite and mixing-vortices under the optimal acoustic excitations. The schematic of the proposed urea biosensor has been presented in Figure 1, wherein the SDrop droplet configuration represents the setup which has been utilized for the biosensing application and the FDRop droplet configuration represents the setup which has been employed for the external sound detection application, respectively.

Resolution of Tartaric Acid by Excess Enantiomeric Method

Sunil Kumar Singh[1] and Partho Sarathi Gooh Pattader[1,2]

[1]Department of Chemical Engineering, IIT Guwahati,India

[2]Centre for Nanotechnology, IIT Guwahati, India

E-mail:sks.2015@iitg.ac.in

In nature, most of the things are not accessible in the pure form or available in the mixture form. Crude oil, coal, water, enantiomers, etc., these are the best examples which are naturally readily available in

the mixture form 1. These mixtures are either in chemically or physically bonded with each other 2. To utilize these resources, it is necessary to get in pure form and achieved by separation techniques3,4. Crystallization, kinetic resolution, capillary electrophoresis, membrane separation, liquid-liquid extraction, chromatography, etc. are few of the separation processes used to separate enantiomers 6,7.

In this present study, the resolution of tartaric acid from a racemic mixture was made by a mechanical method, which is based on the preferential crystallization. The process of preferential crystallization goes under the condition at which the solution reaches the metastable state. The undesired spontaneous nucleation is kinetically introverted for some period of time within the metastable zone, hence in the meantime enantioseparation occurs. Usually, this method starts with a racemic unsaturated solution, cool it very carefully so that it can pass through saturation temperature and enter the metastable zone and in this region, a supersaturated solution exists without crystal. Resolution of a racemic mixture of enantiomers started by adding pure seed crystal of an enantiomer. This seed crystal grows and propagates as a homochiral product. The growth of seed crystal must be stopped before unwanted nucleation, otherwise, it leads to the formation ofcrystals of both enantiomers. Due to high (50%) concentration of impurity, it gives a relatively low yield.

The experiment started with a racemic tartaric acid solution in a batch mode. A solution prepared by dissolving 1 g of D-(-)-tartaric acid and 1 gm of L-(+)-tartaric acid in 8 ml of water at 35°C in a conical flask. The solution was cooled up to room temperature, and added 20% excess (0.2 g) pure crystals of L-(+)-tartaric acid in the racemic solution and left the solution for 8 h at room temperature to grow the crystals. These grown crystals separated from the solution on filter paper and dried it at normal room temperature. Differential scanning calorimetry (DSC) equipment used for the characterization of the moisture-free crystal and result showed that percentage purity was increased by 6%. It had also been observed that the percentage purity of crystals depends on the residence time of crystal in the solution.

References:

1. Zhao, B. & Shaw, J. M. Composition and size distribution of coherent nanostructures in Athabasca bitumen and Maya crude oil. Energy Fuels21, 2795–2804 (2007).

2. Buckley, J. S. & Liu, Y. Some mechanisms of crude oil/brine/solid interactions. J. Pet. Sci. Eng.20, 155–160 (1998).

3. Tzschucke, C. C. et al. Modern separation techniques for the efficient workup in organic synthesis. Angew. Chemie - Int. Ed.41, 3964–4000 (2002).

4. Villaluenga, J. P. G. A review on the separation of benzene/cyclohexane mixtures by pervaporation processes. J. Memb. Sci.169, 159–174 (2000).

5. Coli, J. C. & Bowden, B. F. The application of vacuum liquid chromatography to the separation of terpene mixtures. J. Nat. Prod.49, 934–936 (1986).

6. Wojciech Kujawski , Andrzej WarszawskP, W~odzimierz Ratajczak, Tadeusz Por~bski, Wiestaw Capata, I. O. Removal of phenol from wastewater by different separation techniques Wojciech. Desalination8, 311–318 (1988).

7. Ôi, N. & Kitahara, H. Enantiomer separation by HPLC with some urea derivatives of l-valine as novel chiral stationary phases. J. Liq. Chromatogr.9, 511–517 (1986).

ffect of pore former particle size on the morphological characteristics of ceramic membranes

Sushma Chakraborty, Chandan Das and Ramagopal Uppaluri*

Indian Institute of Technology Guwahati, Guwahati-781039, India

Low cost ceramic membranes have proven to be effective for the microfiltration of oily wastewater treatment, juice processing and potable water production from biologically contaminated water sources. This work addresses systematic investigations that target optimal membrane precursor formulation using saw dust as bio-pore forming agent. Firstly, the preliminary optimal formulation was determined using mixture model design based response surface methodology (RSM) to obtain optimal precursor compositions of kaolin (48.19%), saw dust (8.19 wt%) and feldspar (28.62 wt%) using 355 mesh screened bio-pore former. Thereafter, the membrane morphological study was targeted by carrying out simultaneous reduction in saw dust average particle size (using 150 mesh size and saw dust nano-particles) and saw dust concentration (from 8 to 1%). Morphological, permeation and average porosimetric studies affirmed that while porosity was reduced marginally (24 to 20%), the average pore size reduced significantly from 1 □m to 410 nm, thereby enabling research to address tailor made and customized membrane morphologies for extended industrial microfiltration applications. With bio-pore forming agent being used, the ceramic membrane materials are expected to serve as an ideal filtration medium to complex and real feed systems such as fruit/vegetable juices, wastewaters and contaminated water resources. Further, characterizations were carried out using Laser Particle Size Analyzer (LPSA) for saw dust particle size analysis and Field Emission Scanning Electron Microscope (FESEM) for membrane morphological analysis.

Extraction of Gallic Acid from Roxburgh Fig Leaves by Ultrasound Assisted Extraction

Thangsei Nengneilhing Baite, Bishnupada Mandal*, Mihir Kumar Purkait

Department of Chemical Engineering, Indian Institute of Technology Guwahati, India- 781039

Email: baite176107031@iitg.ac.in, bpmandal@iitg.ac.in*, mihir@iitg.ac.in

The awareness about the health and environment impact of chemicals have been on the rise. Chemical additives are found in almost every angle of life viz., food, cosmetics, pharmaceuticals, etc. Replacement of existing chemicals with safer, environment friendly components is the need of the hour. Plants are the most ideal sources to provide the replacement for such, as they house large no. of bioactive compounds. The present study aims to use the traditionally used medicinal plant, Roxburgh Fig (Ficus auriculata), as a source to extract a bioactive compound, gallic acid, which is a potent antioxidant. Although several researches have been conducted to separate bioactive compound from plants, the existing methods involve use of either environmentally harmful organic solvents, longer extraction time, or use of complex equipment. These factors reduce the overall efficiency and contribute to environmental degradation. To eliminate these disadvantages, the following work is proposed by using water as the solvent for extraction, and improving the efficiency by employing ultrasound assisted extraction (UAE), and studying and optimising various extraction parameters viz., time, temperature, sonication power and pH of the extracting solvent.

Keywords: Roxburgh fig, Gallic acid, Ultrasound assisted extraction.

Selective production of Furfural by Xylose Dehydration using HY Zeolite

Pardeep and N.R. Peela

Department of Chemical Engineering, IIT Guwahati, India

E-mail: parde174107058@iitg.ac.in peelanr@iitg.ac.in

Furfural is one of the top 30 value-added platform chemicals which can be used as a potential alternative for the production of biofuels and biochemicals. Xylose is the main pentose in hemicellulose extracted by acid hydrolysis. An extended investigation has been done on the salting effect of sodium chloride with the different silica-alumina ratio (SAR) of HY catalyst to convert xylose into furfural in a batch mode. An organic phase is added for better extraction of the furfural to increase its yield. A large number of reactions take place during the transformation of xylose into furfural along with the formation of a solid residue called 'humin'. HY zeolite acts as a Bronsted acid which changes the reaction pathways in dehydration of xylose into furfural. The combination of Lewis acid and Bronsted acid results in higher yield of furfural as compared to single Bronsted acid in aqueous media. A much higher yield of furfural has been observed in the biphasic system when the combination of Lewis acid and Bronsted acid are used to transform xylose into furfural even at a lower temperature and low residence time.

Tea-waste based activated carbon for efficient copper (II) adsorption

Somen Mondal and Subrata Kumar Mjumder

Department of Chemical Engineering, IIT Guwahati, India

E-mail: somen.mondal@iitg.ac.in

In the present study, the activated carbons were prepared from the tea-waste. The effects of activating agents on the characteristics of the prepared materials were investigated. A three-step chemical activation process (impregnation, carbonization and the secondary activation) was followed for the synthesis of the activated carbons. The highest surface area and pore volume were found to be 1326 m2/g and 0.42 cm3/g. The copper adsorption onto the prepared activated carbon with the highest surface area and pore volume was investigated. The maximum adsorption capacity of the activated carbon was found to be 76.00 mg/g at room temperature. The pseudo-second-order kinetic model and the Langmuir adsorption isotherm were followed for the copper (II) adsorption onto the activated carbon. The tea-waste based activated carbon obtained from the present investigation may be recommended to use in water purification processes as an improved copper (II) bio-adsorbent.

References:

1. H. Demiral, C. Gungor, Adsorption of copper (II) from aqueous solutions on activated carbon prepared from grape bagasse, J. Clean. Prod. 124 (2016) 103-113.

2. X. Wang, X. Liang, Y. Wang, X. Wang, M. Liu, D. Yin, et al., Adsorption of Copper(II) onto activated carbons from sewage sludge by microwave-induced phosphoric acid and zinc chloride activation, Desalination 278 (2011) 231-237.

3. J.C.M. Pirajan, L. Giraldo, Adsorption of copper from aqueous solution by activated carbons obtained by pyrolysis of cassava peel, J. Anal. Appl. Pyrolysis 87 (2010) 188-193.

4. E. Demirbas, N. Dizge, M.T. Sulak, M. Kobya, Adsorption Kinetics and Equilibrium of Copper from Aqueous Solutions using Hazelnut Shell Activated Carbon, Chem. Eng. J. 148 (2009) 480-487.

Bio-inspired Cu2O Nanoparticles for Photocatalytic CO2 Reduction to Methanol

Anirban Chowdhury1, Nageswara Rao Peela1 and Animes K Golder1 1

Department of Chemical Engineering, IIT Guwahati, India

E-mail: anirban2016@iitg.ac.in

In this work, one pot bio-inspired synthesis of highly crystalline Cu2O nanoparticles (NPs) was carried out at room temperature and pressure using the extract of an edible fruit, named Sechium edule (Figure 1). XRD pattern (Figure 1) revealed single face-centered cubic structure of Cu2O NPs with an excellent agreement with the SAED patterns obtained from HRTEM micrograph. The synthesized Cu2O NPs showed the maximum optical absorption at the wavelength of 450 nm and from the Tauc plot, the calculated band gap energy was found to be 1.71 eV which was slightly lower than a typical value of 1.9 eV for Cu2O NPs. The surface area of the Cu2O NPs was found to be 16.14 m2·g-1 which was in accordance with the earlier reports for Cu2O NPs.
Cu2O NPs were tested for the photocatalytic reduction of CO2 and the photocatalytic test was carried out in a laboratory-made photoreactor using blue LED light strips illuminated from the periphery of the reactor for an uniform illumination of light (Figure 1). The proposed catalyst was effective for the photoreduction of CO2 forming methanol with a concentration of 14.94 µmol·mL-1 after 8 h of photoreaction (Figure 1).

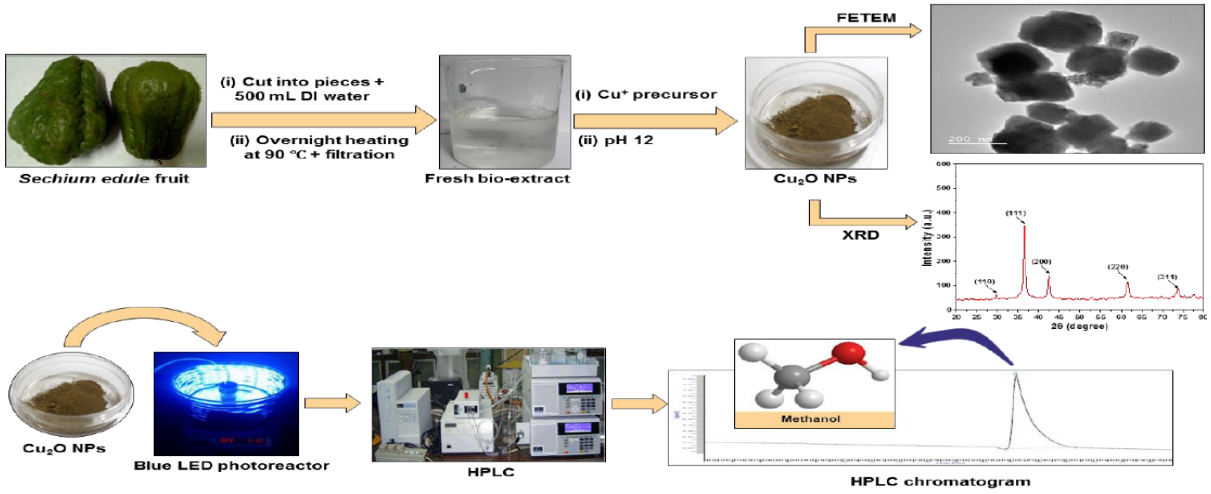


Figure 1: Photocatalytic CO_2 reduction by Cu_2O NPs using bio-inspired route.

A Prior Prediction of Liquid-Liquid-Liquid Equilibria Using COSMO-SAC Model

Debashis Kundu1 , Priyotosh Bairagya 2 and Tamal Benerjee1

1 Department of Chemical Engineering, IIT Guwahati, India

2 Department of Chemical Engineering, Jadavpur University, India

E-mail: debashisk@iitg.ac.in

Three phase liquid equilibria is frequently encountered in enhanced oil recovery, microextraction and triphasic catalytic processes. However, the multicomponent, multiphase equilibria depends on the nature

of compounds and the size of the phase region. Herein, we have predicted the liquid-liquid-liquid equilibria (LLLE) of 6 ionic liquid (IL) containing systems and 6 aqueous-organic systems (hereby, non-IL) employing quantum chemical based Conductor like Screening Model Segment Activity Coefficient (COSMO-SAC) model. The modified Rachford-Rice (R-R) algorithm and modified Henley-Rosen (H-R) algorithm were used to predict the mole fractions of constituents in each phase. In the modified R-R approach, the triphasic systems were assumed into two biphasic liquid-liquid equilibrium which were simultaneously solved iteratively to predict the mole fractions in all three phases. Using this approach, overall average root mean square deviation (RMSD, in %) of 13% was obtained for IL systems whereas 8% was calculated for non-IL systems. In the modified H-R approach, all three phases were considered to be in equilibrium with each other and solved iteratively to predict the mole fractions in all three phases. The overall average RMSD were noted as 6.65% and 6.60% for the IL and non-IL systems respectively.

Bio-oil Generation and Characterization from an Algal Biomass as Sustainable and Renewable Energy Resource

Harshal D Kawale and Nanda Kishore *

Department of Chemical Engineering, IIT Guwahati, India

E-mail: nkishore@iitg.ac.in

The petroleum depletion over a period of time and the need of value added petrochemicals drives a force to develop fruitful technologies. The recent trends in renewable energy production are yet to qualify the energy needs. Thermal processes for biofuels from biomass results biofuels in form of solid, liquid and gas which can be utilized as the fuel and value added products. Among these technologies, pyrolysis is a cost effective technology on pilot scale as well as it can be deliver to form a bio-refinery. We have conducted pyrolysis experiments at variable temperature ranges to get bio-fuels from an algal biomass. The source of biomass is available at tremendous amount in nearby lakes but scarcely researched. Main product obtained is pyrolytic bio-oil which was characterized using Fourier Transform Infrared Spectroscopy (FTIR) and the analysis shows the no. of functional groups present in it. 1H NMR spectroscopy analysed to show various functional groups present in the sample as well as the amount of aromatic carbon content in the bio-oil. Thus, these characterization techniques revealed the fuel potential of the algal biomass to be used as an energy producing alga.

Keywords: Pyrolysis, Bio-oil, Algal biomass, FTIR, 1H NMR.

Electrocatalytic Activity of AgNPs for CO2 reduction

Joy Patar1, Anirban Chowdhury1 and Animes K Golder1 1

Department of Chemical Engineering, IIT Guwahati, India

E-mail: joy.patar@iitg.ernet.in

In this work, silver nanoparticles (AgNPs) were synthesized successfully by using a green method in which the analytes present in olive leaves extract (OLE) served as the reducing as well as the stabilizing agents. This process was easy, eco-friendly, and inexpensive. The AgNPs formation kinetics and crystallinity were studied by UV-Vis spectrophotometric and X-ray diffraction analyses. It was observed that AgNPs formation was most complete within 2 h of reaction time with face centre cubical AgNPs

crystal structure having diffraction planes of (111), (200), (220), and (311). With increasing in pH of the synthetic media, the rate of AgNPs was faster but the Ag2O impurity was evident at pH≥11. Both HR-TEM and FE-SEM micrographs confirmed that AgNPs were mostly spherical in shape with an average size of 18.1 nm (Figure 1). Thermogravimetric assay showed the presence of biomolecules onto AgNPs which was indicative its role for the stability of AgNPs.

AgNPs are cost-effective over other precious metal catalysts such as AuNPs and PdNPs. Hence, these AgNPs was laminated on a glassy carbon electrode using a polymeric binder and tested for the electrocatalytic reduction of CO2 (Figure 1). CH4 was found to be the primary gaseous product formed from CO2 reduction along with concurrent H2 evolution reaction by water splitting.

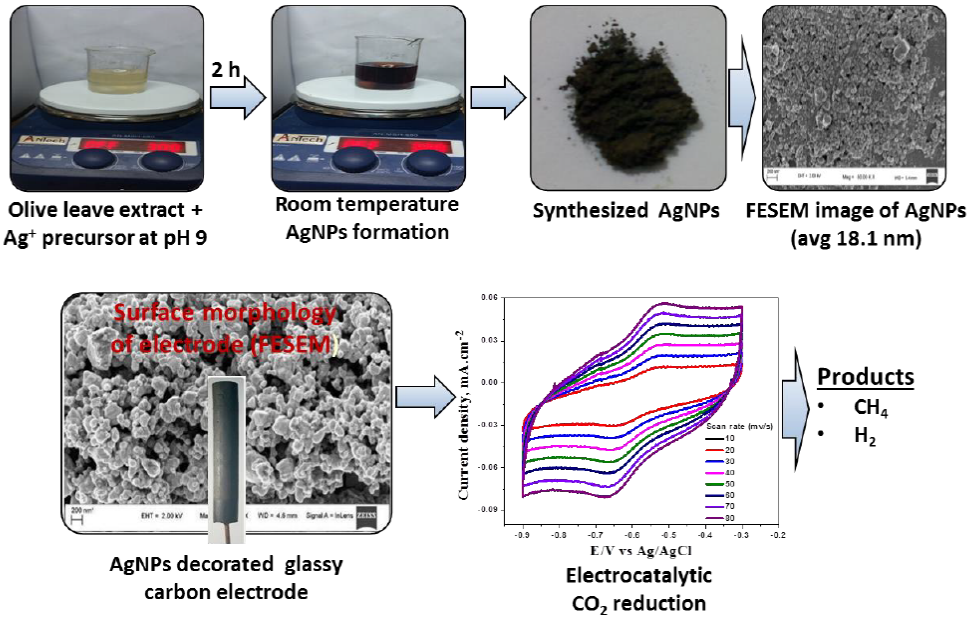


Figure 1: Electrocatalytic reduction of CO_2 by AgNPs synthesized in a bio-mediated route.

A study of sand control by chemical sand consolidation in the oilfields of Upper Assam Basin

Gogoi A.[1*] and Borgohain P.[2]

[12]Department of Petroleum Technology, Dibrugarh University

*Corresponding author e-mail: gogoiaditi8@gmail.com

Sand production is the production of formation sand along with formation fluids due to the unconsolidated nature of the formation. It is a major problem in the oil and gas industry. The excessive ingression of sand in producing wells leads to decrease of crude oil production, damages down hole and surface tools, sand disposal issues, need of routine cleanouts and stuck well accessories. It also decreases the economic producing life of the well. The pressure at which a well will produce sand free from the reservoir is known as the threshold pressure. The production at this threshold pressure is not economically viable and so this threshold pressure is usually ignored to maximize the production rate from the reservoir. This results in increasing sand production and so there is a need for improved sand control methods. The conventional methods of controlling the sand production is mostly through

mechanical means such as gravel packs, standalone sand screens and hydraulic fracturing by providing a barrier in the wellbore and perforations. Most of the oil fields of Upper Assam Basin are in the maturity phase of its producing life and so there is an increase of water cut with high pressure drawdown across sand face. So these conventional methods are incapable of controlling fine sands of the formation. The sandstones found in Upper Assam Basin usually constitute a low percentage of cementing agent which mainly constitute of carbonaceous and calcareous matters and the clay minerals present are migratory in nature. Increase in water saturation due to coning or edge water encroachment, the clay matrix gets loosened and disintegrated which results in mobilization of sand and clay particles. High fluid withdrawal rate results in premature breakthrough of water due to coning, cusping and fast edge water encroachment which results in increased sand cut problem. So, an alternative method of chemical consolidation treatment is necessary as the sand control method in the ageing oilfields of Upper Assam Basin.

The chemical sand-consolidation technique is a sand-control mechanism through which the sand is arrested within the reservoir in contrast to any mechanical sand-control method in which sand is filtered at the formation wellbore. In this method, chemicals such as plastic resins, polymers (epoxy resin, phenol-formaldehyde, urea-formaldehyde, tackifier, furan resin etc.) are injected into the loose formation to bind the sand grains together at their contact point. The chemical plates a thin layer on the surface of the sand grains and packs them together, thereby increasing the unconfined compressive strength (UCS) of the formation which will be sufficient to withstand the drag forces while producing and allowing for increased drawdown without sand production. As the chemical adheres to the rock surface, it reduces the sand permeability of the formation to a great extent, thus enhancing the oil permeability.

Keywords: Sand production, formation sand, chemical consolidation.

Abstract Template for Research Conclave 2019

A.Ashray Koradiya[1],B.Upasana Mahanta[2]C. TamalBanerjee[2]

and D. R. Prasanna Venkatesh[2]

[1]School of Engineering and Appiled Science, Ahmedabad University, Ahmedabad, India

[2]Department of Chemical Engineering, IIT Guwahati,India

E-mail : ashraykumar.k.btechc15@ahduni.edu.in

An electric double layer capacitor (EDLC) stores energy using the operating principle of an electric double-layer formed at the interface between an electrolyte and electrode. The EDLC has the extremely high cycle durability and high power density as compared with secondary batteries such as a lithium ion or a nickel metal hydride cell performance of the EDLC cell is mainly determined by the combination of the electrode material and the electrolyte. To increase the energy of EDLC, researchers have been exploring new material of electrode and mixture of electrolyte. Ionic liquids (ILs) as a electrolyte can provide a broad range of opportunities for fabricating high-energy supercapacitors owing to their wide stable potential windows, flexibility in design, long life cycle and ionic properties. In this work, 1-Butyl-4-methylpyridinium tetraflouroborate was studied. 1-Butyl-4-methylpyridinium tetraflouroborate and acetonitrile (3 : 1 wt%) is used as electrolyte. Three electrode system was used to determine the electrochemical properties. Working electrode is reduced graphene, counter electrode is platinum and Ag/Ag+ is used as reference electrode. Galvanometric Charge Discharge, Cyclic Voltametry(CV) and Electrochemical Impedance Spectroscopy were performed using potentiostate. CV was performed at various scan rates (20,10, 5, 3 mV/s). From CV 2.2 V (-1.7 V to 0.5 V) operating voltage window is obtained. 73.10 F/g specific capacitance is obtained at 0.3 A/g. Energy density and Power density are 49.19 Wh/kg and 0.35 W/kg respectivily.

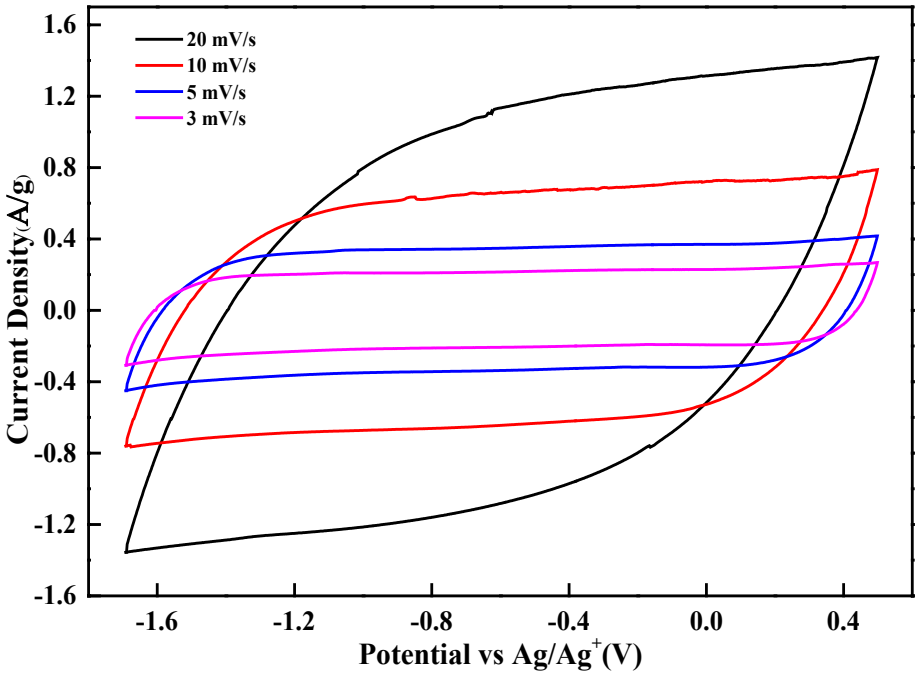


Figure :CV of [BMPy][BF_4] in 25% ACN at different scan rates(mV/s)

Use of Coconut shell waste as activated carbon in removal of methylene blue dye: Kinetic, thermodynamic, and isotherm studies

Ashutosh Yadav, Ravi Kumar Sonwani, Ganesh Swain, Ram Sharan Singh, Birendra Nath Rai*

Department of Chemical Engineering and Technology IIT (BHU), Varanasi 221005, UP, India

Contact's author- Ashutosh Yadav;ashutoshyadav.che17@itbhu.ac.in; 7499497924

The industrial effluents contain methylene blue dye as one of the most toxic dye which are carcinogenic and concern for the environmentalist. It has very adverse effect on human health and aquatic life. It is mainly used on bast (soft vegetable fibres such as jute, flax, and hemp) and to a lesser extent on paper, leather, and mordanted cotton and textile industries discharge effluent that contain methylene blue dye with different concentrations. The treatment of methylene blue dye using cost effective technique is challenge to the environmentalist.

Coconut shell surface cleaned and dried in sunlight then shells were taken out and pulverized in a micro-pulverizing mill. The powder thus obtained was activated with H3PO4 (85%) in 3:1 ratio [H3PO4 volume (ml)/dried coconut powder mass (gm)] and carbonization of the sample in a "Split Tube Furnace Single Zone" reactor. The reactor was placed in a single zone tubular furnace and heated at a constant rate 13 °C/min and then held at carbonized temperature of 510°C for 1 hr under 300 ml/min N2 flow.

Batch adsorption experiments were performed to investigate the effects of dye concentration, adsorbent dose, pH, rate of agitation (rpm), time and temperature. The adsorption parameters studied were: pH (2-10), adsorbent dose (0.0005–0.003 g/50 mL), initial dye concentration (5-200mg/L), temperature (10–50°C), and time (.25-4hr), and incubator rpm (60-150).The samples were analyzed by SEM, EDX, FTIR, and BET. The UV-Vis spectrophotometer was used to measure the concentration of Cr (VI) in wastewater.

The experimental analysis and kinetic study showed that the activated carbon developed from coconut

shell is a promising activated carbon for removal of toxic dye.

Keywords: Activated carbon, H3PO4, Spilt tube furnace single zone.

References: Danish Mohammeda, Ahmad Tanweer, Shahnaz Majeed Shahnaz, Ahmad Mehraj, Ziyang Lou, Pin Zhou, S.M. Shakeel Iqubal. 2018. Use of banana trunk waste as activated carbon in scavenging methylene blue dye: Kinetic, thermodynamic, and isotherm studies. Sustainabilityhttps://www.sciencedirect.com/science/article/pii/S2589014X18300707

SYNTHESIS AND CHARACTERIZATION OF ALUMINA-ACTIVATED CARBON-PVC MEMBRANE

A. Devendra Kumar Gond[1] B. Shobhit Dixit[2] C. Prof. Vijay Laxmi Yadav [3]

[1] Department of Chemical Engineering & Technology, IIT BHU, India

E-mail: devendrakgond.che17@itbhu.ac.in

This paper explores the fabrication of high performing & low-cost membrane for oil removal. Samples of membrane were synthesized using alumina and activated carbon as a filler in the PVC matrix. This study examined the various effects of the alumina and activated carbon on the PVC matrix in improving the surface morphology of the membrane. The synthesized membrane was characterized using different characterization techniques such as SEM analysis, XRD analysis, FTIR analysis and contact angle measurement. Tensile strength and elongation at break (%) tests for membrane were also analyzed. The results showed that the PVC/activated carbon/alumina membrane would be a promising alternative for oil removal from surfactant stabilized oily waste water.

Keywords: Membrane, Oil removal, activated carbon, alumina, waste water, SEM, XRD, FTIR, Contact angle measurement.

References:

[1] Kayvani Fard, Ahmad, et al. “Novel Hybrid Ceramic/Carbon Membrane for Oil Removal.” Journal of Membrane Science, vol.559, no. April, ElsevierB.V., 2018, pp.42–53, doi:10.1016/j.memsci.2018.05.003.

[2] Ghazanfari, Davoud, et al. “Preparation and Characterization of Poly (Vinyl Chloride) (PVC) Based Membrane for Wastewater Treatment.” Journal of Water Process Engineering, vol. 16, Elsevier Ltd 2017, pp. 98–107, doi:10.1016/j.jwpe.2016.12.001.

EXTRACTION OF CAPSAICIN FROM BHUT JOLOKIA USING SOLVENT EXTRACTION AND MICROWAVE ASSISTED EXTRACTION

Ishita Saikia, Srikanya Mech,

Chemical Engineering, Assam Engineering College

The Ghost chilli or Bhut Jolokia is an interspecific hybrid chilli pepper cultivated in the states of Arunachal Pradesh, Assam, Nagaland and Manipur. It is a hybrid of Capsicum chinense and Capsicum frutescens and is closely related to the Naga Morich of Bangladesh. The ghost chilli is rated at more than 1 million Scoville heat units.The hot flavour of chillies is due to the presence of a group of seven closely related compounds called capsaicinoids .Capsaicin and several related compounds are called capsaicinoids and are produced as secondary metabolites by chilli peppers, probably as deterrents against certain mammals and fungi. Pure capsaicin is a hydrophobic, colourless, highly pungent and crystalline to waxy solid compound.
The aim of the present study was to determine the content of capsaicin in Bhut Jolokia samples collected from local markets in Assam. Extraction of capsaicin was done using both ethanol and acetone as solvents in the Soxhlet apparatus by Liquid-liquid extraction and also, using ethanol as a solvent in Microwave assisted extraction. At the end of the experiment, we have drawn the conclusion that Microwave Assisted Extraction is much more efficient as it requires less timing and also less solvent

S-S CROSSLINKED HYDROGELS: APPLICABILITY AS AN ARTIFICIAL VITREOUS

Mir Sahidul Ali *, Sachin Bhaladhare

Department of Chemical and Polymer Engineering, Tripura University,India

E-mail:* mir.sahidul@gmail.com

Significant advancements in development of responsive hydrogels have found many applications in biomedical and pharmaceutical fields. In current study, we have designed disulfide crosslinked hydrogels, capable of transition from solution to gel via redox reaction. This technique provides a premixed cross-linkable polymer solution containing biological substances to inject into potential cavities and forms a hydrogel network in-vivo conforming to different shapes, which may be difficult to prefabricate. Reversible cross-linker containing thiol groups (– SH) are easily transformed into disulfide bridges by air oxidation and thus form a gel in-situ. The pH and redox responsive hydrogels were prepared from poly [acrylamide-co-, methacrylic acid (MAA) by free radical polymerization using AIBN as an initiator and N, N'-bis (acrloyl)-cystamine (BAC) as cross-linker. The chemical structure of the hydrogels were confirmed by Fourier transform infrared (FTIR) spectroscopy, Nuclear magnetic resonance (NMR) spectroscopy and the morphology was observed under X-Ray diffraction (XRD), differential scanning calorimetry (DSC), scanning electron microscopy (SEM). The MAA groups in hydrogel network are pH sensitive which affects the swelling behaviour of the hydrogels. Disulfide containing hydrogels can be suitable artificial substitution of vitreous humour due to its redox sensivity.

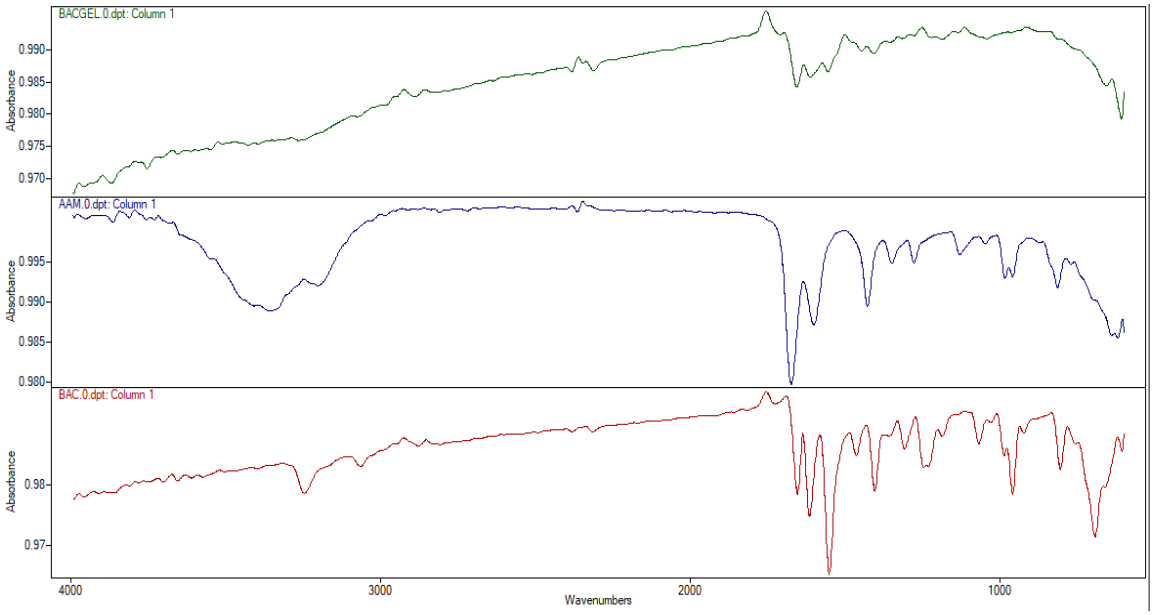


Fig.1: FTIR of AAm, BAC and Hydrogel

References:

1. Santhanam, S., Shui, Y. B., Struckhoff, J. J., Karakocak, B. B., Hamilton, P. D., Harocopos, G. J., & Ravi, N. (2018). Bioinspired Fibrillary Hydrogel with Controlled Swelling Behavior: Applicability as an Artificial Vitreous. ACS Applied Bio Materials (2018).

2. J Liang, J., Struckhoff, J. J., Du, H., Hamilton, P. D., & Ravi, N. (2017). Synthesis and characterization of in situ forming anionic hydrogel as vitreous substitutes. Journal of Biomedical Materials Research Part B: Applied Biomaterials (2017), 105(5), 977-988.

EXTRACTION OF BIOFUEL FROM WASTE BIOMASS

The present study focuses on the comparative assessment three different extraction strategies of biooil from Parthenium hysterophorous, Madhuca indica and Jatropha curcus. Parthenium hysterophorous world's seven most devastating and hazardous weeds and is abundantly available in severable parts of the world.This study treats the subject of effective utilization of this waste biomass(with a cellulose content of 45.2+1.81% w/w) for biofuel production. Madhuca indica is a non-edible source used for extraction of bio-oil. The suitable solvent ratios for extraction were compared among diethylether: ethanol, chloroform: methanol, chloroform: ethanol, isopropanol, methanol in the proportions 3:1,2:2 and 1:3 respectively. Experimental runs provided high biooil yield at temperature 500C and contact time 20 min. The extraction process was observed under the influence of an ultrasonic bath. The maximum bio-oil yield of 82% was obtained under the optimum conditions of temperature.

Jatropha curcas is a species of flowering plant in the spurge family. The extraction was investigated using a lab-scale hydraulic press.A quadratic polynomial model was generated to predict oil recovery and was found to cover 98% of the range for the factors studied,namely 10-20MPa applied pressure,60-900C pressing temperature and 3-5%(w.b.) moisture content.

SYNTHESIS OF XYLAN-B-CYCLODEXTRIN BASED HYDROGELS FOR DRUG DELIVERY APPLICATIONS

Pratik Gami1, Debashis Kundu2andTamal Banerjee2

1School of Engineering and Applied Science, Ahmedabad University, India

2Department ofChemical Engineering, IIT Guwahati, India

E-mail:pratikgami257@gmail.com

Xylan, belongs to the hemicellulose family, is a heteropolysaccaride consisting of pentoses and hexoses. It consists of 80-200 β-xylopyranose residues as backbone which are connected by β-(1→4) glycosydic bonds. β-Cyclodextrin (βCD) is a toroid shaped oligosaccharide with 7 D-glucose units covalently connected by α-1, 4-glucosidic linkages. This structural formation makes the exterior of βCD hydrophilic and interior as hydrophobic. Herein, we have prepared xylan-βCD based hydrogels using cross linking copolymerization method in different molar ratio of xylan to βCD. The cross linking was performed at 50 ℃ in alkaline medium using Ethylene glycol diglycidyl ether. The chemical structure was characterized by Fourier-transform infrared spectroscopy and rheology. Morphology of the gels were obtained by optical microscopy and field emission scanning electron microscope and physical characteristics of the hydrogels were studied by swelling study and gel fraction. Xylan based hydrogel has proved to have good biocompatibility, biodegradability and non-toxicity which make them promising in drug delivery system.

Presentation Title: BiofuelsFrom Marginal Lands: A Rural Solution To The Sustainable Future Of India

Researcher: Shreya Chowdhury

Research focus: Utilizing marginal and degraded lands to produce sustainable and cheap energy source.

School: Indian Institute of Technology (BHU), Varanasi

Student Level: M.Tech in Chemical Engineering

Presentation Type: Paper Presentation

The current share of bioenergy production is not sufficient to meet the present and future energy demands of India. Therefore, there is an immediate need to maximize its production. Since there is a growing demand of food to feed the rapidly growing population, food security has become a national priority in India. The country/government cannot afford to use aerable land for bioenergy production. Hence, we propose a sustainable intensification of bioenergy production from degraded and marginal lands as the most viable option. The rural population of India suffers due to 147.75 mha degraded area wherein 6.41 mha is confined to waterlogging problems. Here the potential energy crops could be exploited depending on their techno-economic viability. This paper focuses on the study of using marginal and degraded land with the appropriate energy crops having high calorific value which can be further processed into solid fuel by briquetting (from the agro-waste), converted into biofuel (bioethanol, biodiesel) or utilized as biochar (low cost industrial adsorbent and also for soil carbon sequestration).The briquetting has resulted in a solid fuel with a calorific value 14-19MJKg-1. The Biofuel Policy of India set an indicative target of 20% blending of both bioethanol and biodiesel with production limited to wasteland and marginal lands. Bio-briquettes form the most economical, ecological fuel with an

upcoming use in bio-gasifiers for thermal application and electricity generation. This proposition aims to offer a sustainable solution to meet our energy requirements, providing local employment to the rural people so that they remain connected to their roots and the wide and judicious use of degraded and marginal lands can play a vital role in solving the conflicts between food vs. energy production. Moreover, this opens up additional avenue for entrepreneurial opportunities in adapting the technology to suit the local conditions.

Keywords: bioenergy, marginal lands, briquette, biofuel, agro-waste, rural, sustainable.

Abstract

Effluents from textile industry are strongly colored, and contained large amount of dissolved and suspended solids (Lu et al., 2009). Above the permissible limits, these effluents are classified as environmentally hazardous and toxic materials. Therefore, these effluents must be remediate before being discharge into the aquatic and terrestrial environment. Literature survey reveals that numbers of techniques such as coagulation, adsorption, ozonation and membrane filtration, have been used to treatment of textile effluents (Roy et al., 2018). Textile effluent wastewater was collected from the Bhadohi industrial area and stored to 4°C for further characterizations and treatment. The most effective bacterial species were isolated from the dye contaminated soil sample and used in the treatment process. The main objective of this study is to develop a novel integrated system for the treatment of real complex textile effluents. The colour, COD, BOD, TSS, TDS, nitrate and phosphate were analysed before and after treatment.

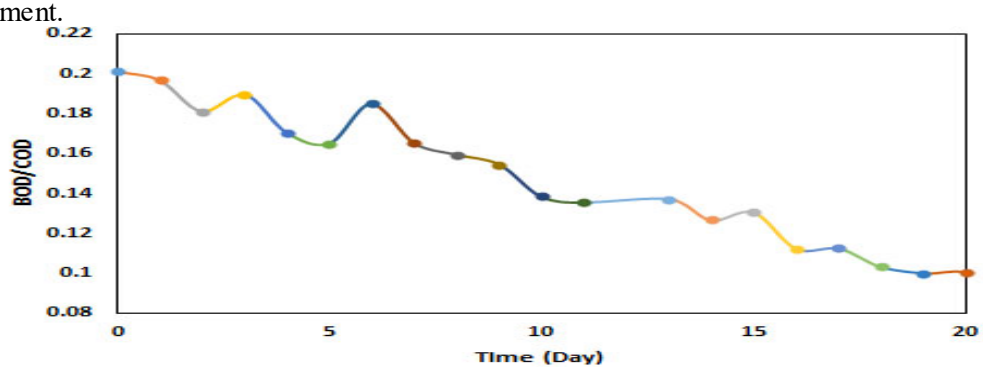


Fig. 1. The change of BOD/COD with time during aerobic treatment of textile effluent.

[1] Lu, X., Yang, B., Chen, J., & Sun, R. (2009). Treatment of wastewater containing azo dye reactive brilliant red X-3B using sequential ozonation and upflow biological aerated filter process. Journal of Hazardous Materials, 161(1), 241-245.

PREPARATION AND CHARACTERISATION OF ACTIVATED CARBON FROM DESSICATED COCONUT RESIDUE

Sunanda P Meena1, Prof S.N Upadhyay 2and Prof P. K Mishra1

1Department of Chemical Engineering and Technology, IIT BHU,India

E-mail:sunandapmeena.che17@gmail.com

This study investigates the effect of temperature and impregnation ratio on the physicochemical properties of activated carbon prepared from desiccated coconut residue by chemical activation using

potassium chloride. Desiccated coconut residue sample was first carbonized at two different temperatures for 1 h at 400 and 600 °C, respectively. The resulting chars were impregnated with KCl at three different impregnation ratio; 1:1, 1:2 and 1:3, respectively and activated under nitrogen atmosphere for 1 h at three different temperatures based on its carbonization temperature. The effect on BET surface area and pore volume was studied

HIGHLY EFFICIENT VISIBLE-LIGHT DRIVEN PHOTOCATALYTIC HYDROGEN PRODUCTION USING METAL CHALCOGENIDES

Sundar Rathod , Nishan N Poojary, Akhil Pavadad

M S Ramaiah Institute of Technology , Bangalore-560054

Corresponding author :ssrathod321@gmail.com

The production of clean and renewable hydrogen through water-splitting reaction using photocatalysts has received much attention due the increase in global energy crises. Hydrogen is a promising fuel and a potential significant alternative to non-renewable fossil fuels as a clean energy for the future. In this study a high efficiency of photocatalytic hydrogen production is possible using metal chalcogenides that is cadmium sulphide clustered with graphene oxide used as a photocatalyst . Cadmium sulphide is clustered with graphene oxide to enhance the hydrogen production . This catalyst was prepared by hydrothermal method. The catalyst used in the reaction is converted into a magnetic composite for the ease of separation of catalyst from the water. The spent catalyst is later removed using the principle of magnetic separation. Thus water obtained at the end of the process is free from cadmium impurities. This work highlights the potential application of cadmium sulphide in the production of hydrogen.

Keywords : Metal chalcogenides, GO-CdS, Hydrogen production.

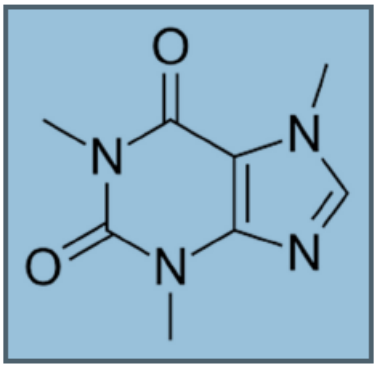
EXTRACTION OF CAFFEINE FROM TEA WASTE

A. Amlan Jyoti Hazarika and B. Nishan Choudhury

Department of Chemical Engineering, Assam Engineering College, Guwahati

E-mail: amlanedu@gmail.com

The present study focuses on the extraction part of caffeine from tea waste through solid-liquid extraction method and its purification. Caffeine (1, 3, 7-trimethylxanthine), with chemical formula (C8 H10 N4 O2). It is a widespread naturally occurring xanthine derivative found in a variety of plants but commonly found in coffee beans and tea leaves. This experiment was conducted to estimate the total amount of caffeine in used tea leaves of black tea, red tea, green tea and white tea and characterization of the caffeine so achieved was done using UV spectroscopy.



Caffeine

Caffeine was initially cooked in water in presence of lime and isolated from tea waste with solid-liquid extraction which was performed in a batch reactor and ethyl acetate is used as a raffinate during the extraction process. Later on decantation and washing was done with hexane followed by activated charcoal for removal of colour and other waxy undesired components.
In the final step the solution so obtained is crystallized with the help of an ice bath. In the ice bath the solution is suddenly cooled; due to the lowering of the temperature the solubility of caffeine decreases and it crystallizes. Centrifuge is used to separate the mixture of crystals of caffeine and the water at a much lower temperature. And after drying, solid white crystals of caffeine is recovered.
Data:

Parameters	Net content
Moisture content	10.74%
Ash content	10.6%
Bulk density	0.2709 (g/cc)
Caffeine content	3-4%

UV spectroscopy data:

Stages	Wavelength	Absorbance
1	272.07	0.3437

A total of 88% of the total caffeine present in the tea waste were extracted by this method.

A COMPREHENSIVE REVIEW OF NATURAL GAS HYDRATE INHIBITION

Ankur Singh, Ajay Suri

Department of Petroleum Engineering, IIT-ISM Dhanbad, India

Ankursingh.pe@gmail.com

Objectives
Gas hydrates are crystalline compounds made up of water and gas at high pressure and low temperature. Subsea and permafrost region pipelines favor such pressure and temperature conditions for hydrate formation. Unless complete dehydration is performed or inhibitors are used, gas hydrates are expected in subsea pipelines. Since complete dehydration is not possible, the most functional & practical solution

is use of hydrate inhibitors .The objective of this paper is to review entire literature about gas hydrate inhibition to comprehend existing techniques & latest development in hydrate inhibition technology, which would work as a guide to further develop this potentially interesting and important area of research.

Process

Literature about types of inhibitors used & their performance/cost efficiency along with their working mechanism & other details was reviewed from more than 200 published papers of various journals like journal of chemical engineering science, energy & fuels, SPE, journal of engineering chemistry, industrial & engineering chemistry research, fluid phase equilibria, American institute of chemical engineers, Journal of natural gas science and engineering & many others.

Results

Traditionally, prevention of hydrate formation has been achieved with addition of thermodynamic inhibitors, commonly methanol or glycols. These inhibitors have the ability to shift hydrate equilibrium curves toward higher pressures and lower temperatures by lowering the activity of water molecules. However, in last two decades, economic and environmental factors have motivated research and development to identify new inhibitors like low dosage hydrate inhibitors (LDHI) for cost effectiveness & for environment friendliness. LDHI are divided into 2 class kinetic hydrate inhibitors (KHI) & Anti Agglomerates (AA). There are three ways to prevent hydrate plug formation: (i) prevent hydrate crystal nucleation, (ii) prevent hydrate growth (iii) prevent agglomeration of hydrate crystals. KHIs act as anti-nucleators & also delay hydrate growth. AAs prevent Hydrate crystals from agglomerating. A KHI polymer has a hydrophobic & a hydrophilic part. Hydrophobic part is the backbone carbon structure (alkyl) while hydrophilic part is the incorporated functional group which is amide in most polymers. High molecular weight Polymer prevents hydrate crystal growth. But very high percentage of high molecular weight groups makes the polymer water-insoluble. Low molecular weight polymer performs better for gas hydrate nucleation inhibition. Controlling both nucleation stage and crystal growth stage gives the best results.

New findings

Several new LDHI being developed are based on different polymers, ionic liquids & organic substances like fish oil & plants, which are reliable performers as well as environment friendly. A plethora of new research is based on synergetic performance between these chemicals. This work will leads to search for new & better combinations of Polymers, Ionic Liquids and synergents that can prevent the pugging of natural gas pipelines by preventing or delaying hydrate formation.

Pretreatment and Characterization of E-glass and Natural Fiber reinforced Polypropylene and PVC composites for insulation and corrosion resistant applications

Binita Joshi1 Vijay Laxmi Yadav2

1 Department of Chemical Engineering & Technology, IIT BHU, Varanasi, India

E-mail: binitajoshi.che17@itbhu.ac.in

Polymer matrix with fiber reinforcement are finding wide use due to their lightweight, reasonable strength and stiffness. In this study, jute-coir-glass fiber reinforced polypropylene and palm-glass-jute reinforced PVC composites specimen blended with cross linkers of different composition is developed.With the increase of plasticizers and cross- linkers, water uptake at equilibrium decreases.The composites were fabricated using hand-layup technique and characterized with respect to their physical and mechanical properties.

Chemical treatments were considered in modifying the fiber surface properties. Surface treatment such as alkali, silane, permanganate treatments were studied. Fiber required for fabrication was pretreated with 9.1%(w/v) NaOH aqueous solution at 40 ℃ with varying time interval for different fiber. It was

observed that the hybrid composite showed excellent resistant to chemicals and the tensile strength of alkali treated composite was also enhanced. The final specimen was hot pressed at 30 to 60 KPa and at suitable temperature.
Experiments were carried out to examine the effect of fiber aspect ratio on the physical and mechanical behaviour of the composites. Thermal and morphological properties of composite were also discussed. Tensile test was conducted using universal testing machine as per ASTM standards. The preferred orientation and degree of crystallinity analysis was done using X-ray diffraction technique and surface topography and composition analysis via scanning electron microscopy. The work extended to study other fiber-epoxy-hardener polymeric matrix system and several mechanical properties such as flexural strength , impact and chemical resistance.

Keywords: Natural Fibers, Composite, coir, jute, palm, PVC, Polypropylene, Hand layup, impact

References

[1] (Velu and Srinivasan)Sanjay, M. R., et al. “Applications of Natural Fibers and Its Composites:

An Overview.” Natural Resources, vol. 07, no. 03, 2016, doi:10.4236/nr.2016.73011.

[2] Sanjay et al.)“Glass-Jute Fiber Reinforced Epoxy Composites.” International Journal of Science and

Research (IJSR), vol. 4, no. 4, 2015.

[3] Mohammad A Torabizadeh. Tensile, compressive and shear properties of unidirectional glass/epoxy composites subjected to mechanical loading and low temperature services. Indian journal of engineering

STUDY OF THERMAL BEHAVIOUR AND PRODUCT CHARACTERIZATION OF ALMOND SHELL PYROLYSIS FOR

BIOENERGY GENERATION

Neha Shukla,Goutam Kishore Gupta,Monoj Kumar Mondal

Indian Institute of Technology,Banaras Hindu University,221005,India

Email:nehashukla.che17itbhu.ac.in

Energy from biomass now is being considered as future renewable fuel and thus in this study almond shell (AS) was pyrolysed for the production of biofuels (bio-oil, bio char and pyrolytic gas). Thermal degradation characteristics of AS by TGA revealed the abundance of volatile matter and thus pyrolysis experiments were performed in the temperature range of 300 to 700 °C in a packed bed reactor system under continuous current of nitrogen. Bio-oil yield increase with temperature, whereas biochar yield decreased continuously. Physicochemical properties (appearance, viscosity, density, carbon residue, pH and HHV) of bio-oil were determined whereas the chemical properties were inspected by FTIR and GC-MS. Proximate, ultimate, HHV, FTIR, SEM-EDX, BET surface area and XRD analysis was used for the bio char characterization. Non-condensable gases evolving out from the outlet were analysed by gas chromatography and amount of H2, CH4, CO and CO2 were determined. According to above results bio-oil can be upgraded to be utilized as biofuel or it can be a source of valuable chemicals, bio char can serve triple purpose as efficient solid fuel, in soil amendment or in waste water treatment as it has very high BET surface area. Pyrolytic gases have significant amount of methane, hydrogen and carbon monoxide that grants excellent combustion properties.
Keywords: Almond shell; pyrolysis; biofuel; bio-energy.

PROBLEM OF WELLBORE STABILITY DURING DRILLING AND PRODUCTION OF NATURAL GAS HYDRATES

Sugat.Srivastava1 , Akshaya Kumar Mishra1 1

Department of Petroleum Engineering, IIT (ISM) Dhanbad, India

E-mail: sugat19@gmail.com anshuakshaya@gmail.com

India is the world's fourth-biggest importer of Liquified Natural Gas (LNG). Domestic LNG demand is expected to grow at a CAGR of 16.89 percent to 306.54 MMSCMD by 2021 from 64 MMSCMD in 2015 (1). In 2006, it was estimated that India is blessed with around 933 trillion cubic feet of Natural gas Hydrates (2). These reserves can suffice India's need for energy for many decades to come.

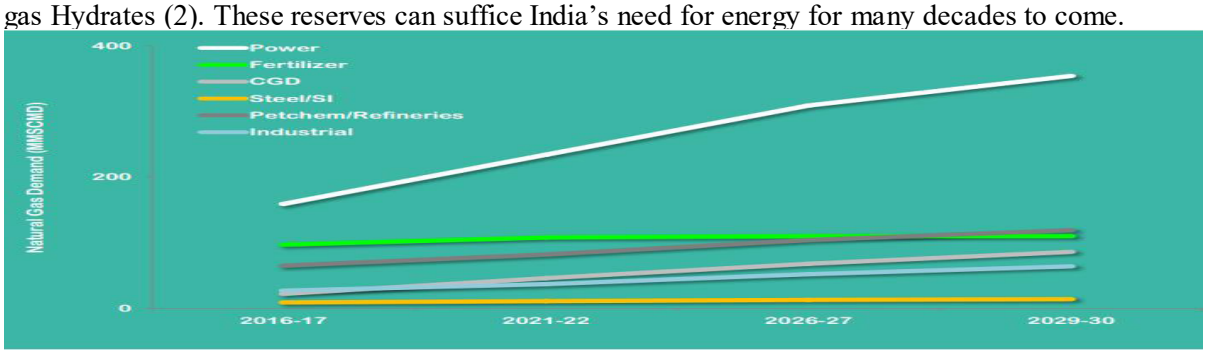


Figure 1 1 End Consumer Industry Wise Demand of Natural Gas in India Till 2030 (in MMSCMD) (5).
The extraction methods for methane gas hydrates are divided into four categories: Thermal Excitation, Depressurization, Chemical Reagent and Gas Displacement. Each of these techniques has its own flaws. The thermal excitation method loses a lot of heat and is inefficient. The depressurization technique has low cost and doesn't need continuous excitation but, it has a low action rate and low efficiency, requiring a high reservoir temperature (3). The chemical reagent method requires low initial energy input levels and has simple and feasible operation, but it is expensive and chances are high that it would corrode the equipment. The Gas Displacement method is based on the exchange process taking place when methane hydrate is introduced to the more thermodynamically stable guest molecule carbon dioxide. Sequestration of CO2 in hydrate follows as an added benefit to released methane gas (4). The method is still not much developed.
The challenges concerning these methods are not only water and sand production but also a potential loss of geo-mechanical stability, which may cause subsidence and landslides (4). Drilling through hydrate-bearing sediments is an uphill task. This requires huge alteration in drilling mud and cement properties. There are chances of dissociation and formation collapse during completion also.
This paper would discuss the problems associated with drilling and production of Natural Gas Hydrates and their possible solutions based on the published field studies of different reservoirs around the world.

References

1. Media Reports, Press Releases, Press Information Bureau, Ministry of Petroleum and Natural Gas, Union Budget 2016-17.

2. Vaid M., India's Gas Hydrates, Oil and Gas Financial Journal, Feb. 20, 2017

3. Y. Ye and C. Liu (eds), Natural Gas Hydrates: Experimental Techniques and Their Applications, Springer Geophysics, DOI: 10.1007/978-3-642-31101-7_11.

4. Haheim T.H., Impact of Temperature on CH4-CO2 Exchange Rate in Hydrate Bearing Sandstones. Master's Thesis in Reservoir Physics, Department of Physics and Technology, University of Bergen, Norway.

5. Collett T.S., Riedel M, Cochran J., Boswell R., et.al. Geologic Controls on the Occurrence of Gas

Hydrates in the Indian Continental Margin: Results of the Indian National Gas Hydrate Program (NGHP) Expedition 01. 2008.

Three Sequential C□N Bond Formation: tert-Butyl Nitrite as a N1 Synthon in a Three Component Reaction Leading to Imidazo[1,2-a]quinolines / Imidazo[2,1-a]isoquinolines

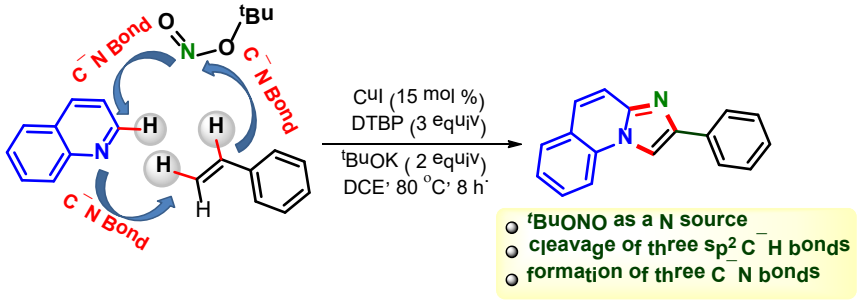
Amitava Rakshit, Prasenjit Sau, Anju Modi, Ahalya Behera and Bhisma K. Patel*

Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati-781039, India

Fax: (+91)361-26909762.

E-mail: amitavarakshit93@iitg.ac.in

Tert-Butyl nitrite serves the dual role of an oxidant as well as a N1 synthon in a multi-component reaction involving quinolines/isoquinolines and styrenes. Herein two sp2 C□H's functionalization of styrenes and one of quinolines/isoquinolines leads to the formation of fused quinolines/isoquinolines via three sequential C□N bond formation.



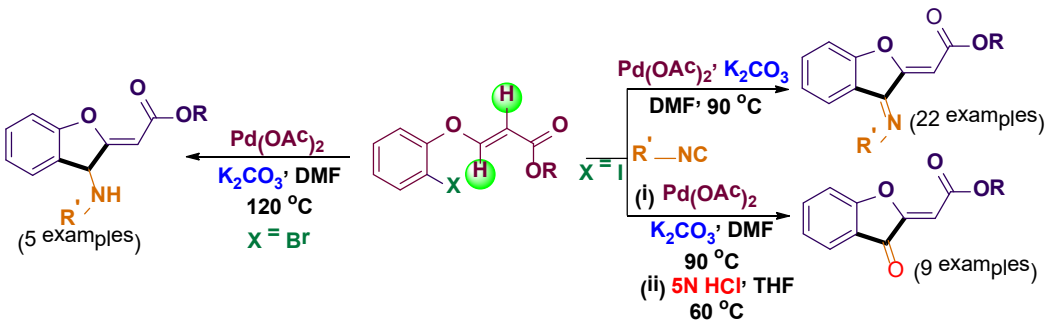
Graphical abstract of the three Component Reaction Leading to Imidazo[1,2-a]quinolines

Palladium-Catalyzed Cascade Reaction of Isocyanides with 2-Iodophenoxy acrylate: Synthesis of Benzofuran Derivatives

Anjali Dahiya Wajid Ali, and Bhisma K Patel

Department of Chemistry, IIT Guwahati, India

E-mail: wajid@iitg.ernet.in



Aurone and dihydrobenzofuran are important building blocks in organic synthesis and also key structural motif of numerous natural products with biological activities. Aurones have been described as antifungal agents, as inhibitors of tyrosinase and as antioxidants. Numerous efforts have been reported for the synthesis of dihydrobenzofuran skeleton including intramolecular Friedel-Craft reaction and Wittig reaction. However, there is only on precedence for the synthesis of benzofuran derivative using

isocyanide as C1 building blocks. Migratory insertions of isonitrile and carbon monoxide during palladium catalyzed reactions have appeared as powerful methods for the preparation of carbo and heterocyclic products. Herein, we wish to report the synthesis of 2,3-disubstituted benzofuran and aurones via palladium catalyzed isocyanides insertion reaction with 2-iodophenoxy acrylate.

References:

Zwergel, C.; Gaascht, F.; Valente, S.; Diederich, M.; Bagrel, D.; Kirsch, G.; Aurones: Interesting Natural and Synthetic Compounds with Emerging Biological Potential, NPC, 2012, 7, 389

Senadi, G. C.; Hu, W.-P.; Boominathan, S. S. K.; Wang, J.-J. Chem. Eur. J. 2015, 21, 998.

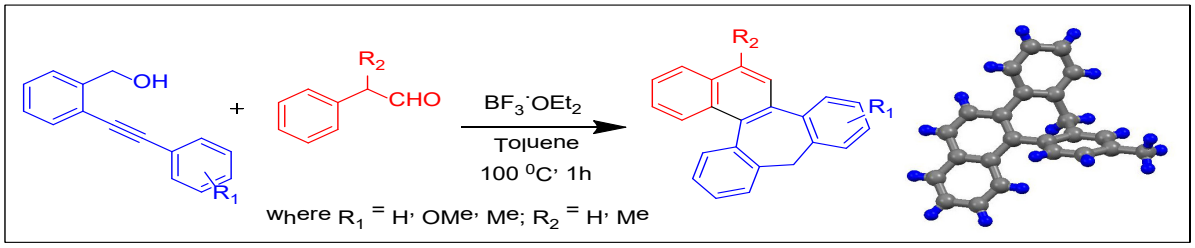
Synthesis of 9H-dibenzo[3,4:6,7]cyclohepta[1,2-a]naphthalene via tandem Diels-Alder and Friedel-Crafts Reaction

Archana K. Sahu, Anil K. Saikia*

Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati 781039, Assam, India

Email- asaikia@iitg.ac.in

9H-dibenzo[3,4:6,7]cyclohepta[1,2-a]naphthalenes belong to the class of poly aromatic hydrocarbons in which a naphthalene core unit is fused to 10,11-dihydro-5H-dibenzo[a,d][7]annulene. These molecules don't possess any plane of symmetry, hence are chiral and optically active as well. We have developed a new strategy for synthesis of 9H-dibenzo[3,4:6,7]cyclohepta[1,2-a]naphthalene from o-alkynyl benzyl alcohol using Lewis acid via tandem Diels-Alder and Friedel Crafts reactions.



References

[1] Saikia, A. K.; Ghosh, P.; Deka, M. J.; Borah, M. RSC Adv., 2016, 6, 106656–10666.

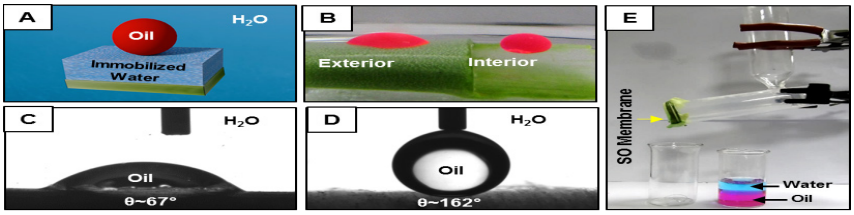
[2] Otani, T.; Ueki, K.; Cho, K.; Kanai, K.; Tatenob, K.; Saito, T. Chem. Commun., 2015, 51, 7895-7898.

Aloe Vera Gel derived Highly Durable and Stretchable Underwater Superoleophobic Membrane

Arpita Shome, Uttam Manna*

Department of Chemistry Indian Institute of Technology-Guwahati, Kamrup, Assam-781039, India

umanna@iitg.ernet.in



ıematic illustration of oil wettability on immobilized-aqueous phase under water. Digital image (B) ngle images (C, D) of beaded oil droplet on exterior (C) and interior (D) of Aloe Vera leaf under water. (E) Oil water separation using Superoleophobic membrane.

Bio-mimicked artificial underwater superoleophobic interfaces inspired from fish scale, seaweed and clam's shell have been developed in the past mostly through synthetic hydrogel, metal oxide and electrostatic multilayers deposition approaches.1-4 However, these biomimicked interfaces have durability issues in practically relevant conditions. In this report, aloe vera leaf which consists of a thick mucilage containing a large amount (˜99%) of water was discovered to be inherently capable of displaying durable underwater nonadhesive superoleophobicity with advancing oil contact angle above 160° and contact angle hysteresis below 10°. This nature-inspired wettability remains unperturbed even after prolonged (30 days) exposure to extremes of pH, high salinity, river water, surfactant water, liquid nitrogen (-196°C), boiling water (100°C). This naturally abundant mucilage was strategically exploited to generate catalyst-free chemically reactive crosslinking chemistry for developing highly stretchable and durable underwater superoleophobic coating that could sustain physical abrasions i.e., 150% deformation, scratch test, sand paper abrasion and chemically harsh aqueous conditions for 30 days. The stretchable and biomimicked membrane was exploited for separating both heavy and light oils following gravity-driven selective filtration processes. Oils of different viscosities were successfully (above 97% efficiency) and repetitively separated through this Aloe Vera mucilage derived fish scale-mimicked membrane—in different practically relevant and challenging circumstances.

References

[1] M. J. Liu, S. T. Wang, Z. X. Wei, Y. L. Song and L. Jiang, Adv. Mater. 2009, 21, 665.

[2] Y. Cai, Q. Lu, X. Guo, S. Wang, J. Qiao and L. Jiang, Adv. Mater. 2015, 27, 4162.

[3] L. Lin, M. J. Liu, L. Chen, P. P. Chen, J. Ma, D. Han and L. Jiang, Adv. Mater. 2010,22, 4826.

[4] F. Zhang, W. B. Zhang, Z. Shi, D. Wang, J. Jin and L. Jiang, Adv. Mater. 2013, 25, 4192.

Development of Sensors Based on π-Conjugated System for Highly Sensitive and Selective Detection of Nitroexplosive-Picric Acid

Arvin Sain Tanwar1, Akhtar Hussain Malik1 and Parameswar Krishnan Iyer1,2

1 Department of Chemistry, IIT Guwahati, India

2 Centre for Nanotechnology, IIT Guwahati, India

E-mail: pki@iitg.ernet.in

Selective types of π-conjugated polymers were designed, synthesised and further utilized in attaining simple, low cost and portable optical/electrical sensors capable of monitoring nitroexplosive-Picric acid (PA) at ultra-trace level. The conjugated polymer PFAM showed rapid and specific recognition toward PA on solid support and in solution based on IFE/PET mechanism. The non-fluorescent cationic conjugated polymer PPPy participates in indicator displacement assay resulting turn-on fluorescence selectively in presence of PA. The cationic conjugated polymer nanoparticle PFMI displayed remarkable fluorescence response towards PA in solution and vapour phase via two terminal electronic device based on RET/PET mechanism. The cationic conjugated polymer PFBT displayed substantial fluorescence quenching for PA in solution as well as solid state based on IFE and RET mechanism and utilised economical paper strips for on-site detection of nitroexplosive.

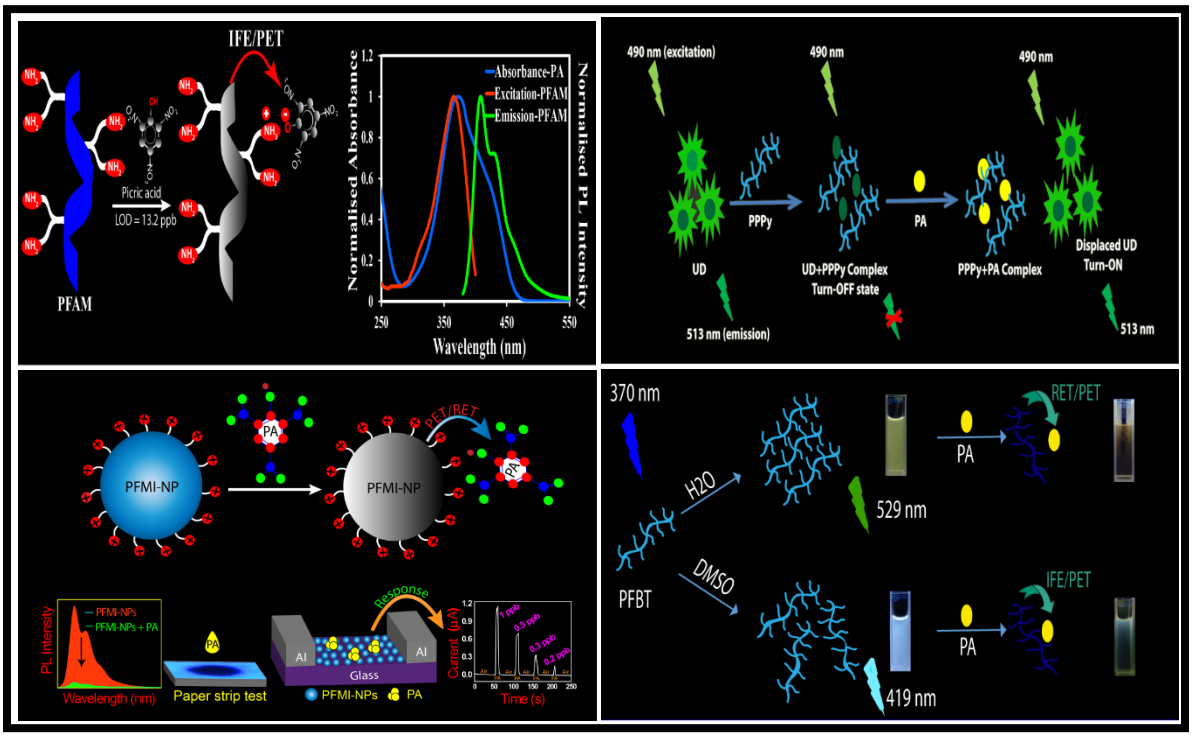


Figure1. Graphical Representation of picric acid detection by polymer (a) PMI, (b) PFMI, (c) PFAM and (d) PFTP.

References.

1. Malik, A. H.; Hussain, S.; Kalita, A.; Iyer, P. K. Conjugated Polymer Nanoparticles for the Amplified Detection of Nitro-explosive

Picric Acid on Multiple Platforms. ACS Appl. Mater. Interfaces 2015, 7, 26968−26976.

2. Tanwar, A. S.; Hussain, S.; Malik, A. H.; Afroz, M. A.; Iyer, P. K. Inner Filter Effect Based Selective

Detection of Nitroexplosive-Picric

Acid in Aqueous Solution and Solid Support Using Conjugated Polymer. ACS Sens. 2016, 1, 1070−1077

3. Tanwar, A. S.; Iyer, P. K. Fluorescence “Turn-On” Indicator Displacement Assay-Based Sensing of Nitroexplosive 2,4,6-Trinitrophenol in Aqueous Media via a Polyelectrolyte and Dye Complex. ACS Omega, 2017, 2, 4424–4430.

4. Tanwar, A. S.; Adil, L. R.; Afroz, M. A.; Iyer, P. K. Inner Filter Effect and Resonance Energy Transfer Based Attogram Level Detection of Nitroexplosive-Picric acid Using Dual Emitting Cationic Conjugated Polyfluorene. ACS Sensors 2018, 3, 1451-1461.

5. Tanwar, A. S.; Patidar, S.; Ahirwar, S.; Dehingia. S.: Iyer, P. K. “Receptor Free” Inner Filter Effect Based Universal Sensor for Nitroexplosive-Picric Acid Using Two Polyfluorenes Derivatives in Solution and Solid State and IFE Corrections. Analyst 2019, 144, 669-676.

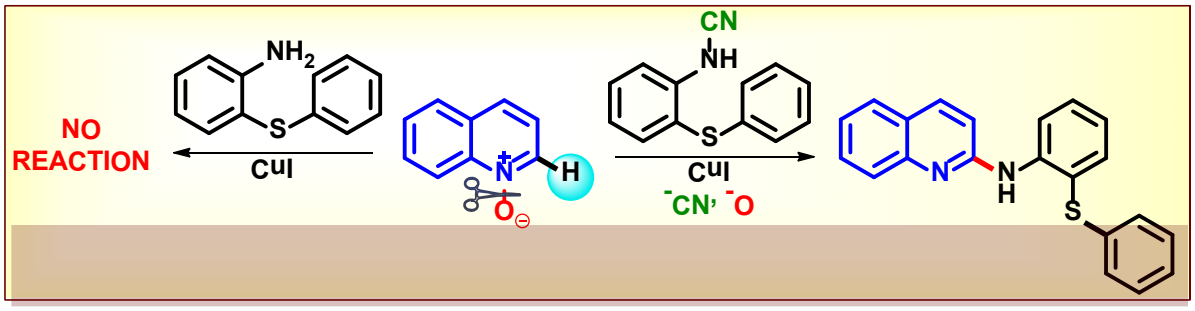
Cyano Sacrificial (Arylthio)-arylamination of Quinoline and Isoquinoline N-Oxides using N-(2-(Arylthio)aryl)cyanamides

Ashish Kumar Sahoo, Ahalya Behera, Prasenjit Sau, and Bhisma K. Patel*

Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati-781039, India

E-mail: kumar176122106@iitg.ac.in

A copper(I) catalyzed regioselective arylthio-arylamination of quinoline and isoquinoline N-oxides have been achieved at the expense of a cyano (-CN) group from N-(2-(arylthio)aryl)cyanamides. This reductive amination proceeds in one pot at 80 □C in the absence of any additives. This is a unique illustration of aryl cyanamides serving as arylaminating agents on quinoline/isoquinoline N-oxides with concurrent auto-reduction of N-oxide.



Hierarchical SrTiO3 microspheres as Photovoltaic Boosters

Avishek Banik, Mohammad Qureshi*

Department of Chemistry, Indian Institute of Technology Guwahati-781039, Assam

(E-mail-a.banik@iitg.ac.in)

Inadequate utilization of higher wavelength photons for small sized (~ 20-30 nm) ZnO nanoparticle as well as contending and thermodynamically favourable back-transfer reactions occurring at the hetero-interfaces remains the bottle neck to good efficacy value.[1, 2] The light harvesting effects along with the energy barrier properties in dye sensitized solar cells (DSSCs) have been studied by utilizing an easily synthesizable and cost-effective nanocube assembled micron-sized SrTiO3 (STO NCMS) in a binary hybrid photoanode with ZnO nanoparticles. An optimized photoanode loaded with 3% STO NCMS yielded a ~2-fold increment in power conversion efficiency compared to pristine ZnO NP based device.[3] Improved performance of photoanode with hybrid composite scaffold can be accredited to the boosted optical response in conjunction with impeded reverse tunneling probability of STO NCMS containing photoanode. Light scattering properties were evaluated using UV-Vis DRS and electrochemical impedance analysis unveiled that incorporation of STO NCMS can effectively prolong the lifetime of photo-injected electrons (τe) indicating an impeded reverse tunneling probability of photoinjected electrons.

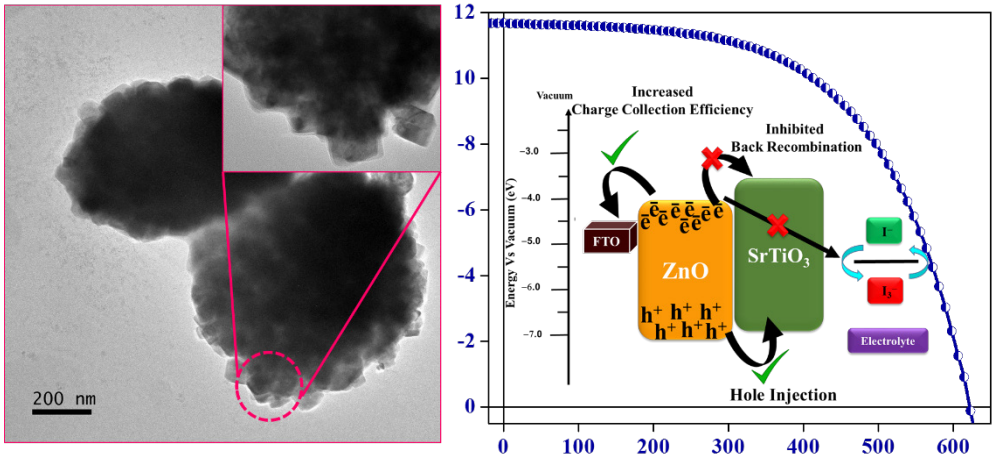


Figure 1. TEM image of $SrTiO_3$ and schematic of charge transfers

References

[1] M. Gratzel, Nature 2001, 414, 338.

[2] B. E. Hardin, H. J. Snaith, M. D. McGehee, Nat. Photonics, 2012, 6, 162.

[3] A. Banik, M. S. Ansari, S. Alam, M. Qureshi, J. Phys. Chem. C, 2018, 122, 16550.

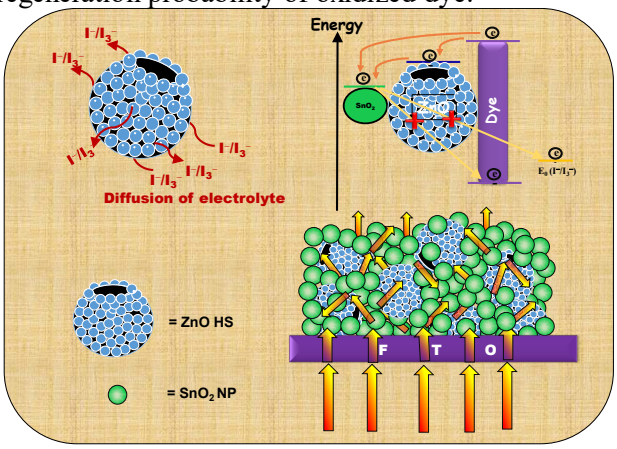
Nano-amassed ZnO Microspheres as a Synergy Booster for SnO2 based Dye-sensitized solar cell

Avishek Banik, Mohammad Shaad Ansari, Mohammad Qureshi*

Department of Chemistry, Indian Institute of Technology Guwahati-781039, Assam

(E-mail-a.banik@iitg.ac.in)

Finding the materials characteristic, satisfying most of the photovoltaic conditions are difficult. To the contrary, utilization of foreign materials, which can contribute to light harvesting, and charge transfers in the devices are now desirable/ thought-provoking.[1] Herein, a binary hybrid photoanode utilizing nano-amassed micron sized mesoporous zinc oxide hollow spheres (meso-ZnO HS) in conjunction with SnO2 nanoparticle (NP), i.e. SnO2 NP_ ZnO HS [for an optimized weight ratio (8:2)] displayed a near □□□□fold increase in the efficiency (□) compared to bare SnO2 nanoparticle device□□Enhanced device efficacy in the composite photoanode based device can be accredited to the dual function of nano-amassed meso-ZnO HS.[2] Nano-amassed micron sized ZnO HS embedded in the photoanode can increase the light harnessing capability without sacrificing surface area by as well as optical confinement of light by multiple reflections within its cavity and an enhanced light scattering effects. EIS analysis revealed an extended lifetime of electron (τe) and a higher value of Rct2 at working electrode/dye/redox mediator interface indicating a minimum photoinduced electron interception. Open-circuit voltage decay reveals a slower recombination kinetics of photo-generated electron, supporting our claim that the nano- ammased meso-ZnO HS can serve as an energy barrier to the photo-injected electrons to retard the back transfer to the electrolyte. Moreover, the improvement in the fill factors of the composite based devices is endorsed to the facile penetration of electrolyte through the pores of nano-amassed meso-ZnO HS, which increases the regeneration probability of oxidized dye.



References

[1] B. E. Hardin, H. J. Snaith, M. D. McGehee, Nat. Photonics, 2012, 6, 162.

[3] A. Banik, M. S. Ansari, M. Qureshi, ACS Omega 2018, 3, 14482−14493.

Nitric Oxide Dioxygenase activity of a nitrosyl complex of cobalt(II) porphyrinate in presence of hydrogen peroxide via putative peroxynitrite intermediate.

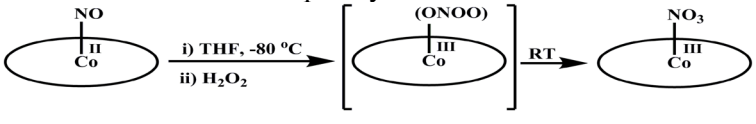
Baishakhi Mondal, Biplab Mondal*

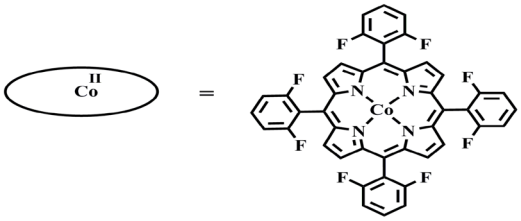
Department of Chemistry, Indian Institute of Technology Guwahati,

North Guwahati, Assam 781039, India

(biplab@iitg.ac.in)

The reaction of a cobalt porphyrin complex in dichloromethane with nitric oxide (NO) gas led to the corresponding nitrosyl complex. Spectroscopic studies and structural characterization revealed it as a bent nitrosyl having {CoNO}8 description. It is stable towards molecular oxygen (O2) but it reacts with H2O2 to result in Co(III)-nitrate complex. It induces phenol ring nitration with an appreciable yield. The involvement of a Co-peroxynitrite intermediate in the reaction is implicated. [1-3]





References

[1] S. Hong, F. F. Pfaff, E. Kwon, Y. Wang, M.-S. Seo, E. Bill, K. Ray, W. Nam, Angew. Chem. Int. Ed. 2014, 53, 10403.

[2] S. Saha, K. Gogoi, B. Mondal, S. Ghosh, H. Deka, B. Mondal, Inorg. Chem. 2017, 56, 7781.

[3] B. Mondal, S. Saha, D. Borah, R. Mazumdar, B. Mondal, Inorg. Chem. 2019, 0000.

A new 3D luminescent Zn(II)-organic framework containing quinoline-2,6-dicarboxylate linker for the highly selective sensing of Fe(III) ion

Chiranjib Gogoi,a Muhammed Yousufuddinb and Shyam Biswasa

a Department of Chemistry, Indian Institute of Technology Guwahati, Assam.

b Life and Health Sciences Department, The University of North Texas at Dallas, Dallas, Texas 75241, United States.

E mail: chiranjib2016@iitg.ac.in

A new 3D zinc-organic framework [Zn(QDA)]·0.7DMF·0.5H2O (1, H2QDA = quinoline-2,6-dicarboxylic acid, DMF = N,N-dimethylformamide) was synthesized under solvothermal conditions. The single crystal X-ray diffraction analysis reveals that the 3D framework structure of 1 has PtS topology and contains Zn(II) ions having distorted square pyramidal geometry with ZnO4N configuration. The phase purity of the bulk sample was characterized by X-ray powder diffraction

(XRPD), thermogravimetric analysis (TGA) and Fourier transform infrared (FT-IR) spectroscopy. The as-synthesized sample (1) was activated by stirring with acetone for 24 h, followed by heating under vacuum for 24 h at 120 °C. The TGA experiment indicated that both 1 and its activated form (1') are stable up to 440 °C. The crystalline structure of the compound was retained after immersion in water, 1(M) HCl, acetic acid and NaOH (at pH = 10) solutions. Compound 1' exhibited very quick fluorescence quenching response after the addition of Fe3+ solution. This quenching was not affected by the presence of other competitive metal cations. A very low detection limit of 9.2 ppb was observed for Fe3+ ion, which is among the lowest values documented in the literature for MOF based fluorescence probes. Both fluorescence resonance energy transfer (FRET) as well as photo-induced electron transfer (PET) processes play major roles for the selective detection of Fe3+ ion. The recyclability experiment suggested that 1' can be used for the long-term detection of Fe3+ ion.

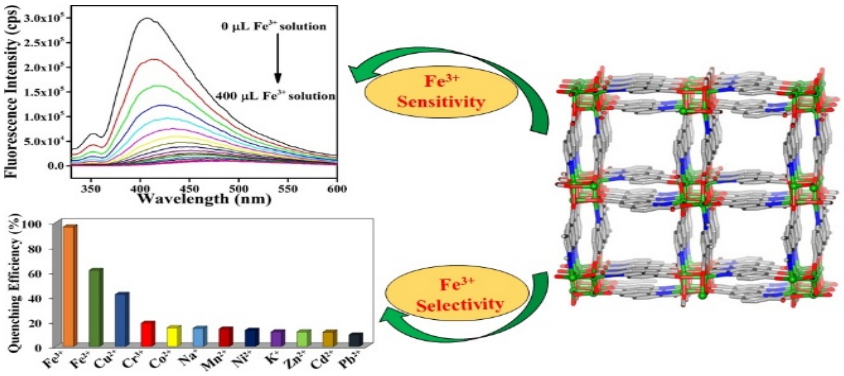


Figure: Schematic representaion of sensitive and selective behaviour of the MOF towards Fe3+.

References:

Gogoi, C.; Yousufuddin, M.; Biswas, S., A new 3D luminescent Zn(II)–organic framework containing a quinoline-2,6-dicarboxylate linker for the highly selective sensing of Fe(III) ions. Dalton Trans. 2019, 48, 1766-1773.

A Technical Evaluation of Arsiron Nilogon for Community and household applications in Jorhat District

Abhishek Gogoi1, Debanga Sourav Saikia1, Bhrigu Kumar Pegu1

1 Department of Chemistry, JB College (Autonomous), Jorhat, Assam

E-mail: djdebanga@gmail.com

Arsiron Nilogon, a method developed in Tezpur University by Dr. Robin K. Dutta, professor, is one of the most efficient and low-cost methods used for removal of arsenic and iron from contaminated groundwater. The present project was undertaken to study the installation and understand the complete working process and performance of Arsiron Nilogon in community and household applications during a one-month summer internship at Tezpur University. Water samples were collected from Sree Sree Kamalabari Satra H.S. School, Titabar, Chitralekha Siksha Bikash Mandir, Dholajan, Binanda Hazarika's house, Borhulla and Jayanta Saikia's house, Jorhat, where the arsenic concentration was found to be 86.6 ppb, 21.2 ppb, 98 ppb and 60.3 ppb respectively. After some preliminary investigation for suitable locations we installed four Arsiron Nilogon units in the respective areas for two community applications and two household applications. We have collected the water samples before and after treatment with this method and then analysed them for different water quality parameters using different

analytical tools. After removal using Arsiron Nilogon, the arsenic concentration in the water reduced from 86.6 ppb, 21.2ppb, 98ppb, 60.3ppb to 0.5 ppb, 0.1 ppb, 0.02 ppb and 0.01 ppb respectively i.e., to below the WHO guideline value of 10 ppb. This study shows the high effectiveness of Arsiron Nilogon.
Keywords: Arsiron Nilogon, removal, ground water etc.

Selective Cooperation with Liquids for Environmentally Friendly and Comprehensive Oil Water Separation

Authors: Dibyangana Parbat and Dr. Uttam Manna

Email: d.parbat22@gmail.com, umanna@iitg.ac.in

Indian Institute of Technology, Guwahati, Assam 781039

A hydrophobic 3D smart coating possessing a unique relationship with oil (both water affinity and water repellency in absence and presence of oil respectively), is synthesized by using facile and catalyst-free 1, 4-conjugate addition reaction1 between acrylate and amine groups at ambient conditions. The pre-soaked coated material with water is capable of absorbing both heavy and light oils with efficiency above 1000 wt %, and the impregnated metastable aqueous phase is spontaneously and selectively ejected out from the material. This super-oil-absorbance property can withstand diverse scenarios, including extremes of temperature (100 °C and 10 °C), pressure (184.7 mbar), and prolonged (7 days) exposures to extremes of pH (1 and 12), surfactants-contaminated (dodecyltrimethylammonium bromide/sodium dodecyl sulfate, DTAB/SDS, 1 mm) water, artificial sea water, etc.2 Moreover, this super-oil-absorbent is exploited in demonstrations of comprehensive and facile clean-up of oil from various forms of oil–water mixtures (i.e., floating light-oil, sediment heavy-oil, oil-in-water emulsions, etc.) in extremes and complex settings3 that are relevant to practical scenarios including marine oil spills, following ecofriendly and energy-efficient selective-absorption/active-filtration principles.4-5

References:

1. A. M. Rather, U. Manna. Chem. Mater. 2016, 28, 8689-8699.

2. D. Parbat, U. Manna. Chem. Sci., 2017, 8, 6092-6102.

3. D. Parbat, U. Manna. ChemSusChem 2017, 10, 4839-4844.

4. Z. Chu, Y. Feng, S. Seeger. Angew. Chem. Int. Ed. 2015, 54, 2328-2338.

5. B. Wang, W. Liang, Z. Guo, W. Liu. Chem. Soc. Rev. 2015, 44, 336-361.

The Sustainable Synthesis of Perimidines, Quinazolines, 2-aminoquinolines and 2-alkylaminoquinolines via Acceptorless Dehydrogenative Coupling by Phosphine free Mn(I) Complexes

Kalicharan Das, Avijit Mondal, Debjyoti Pal and Dipankar Srimani*

Department of Chemistry, Indian Institute of Technology, Guwahati, Assam - 781039, India

(E-mail: dsrimani@iitg.ernet.in)

Heterocycles are the largest and most diverse family to life because their structural moieties exist in many natural products and drug-like compounds. In this perspective, noble metal catalysed acceptorless dehydrogenative coupling (ADC) reaction [1] or borrowing hydrogen [2] has attracted significant

attention. The replacement of noble metal catalyst with earth abundant, nontoxic, and cost-effective catalyst is a central goal in catalysis in the recent times. In this regard, Mn-metal has high potential applicability, as the biocompatible manganese is found to be the third most abundant transition metal in the earth's crust.

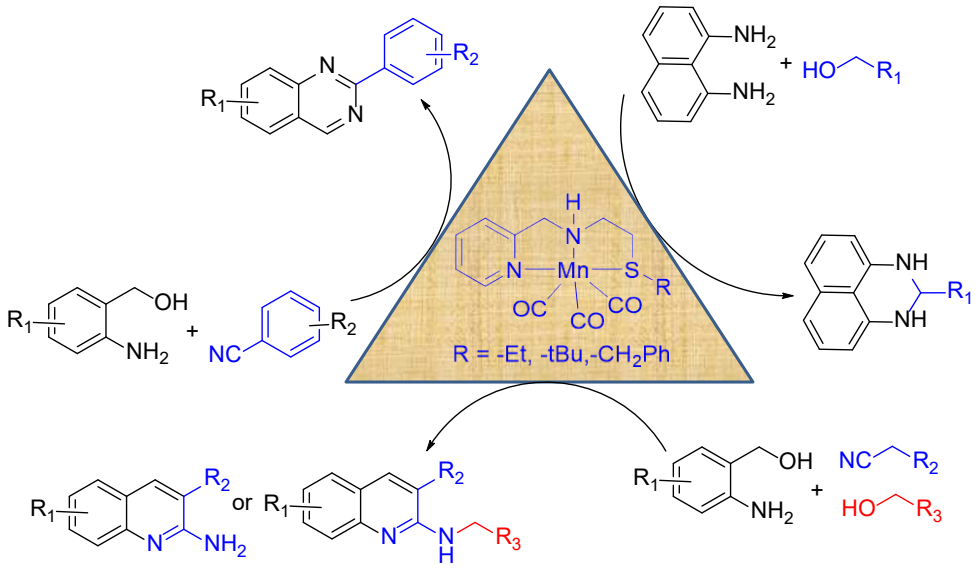


Figure 1.The acceptorless dehydrogenative coupling reactions for the synthesis of N-heterocyclic compounds.

Thus, tridentate NNS-ligand based manganese (I) complexes have been synthesized [3] to study their applicability towards the sustainable synthesis of perimidines, quinazolines, 2-aminoquinolines and 2-alkylaminoquinolines [4] for the construction of C–C and C–N bond via acceptorless dehydrogenative coupling (ADC) reaction. To validate the synthetic utlity, diverse range of substrate scope having different functional groups has been executed. The usage of an earth-abundant biocompatible manganese metal and non-phosphine ligand system makes this protocol highly sustainable and attractive.

References:

[1] (a) C. Gunanathan, D. Milstein, Science 2013,341, 1229712. (b) S. M. A. Hakim Siddiki, T. Toyao and K. Shimizu, Green Chem. 2018, 20, 2933-2952.

[2] G. Guillena, D. J. Ramo´n and M. Yus, Chem. Rev. 2010, 110, 1611-1641.

[3] (a) K. Das, A. Mondal and D. Srimani, J. Org. Chem. 2018, 83, 9553-9560.

(b) K. Das, A. Mondal and D. Srimani, Chem. Commun. 2018, 54, 10582-1058.

[4] K. Das, A. Mondal, Debjyoti Pal and D. Srimani, Manuscript submitted.

Highly Efficient Pincer–Ruthenium Catalysts for Atom Transfer Radical Additions

Kanu Das,a Moumita Dutta,a Babulal Das,a Hemant Kumar Srivastava,a,*Akshai Kumara,b*

a)Department of Chemistry, Indian Institute of Technology Guwahati,

Guwahati–781039, Assam, India

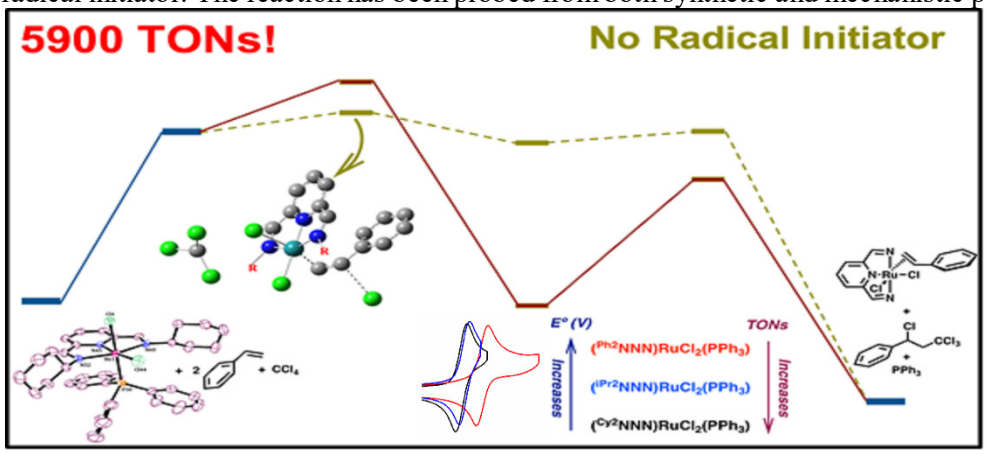
b)Center for Nano Technology, Indian Institute of Technology Guwahati,

Guwahati–781039, Assam, India

E-mail: hemantkrsri@gmail.com, akshaikumar@iitg.ac.in

The functionalization of alkenes with halogenated hydrocarbons leads to valuable feedstock that can be readily transformed to a variety of fine and commodity chemicals. One of the convenient tools to such functionalization is the addition of halogenated hydrocarbons across the olefinic double bond, a reaction that was first discovered by Kharasch.[1] While the classic methods of using radical initiators has many limitations, transition metal catalysts, in particular, Ru(II) complexes have enjoyed great success in catalyzing the Kharasch addition (also known as atom transfer radical addition (ATRA)). While the catalysts based on [RuCl(arene)(PR3)2] show moderately good activity, the improved activities of [RuCl2(arene)(PR3)] is limited by decomposition of the catalytically active 12-electron species (generated after loss of arene ligand). The best turnover (in the absence of any radical initiator) reported hitherto for the ATRA of CCl4 to styrene is 3700 by the group of Malacea-Kabbara and Gendre using [RuCl2(arene)(PR3)] with phosphine diene ligands.[2] In presence of radical initiator AIBN, the Stradiotto group reports turnovers up to 4350 TON.[3] Pincer–ruthenium complexes are potential precursors for 16–electron fragments and to the best of our knowledge, there have been no reports on the use of pincer–ruthenium complexes in catalytic ATRA reactions.

It was envisioned that the 18–electron NNN pincer–ruthenium complexes would generate the corresponding 16–electron fragment (R2NNN)RuCl2 that could readily bind to styrene and catalyze the ATRA reaction. In the current study, we report the synthesis of new pincer-Ru(II) complexes of the type (R2NNN)RuCl2(PPh3) (R = Cy, tBu, iPr and Ph) and their catalytic activity towards the ATRA of CCl4 to styrene. The new complexes have been fully characterized by NMR, HRMS and single crystal X-ray analysis. Of the four complexes tested, (Cy2NNN)RuCl2(PPh3) resulted in the highest TON (ca. 5900) reported yet for ATRA of CCl4 to styrene at very low catalyst loading (0.2 mM) at 140 °C in the absence of any radical initiator. The reaction has been probed from both synthetic and mechanistic point of view.



References

[1] M. S. Kharasch, W. H. Urry, E. V. Jensen, J. Am. Chem. Soc. 1945, 67 (9), 1626-1626.

[2] F. Chotard, R. Malacea-Kabbara, C. Balan, E. Bodio, M. Picquet, P. Richard, M. Ponce-Vargas, P. Fleurat-Lessard, P. Le Gendre Organometallics 2018, 37 (5), 812-820.

[3] R. J. Lundgren, M. A. Rankin, R. McDonald, M. Stradiotto, Organometallics 2008, 27 (2), 254-258.

[4] K. Das, M. Dutta, B. Das, H. K. Srivastava, A. Kumar, Manuscript Submitted

Dicyclohexylurea derivatives of amino acids as dye absorbents and anion sensors

Karabi Roy,1 Suvankar Ghosh,2 Monikha Chetia,1 Priyadarshi Satpati2*and Sunanda Chatterjee1*

Department of Chemistry 1, Department of Biosciences and Bioengineering2

Indian Institute of Technology Guwahati, Assam, India 781039

Low-molecular-weight (LMW) organogelators is trending nowadays as advanced functional materials because of their immense applications in various fields. These are a family of small molecules that can immobilize organic solvents through molecular self-assembly, and thus represent a novel class of supramolecular materials.which can be used in various applications such as templated materials, drug delivery agents, cosmetics, sensors, enzyme-immobilization matrices, as well as in phase selective gelation and water purification by dye absorption..These gelators create a three-dimensional (3D) network in organic solvents by self-organizationof the monomeric species to higher-order structures, which are driven by specific noncovalent intermolecular interactions, commonly electrostatic, dipole–dipole, van der Waals, π-π stacking, and/or hydrogen bonding. The emerging development of efficient low-cost organogelators is of great interest. In the past few years, a number of LMW organogelators like carbohydrates, amino acids, steroids, organometallic compounds etc. have been studied.Among these, amino acids have emerged as one of the potential organogelator molecules that are easy to avail and are cost effective. Also, amino acids are capable of forming gels in a wide variety of organic solvents. Understanding the fact that the behaviour of gelation is largely affected by molecular chemistry and the chemical environment such as solvents, we have reported here the gelation behavior of dicyclohexyl derivatives of three amino acids and their application as dye absorbent and anion sensors. The three amino acids chosen for this study are: γ-aminobutyric acid, L-phenylglycine and L-phenylalanine. The N-termini of all the three amino acids are protected by Fmoc- group and the C-termini are protected by N,N′ –Dicyclohexylurea.

References:

1. S.K. Brar, P. Singh, M. Bajaj, A. Deep, N. Wangoo and R.K. Sharma, Mater. Chem. Front., 2017, 1, 449—454.

2. J. Schiller, R. Pérez-Ruiz, D. Sampedro, E. Marqués-López, R.P. Herrera and D. DíazDíaz , Sensors, 2016, 16, 1-12.

Potent Anti-proliferative Activities of Organochalcogenocyanates towards Breast Cancer

Kaustav Banerjee and Krishna P. Bhabak*

Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati, Assam – 781039, India

(Email: kaustav.chem@iitg.ac.in and kbhabak@iitg.ac.in)

Cancer is one of the major threat that leads to an increased mortality of human population throughout the world. Specifically, breast cancer has been identified as the second leading cause of mortality among women.[1] Among many other strategies, the traditional and conventional treatment includes chemotherapy that targets to arrest the proliferation of abnormally growing cells, and induce programmed cell death and apoptosis.[2,3] However, most of the chemotherapeutic drugs lack selectivity and result in pronounced side effects leading to the unwanted toxicity towards normal cells. It has been shown that, the conventional chemotherapeutic drugs lead to the overproduction of reactive oxygen or nitrogen species (ROS or RNS) that accounts for their increased side-effects. Therefore, cancer chemoprevention has emerged as an useful strategy that utilizes antioxidants including synthetic organoselenium compounds to significantly attenuate the toxicities induced by chemotherapeutic compounds.[4]

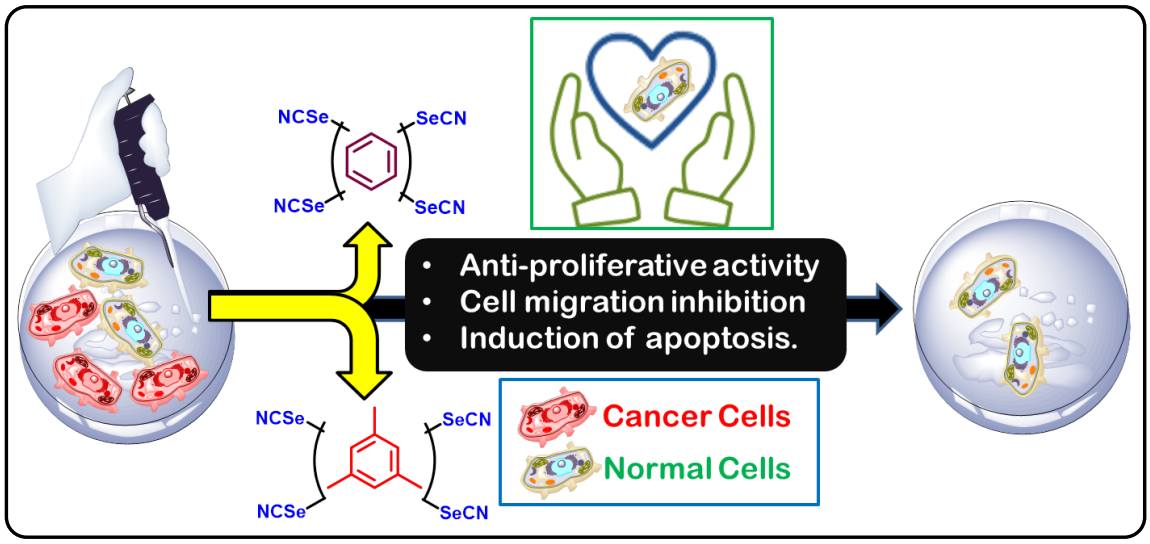


Figure 1. Schematic representation of anti-proliferative activities of organochalcogenocyanates.

In the present study, we have synthesized a series of organochalcogen compounds having single or multiple chalcogenocyanate units (selenocyanate and thiocyanate) in a molecule to assess their anti-proliferative activities towards different breast cancer cells. The potent compounds were further studied to understand their mode of action in a triple-negative breast cancer cell line (MDA-MB-231).[5]

References:

1. P. Anand, A. B. Kunnumakkara, C. Sundaram, K. B. Harikumar, S. T. Tharakan, O. S. Lai, B. Y. Sung, B. B. Aggarwal, Pharm. Res-Dord. 2008, 25, 2097.

2. H. Liu, L. Lv, K. Yang, Am. J. Canc. Res. 2015, 5, 880.

3. T. Helleday, Annals. Of Oncology, 2017, 28, 2054.

4. K. A. Conklin, J. Nutr. 2004, 134, 3201s.

5. K. Banerjee, G. Padmavathi, D. Bhattacherjee, S. Saha, A. B. Kunnumakkara, K. P. Bhabak, Org. Biomol. Chem. 2018, 16, 8769.

New theraptiques approach of Alzheimer disease

Alzheimer is the most common form of dementia. The pathological hallmarks are plaque containing amyloid beta and neuro-fibrillary tangles in the brain of patient of Alzheimer. The plaques contains beta sheet of amyloid oligomers that is believed to be culprit of this unsolved mystery of Alzheimer. Multiple techniques help chemist to be study the structural assembly of oligomers for the better understanding of this disease for its early prediction and treatment. Many theraptique approach is applied to cure Alzheimer and our work based on the study the mechanistic role of amyloid beta and treatment of Alzheimer. There are many advantages of using polymer in theraptiques that we will elaborate in my poster.

Design and Synthesis of Anionic Conjugated Polymer for Sensitive and Selective Detection of Polyamines

Laxmi Raman Adil1 and Parameswar Krishnan Iyer 1,2

1 Department of Chemistry, IIT Guwahati, India

2 Center for Nanotechnology, IIT Guwahati, India

E-mail: ramanadil@gmail.com

Polyamines (spermine, spermidine) are commonly found in nearly all living cells. These are formed by decarboxylation of amino acids and they implement vital functions in the regulation of cell growth and separation.1 Chemosensors based on fluorescence have attracted significant attention because of their simplicity, sensitivity and selectivity. We synthesized anionic conjugated polymer PFAN and it is well characterised by 1H NMR and IR spectroscopy. We successfully used this anionic conjugated polymer PFAN to detect polyamines via electrostatic interaction with great selectivity in water medium.

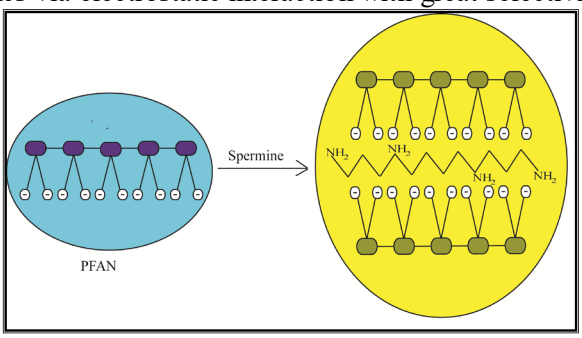


Figure 1. Graphical representation of the sensing of polyamine by PFAN

References

[1] T. Kim, Y. Kim, Chem. Commun, 2016,52, 10648.

[2] R. Zhang, S. H. P. Sung, G. Feng, C. Zhang, B. Z. Tang , B. Liu, Anal. Chem. 2018, 90, 2, 1154-1160.

Enhancing the Power Conversion Efficiency of organic solar cell by Incorporating Cost Effective 2,5-Difluorobenzene Units into the Polymer Backbone via Random Copolymerization

Maimur Hossain1, Parameswar K Iyer1,2
maimur007@gmail.com

1Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India.

2Center for Nanotechnology, Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India.

Two new random terpolymers m1PTB7-and m2PTB7-Th have been designed and synthesized by incorporating a significantly low cost 2,5-Difluorobenzene in donor polymer for the application in organic photovoltaics (OPVs). Replacing 5 and 10 mol% of extremely expensive 3-fluorothieno[3,4-b]thiophene-2-carboxylate monomer in the well-known PTB7-Th by a > 85-times lower cost 2,5-Difluorobenzene the new terpolymers m1PTB7-Th and m2PTB7-Th shows deeper HOMO energy level and comparable LUMO energy level because of this, there is a significant increase in Voc which helps to achieve higher power conversion efficiency (PCE) of 8.51% (Voc=0.850 V) with m1PTB7-Th compare to 8.10% for PTB7-Th (Voc=0.760 V) and the 4.0% (Voc= 0.890 V) for m2PTB7-Th in bulk heterojunction photovoltaic device with the structure of ITO/PEDOT:PSS/Donor:PC71BM (1:1.5, w/w)/Ca/Al by using 3% of 1,8-diiodooctane (DIO) as solvent additive in the active layer.1 By using this low cost monomer incorporation in random copolymerization high performance polymer with improved Voc can be achieved.

Reference:

1. J. Gao, W. Wang, S. Zhang, S. Xiao, C. Zhan, M. Yang, X. Lu and W. You, J. Mater. Chem. A, 2018, 6, 179

Tuning twin excited state intramolecular proton transfer of 3,5-bis(2-hydroxyphenyl)-1H-1,2,4-triazole

M. Das , B. and G. Krishnamoorthy*

1 Department of Chemistry, IIT Guwahati, India

E-mail: minati@iitg.ernet.in

The excited state intramolecular proton transfer (ESIPT) of 3,5-bis(2-hydroxyphenyl)-1H-1,2,4- triazole (bis-HPTA), a molecule possessing two intramolecular hydrogen bonded donor–acceptor pairs, has been investigated by means of absorption spectra, emission spectra and time resolved area normalized emission spectra. The molecule exists as different conformer in different solvent and hence resulting different ESIPT process. Simply by changing the solvent system, ESIPT process is tuned. In nonpolar solvents bis-HPTA undergoes not only a single ESIPT (ESIPT-I), but also a rare twin ESIPT (DK) from conformer bis-HPTA-I. The most interesting fact is that initially, only one acid–base pair is ESIPT (ESIPT-I) active and the other pair is ESIPT inactive (ESIPT-II). The first proton transfer triggers the proton transfer in the second acid–base pair by creating appropriate conditions and labeled as ‘proton transfer triggered proton transfer’ (PTTPT). In n,n-dimethylformamide (DMF), bis-HPTA becomes the most stable conformer and forms H-bond with DMF solvent molecules leading another ESIPT process (ESIPT-III). Regaining of ESIPT-I from ESIPT-III is performed by removing bis-HPTA from DMF solvent cage in presence of silver nanoparticle.

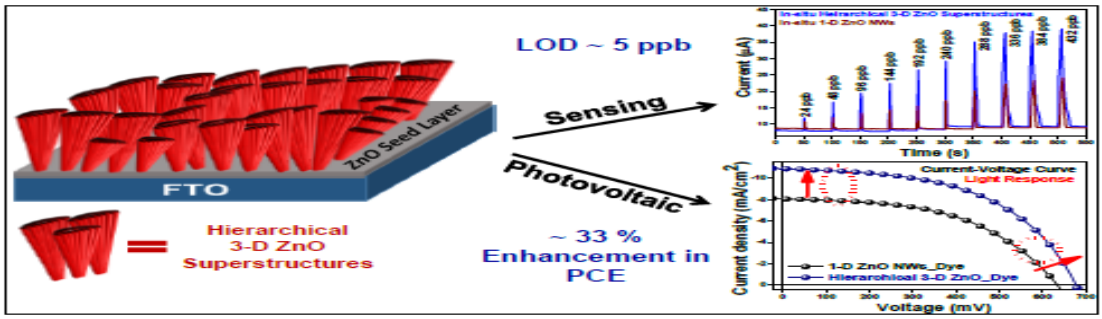
Multifunctional Hierarchical 3-D ZnO Superstructures Directly Grown over FTO Glass Substrate: Enhanced Photovoltaic and Selective Sensing Applications

Mohammad Shaad Ansari1, Avishek Banik1, Mohammad Qureshi1*

1Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati, 781039, Assam, India

*E-mail: mq@iitg.ernet.in

Sensing device which relies on electron transport often suffer from the drawback of higher Ohmic contacts between the active materials and its collecting electrode, in most of the cases, a transparent conducting oxide. Designing such systems, would become more important when the vapor pressure of the compounds yield very low concentrations of sensing elements. Here, an in-situ growth of hierarchical three dimensional Zinc oxide superstructures over conductive glass substrate i.e., fluorine doped tin oxide under controlled hydrothermal route has been reported for low Ohmic contact, thereby an efficient charge injection. An anionic polysaccharide “k-carrageenan” is employed for assisting the hetero epitaxial aggregated growth of 1-D nanocrystals. We have successfully demonstrated the applications of as-characterized multifunctional 3-D ZnO hierarchical structures in photovoltaic and selective chemical vapor sensing. A significant enrichment (33 %) in power conversion efficiency (η) for hierarchical 3-D ZnO superstructures based photovoltaic device as compared to 1-D ZnO nanowires was observed, mainly due to the larger surface to volume ratio for sensitizer loading, better light-scattering effect, better charge separation and collection. Two terminal sensor devices displayed high sensitivity and selectivity for NH3 vapors with the limit of detection value of 5 parts per billion (ppb) for three dimensional ZnO hierarchical superstructures while 17 ppb for 1-D ZnO NWs, which is very less as compared to maximum permissible limit i.e., 25 parts per million (ppm).[1] Selectivity, recyclability, response/recovery time and sensitivity for primary, secondary and tertiary amines are studied to understand the probable mechanism for such high sensing ability of the hierarchical superstructures.



References:

1. M. S. Ansari, A. Banik, A. Kalita, P. K. Iyer, M. Qureshi, J. Mater. Chem. A, 2018, 6, 15868.

Delta amino acid containing peptide organogels with multiple applications: dye absorption, conductivity and NH3 sensing

Monikha Chetia, Swapna Debnath, Sunanda Chatterjee

Department of Chemistry, IIT Guwahati, Guwahati, Assam 781039.

The molecular self-assembly of small peptides can give rise to functional materials with various interesting properties and applications. This has stimulated extensive research in this field in the recent years. Herein, we report four dipeptides (P1,P2,P3, P4) containing delta amino acid paraamino benzoic

acid (PABA) which have been found to form stable and mechanically robust gels in a wide range of organic solvents.
The gelation behavior of the of these peptides have been studied using the FESEM and Rheology techniques and the mechanism of gelation has been probed in detail using techniques like IR, PXRD, NMR and Fluorescence. The gelation of these peptides has been found to be driven by the pi-pi stacking of aromatic moieties, hydrogen bonding and hydrophobic interactions. Interestingly, these organogels have been found to be efficient organic dye absorbants. The peptide organogels were doped with reduced graphene oxide to form hybrid gels for obtaining conductive hybrid organogels. The hybrid gel was studied using FESEM and rheology and the conductivity measurements done by the Keithley sourcemeter instrument. The RGO doped organogel was found to have sensing abilities for ammonia.
Gelation property of four small dipeptides containing delta amino acid residues have been studied. Aromatic pi-pi interactions is a principle driving force for the gelation in these systems. Doping reduced graphene oxide creates stable hydrid gels which are conducting in nature and senses gaseous ammonia.

Refrences:

1.Banerjee.A.; Nanda. J.; Adhikari, B.; (2011) Pyrene containing peptide-based fluorescent organogels: inclusion of graphene into the organogels. Eur. J. 17, 11488-11496.

2.Das. P. K.; Kar. T.; Mukherjee. S.; (2014) Organogelation through self-assembly of low molecular-mass amphiphilic peptide. New J. Chem., 38, 1158-1167.

Cyanomethylation of Aldehydes Catalyzed by Pincer-Based Nickel Complexes: An Experimental and Computational Study

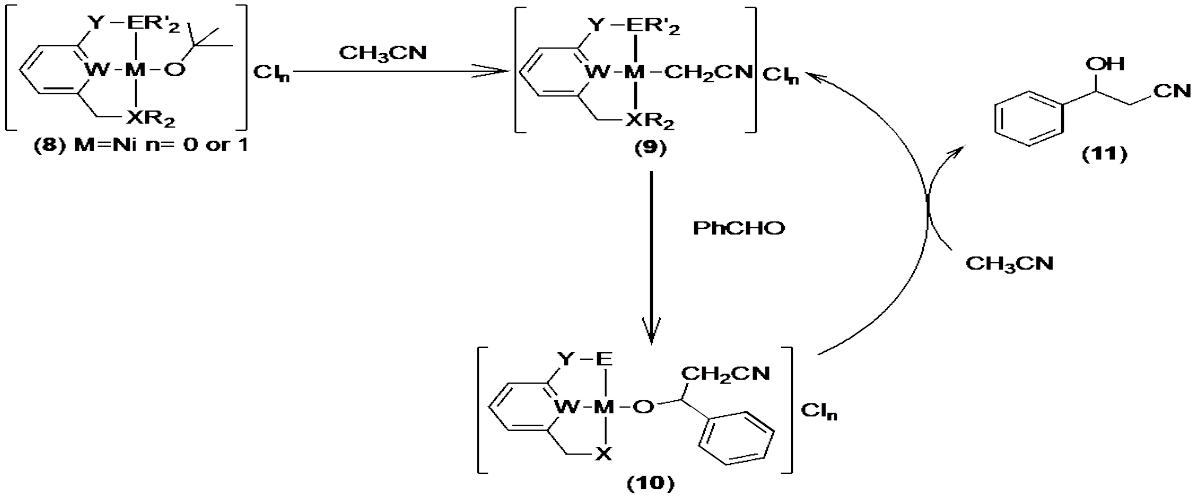
Moumita Dutta,a Kanu Das,a Hemant Kumar Srivastava,a,*Akshai Kumara,b*

aDepartment of Chemistry, Indian Institute of Technology Guwahati, Guwahati–781039, Assam, India

bCenter for Nano Technology, Indian Institute of Technology Guwahati, Guwahati–781039, Assam, India

Email: hemantkrsri@gmail.com, akshaikumar@iitg.ac.in

Ever since the first report by Moulton and Shaw in 1976, the chemistry of pincer metal complexes have witnessed an explosive growth and have found wide spread utility [1]. Pincer complexes have been used either in stoichiometric or in catalytic fashion to bring about the synthesis of fuels, commodity and fine chemicals. The rigidity of the pincer framework along with the high thermal stability that it imparts allows pincer-metal systems to operate at temperatures not normally accessible to other homogeneous systems. In addition, the modularity of the pincer complex allows for an plethora of possible modifications to the three coordinating groups thereby facilitating excellent ligand tuning.
This has resulted in the use of pincer-metal complexes for a variety of catalytic applications ranging from alkane dehydrogenation and C-C coupling reactions to transformation of carbon dioxide. While the initial studies were limited to precious metals, recent years have seen an surge in research on inexpensive metals such as Fe, Co and Ni. In this context, the Miller group had recently reported (iPr2POCCNEt2)Ni catalysed cyanomethylation of aldehydes [2]. We envisaged that, a significant change in reactivity could be obtained by subtle tuning of the σ-donating and/or the π-accepting ability of the pincer fragment.
In the current work, an attempt has been made to rationally design efficient systems based on pincer-nickel complexes for the activation of acetonitrile and its catalytic addition to aldehydes. Experimental and computational studies have been used to probe this reactivity from a synthetic and mechanistic point of view [3].



References

[1] C. J. Moulton, B. L. Shaw, J. Chem. Soc., Dalton Trans. 1976, 1020.

[2] J. B. Smith, A. J. Miller, Organometallics 2015, 34, 4669.

[3] M. Dutta, K. Das, H. K. Srivastava A. Kumar, Manuscript under preparation

Construction of C=N, C=C bond; formation of Indole and its functionalisation in one-pot, in the Presence of Air-stable Ruthenium SNS and NNS Pincer Complexes

Nandita Biswas, Kalicharan Das, Bitan Sardar and Dipankar Srimani*

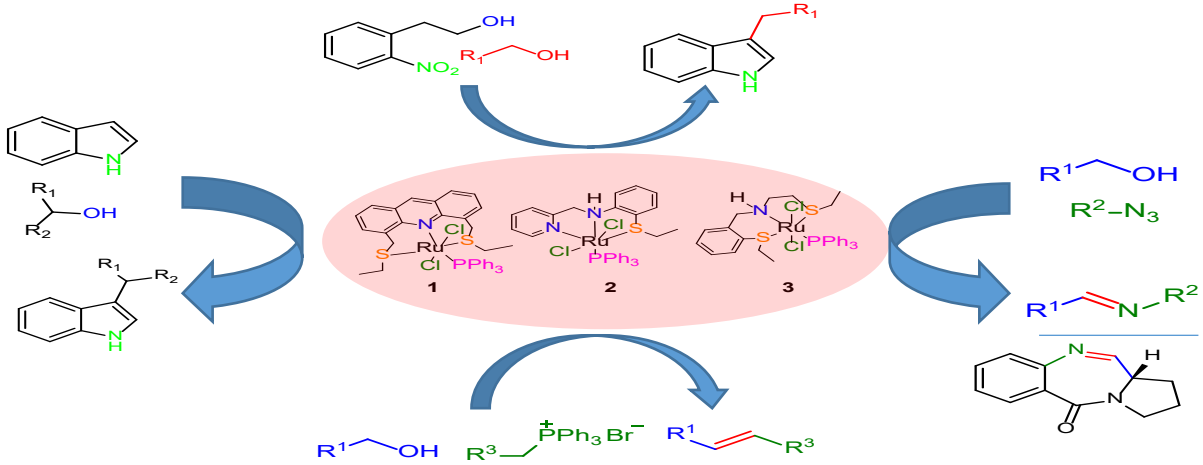
Department of Chemistry, Indian Institute of Technology Guwahati, Assam, 781039, India

(E-mail: dsrimani@iitg.ernet.in.)

C=N, C=C bond formation reaction is most important tool in organic chemistry for the synthesis of nitrogen containing heterocyclic molecules, natural products and some biological active molecules[1]. Especially new methods for indole synthesis and functionalisation continue to attract attention. We developed high atom economical and green synthesis of indole and its functionalisation[2] from 2-nitrophenyl ethyl alcohol in one pot. The acridine-based pincer complex shows excellent reactivity towards multistep oxidation reduction process with very small amount of catalyst loading (2 mol%).
We have synthesized structurally important enantio-pure Pyrrolo[1,4]benzodiazepines derivatives without any observed racemization as the reaction was performed under mild neutral condition via acceptorless dehydrogenative[3] aza-Wittig reaction. This protocol has also been successfully applied to synthesize olefins from alcohols and phosphonium salts. The usage of air-stable ruthenium complexes

for these types of important organic transformations under oxidant and acceptor-free condition makes this protocol attractive.

Figure 1. Graphical abstract of the dehydrogenative aza-Wittig and Wittig reaction, synthesis of indole followed by 3 alkylation with air and moisture stable ruthenium pincer complexes



References

[1] J. Mantaj, P. J. Jackson, K. M. Rahman, D. E. Thurston, Angew. Chem. Int. Ed. 2017, 56, 462-488; Angew. Chem. 2017, 129, 474-502.

[2]S Whitney, R Grigg, A Derrick, A Keep, Org. Lett., 2007, 17, 3299-3302.

[3] C. Gunanathan, D. Milstein, Science 2013, 341, 1229712.

Fluorescence Resonance Energy Transfer Based Wash-Free Bacterial Imaging and Antibacterial Application Using Cationic Conjugated Polyelectrolyte

Nehal Zehra† and Parameswar Krishnan Iyer†‡

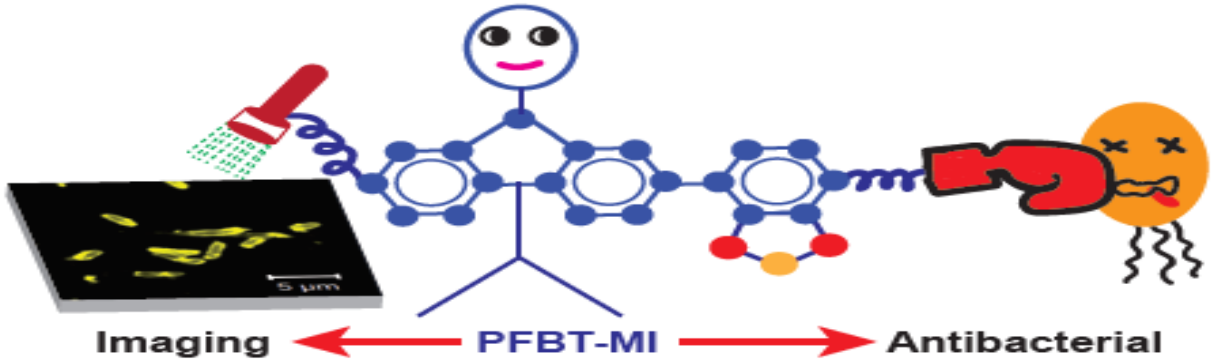
† Department of Chemistry, and ‡Centre for Nanotechnology, Indian Institute of Technology Guwahati, Guwahati 781039, Assam, India

*Corresponding author's E-mail: zhrnehal@gmail.com

Alternate E-mail : pki@iitg.ac.in

Bacterial Infection is one of the global health issue that should be addressed immediately. The detection of bacteria at early stage plays an important role in prevention of upsurge of epidemic diseases. Herein, we report a fluorescence resonance energy transfer (FRET) based probe for the wash-free imaging of Staphylococcus aureus (Gram-positive) and Escherichia coli (Gram-negative) bacteria and their killing. The conjugated polyelectrolyte (CPE) [9,9-bis(6′-methylimidazoliumbromide)hexyl-fluorene-co-4,7-(2,1,3-benzothiadiazole)] (PFBT-MI)) has cationic imidazolium group that makes the CPE water soluble as well as act as a binding site for the negatively charged bacterial membrane. The presence of bacteria in aqueous media could be easily envisaged under UV lamp as the CPE undergo change in fluorescence color from blue to yellow, due to electrostatic interaction with negatively charged bacterial membrane. Furthermore, the PFBT-MI shows excellent antibacterial property against both S. aureus and E. coli with a minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) value of (30 µM or 23.7 µg/mL) and (60 µM or 47.7 µg/mL) for S. aureus and for E. coli (60 µM or 47.7 µg/mL) and (100 µM or 79 µg/mL), respectively.The antibacterial action of PFBT-MI is due to the

amphiphilic nature that results in the intercalation and disintegration of the bacterial cell membrane and thus bacterial cell death. Besides, antibacterial activity the PFBT-MI shows less cytotoxicity against mammalian cells and thus it can be applied for biomedical application.



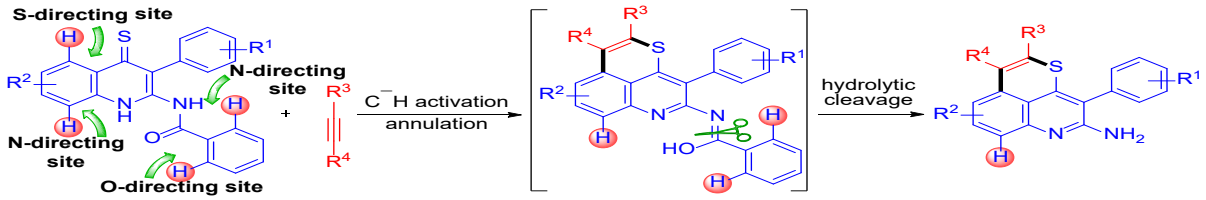
References:

1) Zehra, N.; Dutta, D.; Malik, A. H.; Ghosh, S. S.;Iyer, P. K.* Fluorescence Resonance Energy Transfer Based Wash-Free Bacterial Imaging and Antibacterial Application Using Cationic Conjugated Polyelectrolyte, ACS Appl. Mater. Interfaces 2018, 10, 27603-27611.

2)Ji, E.; Corbitt, T. S.; Parthasarathy, A.; Schanze, K. S.; Whitten, D. G. Light and Dark-Activated Biocidal Activity of Conjugated Polyelectrolytes. ACS Appl. Mater. Interfaces2011, 3, 2820–2829.

A Thiocarbonyl Directed Regiospecific C□H/S□H Annulation of Quinoline-4(1H)-thiones with Alkynes

A unique illustration of regiospecific C□H/S□H annulation of quinoline-4(1H)-thiones with alkynes have been demonstrated using a Ru(II)-catalyst. This is the first example of any C□H/S□H annulation directed via a C=S group. Here, preferential annulation takes place at the sterically hindered position even in the presence of three other competing sites viz. two C□H/N□H and one C□H/O□H leading to the synthesis of thiopyrano[2,3,4-de]quinolines.



References-

1. A. Modi, P. Sau, N. Chakraborty. B. K. Patel, Adv. Synth. Catal. 2019, 361, 1–9

2. A. Modi, P. Sau, B. K. Patel, Org. Lett.2017, 19, 6128.

Spontaneously Self-Assembled Naphthalimide Nanosheets: Condensed State Emission and Unveiling a-PET for Sensitive Detection of Organic Volatile Contaminants in Water

Niranjan Meher, Parameswar K. Iyer*

Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India

(Email id: pki@iitg.ac.in, nmchem.iitg@gmail.com)

A simple and novel design strategy of long alkyl chain substitution has been formulated to block the detrimental π-π interaction that potentially transforms the aggregation-caused quenching (ACQ) chromophores into aggregation-induced emission (AIE) active smart nanomaterials. Owing to the strong interchain hydrophobic interaction that dominantly direct the self-assembly in water, the long octadecyl pendant chain substituted naphthalimide (NI) derivatives self-assembled into fluorescent nanosheets (NS)-like structures that spontaneously have surfaces coated with NI cores in water in an amorphous phase. The fluorescent NS were subsequently used to recognize the organic volatile contaminants (OVCs) at parts per billion (ppb) levels via an acceptor-excited photoinduced electron transfer (a-PET) mechanism, unveiled as the first representative example of a-PET mechanism-based fluorophore/analyte system. A new design strategy is thereby demonstrated to detect toxic xylene derivatives in water using smart nanomaterials.

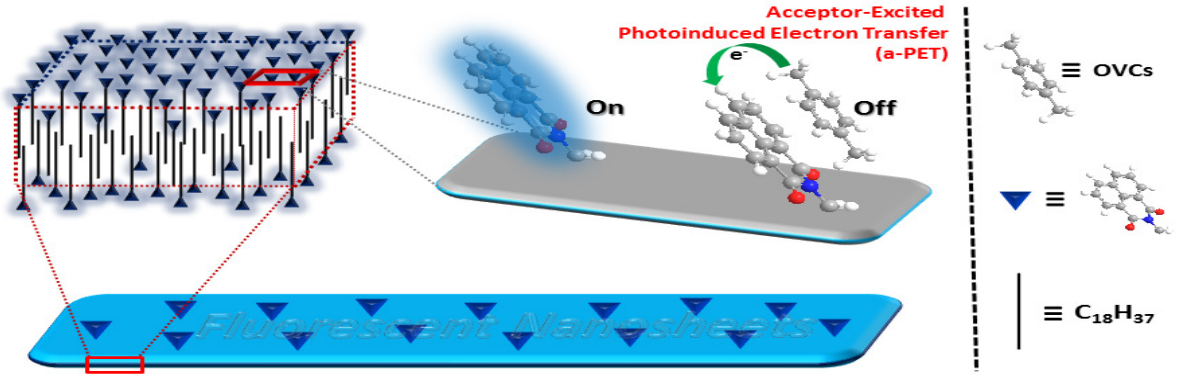


Figure 1. Graphical presentation of formation of AIEgenic naphthalimide nanosheets and their application for OVCs detection via the a-PET mechanism in water.[1]

Reference

[1] N. Meher, P. K. Iyer, Angew. Chem. Int. Ed. 2018, 57, 8488–8492.

Self assembly of Heteroatom Annulated Perylene Bis Benzimidazole

Paresh Kumar Behera, Ravindra Kumar Gupta and A.S. Achalkumar

Department of chemistry, Indian Institute of Technology Guwahati, Assam-781039

E-mail: achalkumar78@gmail.com

A Series of bay-annulated perylenetetracarboxylic bis(benzimidazole)(PTCBIs) were synthesized by introducing hetero-atoms (S and Se) in the bay-region of perylene to modify their photophysical properties and self-assembly behaviour. These bay-annulated perylene bis(benzimidazoles) were molecularly characterised with the help of well-established techniques and the thermal behaviour of these molecules were preliminary characterised by polarised optical microscopy and differential scanning calorimetry. These perylene bis(benzimidazoles) form columnar phase by the stacking of disc-like molecules with an intimate π-π overlap forms a 1D pathway for the anisotropic charge migration along the columns. This has a great potential in comparison to the organic

single crystals or amorphous polymers in terms of processability, ease of handling and high charge carrier mobility. These PTCBIs show broader absorption range Which makes these molecules to act as semiconducting organic layer in organic solar cells. These PTCBIs act as electron acceptor in n-type semiconductors.

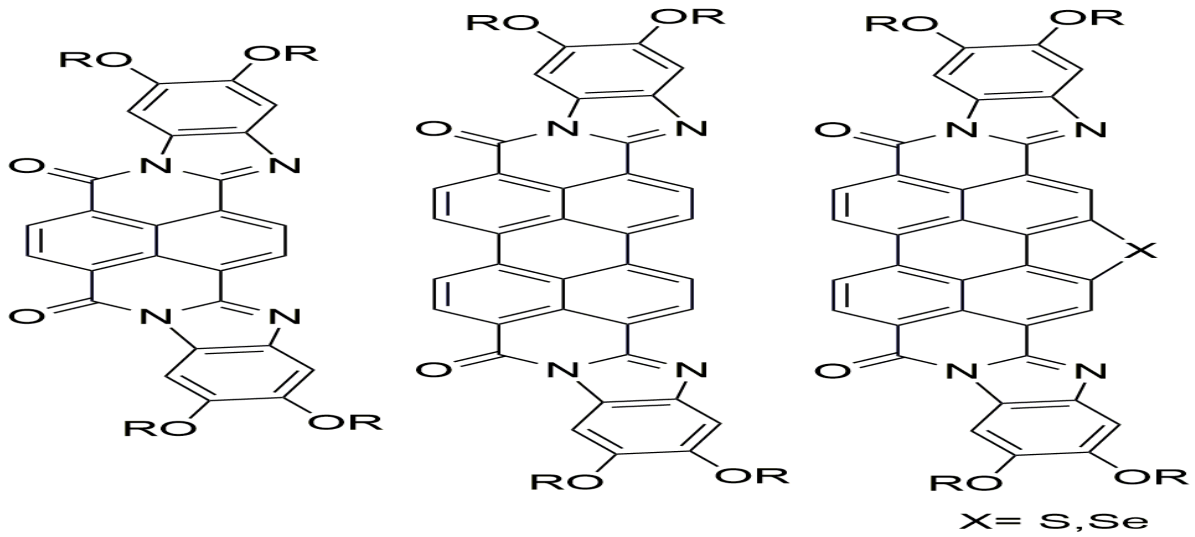


Figure. Schematic diagram of PTCBIs

References

[1] R.K. Gupta, D.S.S. Rao, S.K. Prasad, A.S. Achalkumar, Chem. Eur. J. 2018, 24, 3566 – 3575

[2] L. Perrin, P. Hudhomme, Eur. J. Org. Chem. 2011, 5427–5440.

[3] Z. Yuan, Y. Xiao, Z. Li, X. Qian Org. Lett., 2009, 11 (13), pp 2808–2811

Investigation of Conformation, Self-assembly and Morphology of Two dipeptides

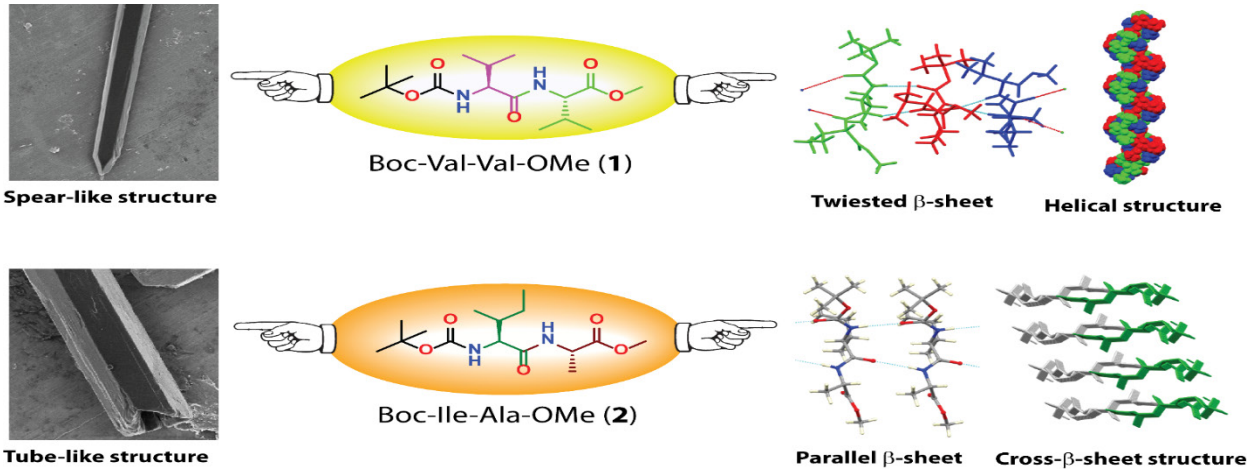
Rajat Subhra Giri, and Bhubaneswar Mandal*

Department of Chemistry, Laboratory of Peptide and Amyloid Research,

Indian Institute of Technology Guwahati, Assam- 781039, India.

Email: rajat.giri /bmandal@iitg.ernet.in

Herein, we present conformation, self-assembly and morphology of two dipeptides, Boc-Val-Val-OMe (1) and Boc-Ile-Ala-OMe (2), containing sequence identity with hydrophobic C-terminus (Aβ 39-42) of Alzheimer's Aβ39-40 and Aβ41-42 peptide, respectively. The single crystal X-ray diffraction (SC-XRD) analysis revealed that 1 adopted a twisted β-sheet like conformation and also exhibited left-handed helical architecture in higher order packing. Whereas, peptide 2 adopted intermolecular hydrogen bonded supramolecular β-sheet structure in crystalline form. The higher order self-association of it showed a supramolecular cross-β-sheet structure along crystallographic b-axis. FTIR and CD experiment also supported the β-sheet conformation of both these peptide in methanol-water medium. The morphology analysis indicated that peptide 1 and 2 self-assembled to form straight unbranched two ended spear and hollow tube-like structures, respectively, in methanol-water (2:1) medium.These peptides self-assembled to the ordered structures which found to bind with the amyloid binding dyes e.g. ThT and Congo Red. These results may help in understanding amyloidogenesis and design principle of nanostructures



Reference

1.R. S. Giri and B. Mandal, CrystEngComm, 2018, 20, 4441–4448.

Molecular dynamics simulation on the inhibition of hIAPP aggregation using a novel cyclen-hybrid molecule

Rituparna Roy, Sandip Paul*

Department of Chemistry, IIT Guwahati, Guwahati, Assam – 781039, India

(sandipp@iitg.ac.in)

Abnormal misfolding and aggregation of amyloid peptides leads to many neurodegenerative diseases. Human islet amyloid polypeptide (hIAPP), which is co-secreted with insulin from pancreatic islet β–cells, misfolds into amyloid deposits in pancreatic islets in type 2 diabetes mellitus (T2DM). These amyloid deposits contribute to the dysfunction of β–cells, further causing apoptotic death of β–cell mass. Inhibition of hIAPP aggregation has been regarded as a potential therapeutic approach for T2DM. The search for plausible agents that bind specifically to precursor protein conformation and inhibit amyloid assembly is an important challenge. Many small molecule polyphenols have been found to inhibit hIAPP aggregation.[1,2] However, our current work studies the effect of a new molecule, N-(2-((4,6-di(1,4,7,10-tetraazacyclododecn-1-yl)-1,3,5-triazin-2-yl)amino)ethyl)-2-oxo-2H-chromene-3-carboxamide, (molecule I) on the aggregation of hIAPP. The ability of this triazine bridged system, containing two cyclen units and an antioxidant coumarin appendage, to treat Alzheimer's disease has been reported elsewhere.[3] Considering the common structural and aggregation features of hIAPP and amyloid-β peptide and the correlation of type 2 diabetes and Alzheimer's disease, herein we examine the inhibition activity of molecule I on the aggregation and toxicity of hIAPP using computational approaches. All-atom molecular dynamics simulations of hIAPP was performed with varying concentrations of molecule1 in an explicit solvent . Studies show molecule I can inhibit the conformational transition of hIAPP monomers to β–sheet structures, thus reducing amyloid fibrillization. A comprehensive examination of the mechanistic pathway proved this molecule to serve as a multimodal therapeutic of T2DM and further helps in the search for more effective agents that can inhibit hIAPP fibrillogenesis

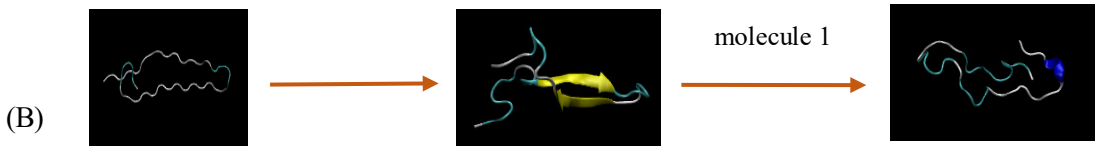


Figure 1.Snapshots of a hIAPP monomer taken (A)at the beginning of simulation, (B) at the end of

500ns run with TIP3P water and (C) after 500 ns simulation after addition of molecule 1.

References:

[1] Q. Wang, L. Ning, Y.Niu, H. Liu, X. Yao, J. Phys. Chem. B,2015,119, 15-24.

[2] Q. Wang, S.Zhou, W.Wei, X.Yao, H. Liu, Z. Hu,Phys.Chem.Chem. Phys.,2015, 17, 29103-29112.

[3] P. Gonzalez, K. Pota, L. S. Turan, V. C. P. da Costa, G. Akkaraju, K. Green, ACS Chem. Neurosci., 2017,8, 2414-2423.

Differential detection of two toxic heavy metals: Fluorogenic sensing of Hg(II) and Ag(I) ions via two mechanistically discrete signal genres

Rupinder Singh and Gopal Das*

Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati 781039, India

email: gdas@iitg.ernet.in

Selective and specific detection of Hg(II) and Ag(I) ions has been enabled by a prudently developed new schiff base probe (L) in a differentially responsive manner of emission intensity. An exciting aspect of the devised ligand is its efficient detection ability of Hg(II) and Ag(I) ions by two different fluorometric responses: a TURN-ON signal for Hg(II) and a TURN-OFF response for Ag(I). The sensing aptitude of the analytes in concern in 1:1 (v/v) acetonitrile/ HEPES Buffer (10 mM, pH 7.4) mixed aqueous medium further make it an encouraging prospect for practical applications. The functioning of two different mechanisms for judicious distinction and detection of the Hg(II) and Ag(I) ions has also been successfully validated. Sensing of Hg(II) proceeds via conventional metal chelation enhanced fluorescence mechanism (CHEF) whereas detection of Ag(I) follows from the formation of nano-sized aggregates in the working medium.

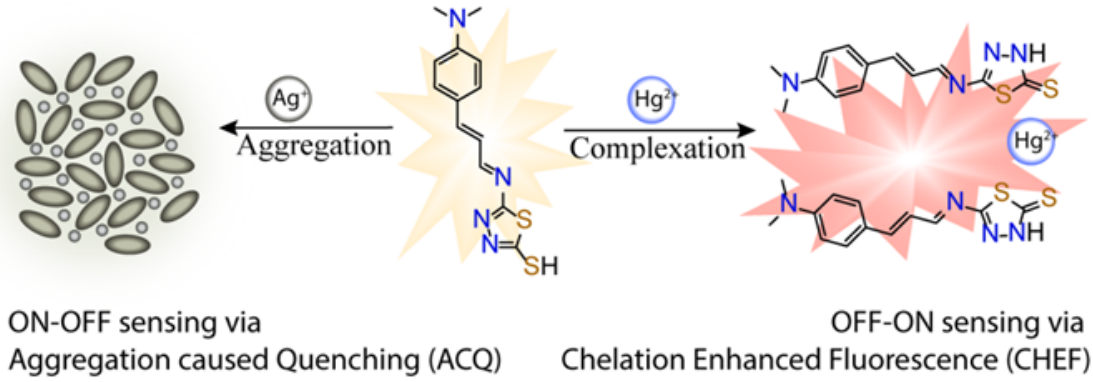


Figure 1. Graphical abstract of dual mode fluorogenic detection of Hg(II) and Ag(I)

References

[1] R. Singh, G. Das, Sens. Actuators, B, 2018, 258, 478.

Conformational Deviation Of Thrombin Binding G-quadruplex Aptamer (TBA) In Presence Of Divalent Cation Sr2+: A Classical Molecular Dynamics Simulation Study

Saikat Pal, Sandip Paul*

Department of Chemistry, Indian Institute of Technology, Guwahati, Assam 781039, India

Email address of corresponding author: sandipp@iitg.ac.in (S. Paul)

Thrombin binding TBA-G-quadruplex aptamer (TBA) plays a major role in blood coagulation cascade. The 15-mer TBA sequence tends to form four-stranded TBA-G-quadruplex structure. In this research work, a series of explicit solvent classical MD simulations of the TBA is carried out using different salt (SrCl2) concentrations (0, 50, 100 and 200 mM). Here we have also testified the effect of salt concentration of divalent cation Sr2+ on the conformational change of quadruplex DNA. The structural deviations, fluctuations, torsional angles and the affinity of the ion are explored at different salt concentrations. It is found that the conformation of TBA-G-quadruplex at 0 mM and 50 mM salt concentrations, is very much different than the other salt concentrations (100 mM and 200 mM). Also observed are as follows: (i) no exchange of Sr2+ ion between inside and outside of the channel, (ii) an enhancement in the Sr2+ ion density around the phosphate region of the loop residues as salt concentration increases and (iii) the stacking of T3 and T4 residues of loop-1 that appears up to 50 mM concentration, vanishes as the salt concentration is increased further.

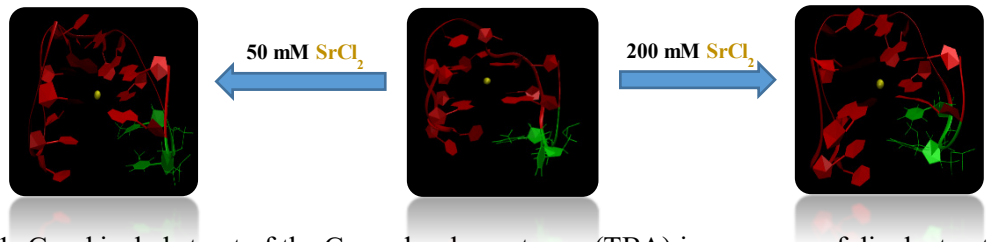


Figure 1. Graphical abstract of the G-quadruplex aptamer (TBA) in presence of divalent cation Sr2+.

References

[1] Saikat Pal, Sandip Paul, Int. J. Biol. Macro. 2018, xxx, xxx–xxx.

[2] M. Rebič, A. Laaksonen, J. Šponer, J. Uličny, F. Mocci, J. Phys. Chem. B 2016, 120, 7380–7391.

Phase transition of silver nanoparticle from aqueous to organic solvent for realization in nanoparticle embedded organic memory

Shubham Sharma1 Rahul Narasimhan.A2 , Peddaboodi Gopikrishna1 and Parameswar Krishnan Iyer1,2

1 Department of Chemistry,IIT Guwahati, India

2 Centre for Nanotechnology, IIT Guwahati, India

E-mail: shubham.sharma@iitg.ernet.in

Owing to the highly established organic semiconductor for different application in electronics, in this work a nanoparticle-based organic memory is formulated as a proof of concept. Nanoparticle has a big disadvantage of being suspended in water which constraints in doping a nanoparticle onto the organic semiconductor. In this work, the suspension of nanoparticle is deliberately converted from water to an organic solvent. This process can be used especially for creating traps in a matrix containing organic

semiconductor materials. Though the device engineers strive to eliminate traps in the field of Solar cell, OLED and OFET. The traps are the main ingredients in the application like Resistive memory device. The nanoparticle suspended in the toluene solution is characterized optically to confirm its stability.

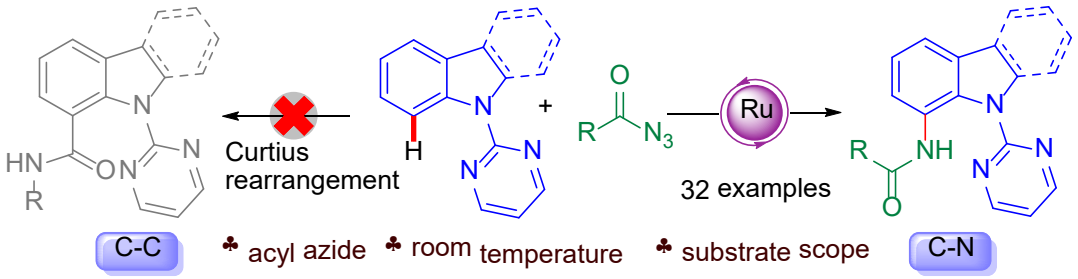
RuII-Catalysed Regioselective C–N Bond Formation of Indolines and Carbazole with Acyl Azides

Sonbidya Banerjee, Pinaki Bhusan De, Sourav Pradhan, Tariq A. Shah and Tharmalingam Punniyamurthy*

Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati 781039, India.

E-mail: tpunni@iitg.ac.in.

RuII-catalysed pyrimidine directed coupling of the C-7 C–H bond of indolines with acyl azides as a nitrogen surrogate has been developed to produce acyl amides at room temperature. The reaction of aryl, heteroaryl and α,β-unsaturated acyl azides can be accomplished in good yields. The procedure can be extended to the C1-amidation of carbazole with moderate yields. The substrate scope, use of less expensive Ru-catalysis, and oxidant-free conditions are the significant practical features.



References

1.Shang, M.; Sun, S. Z.; Dai, H. X.; Yu, J. Q. J. Am. Chem. Soc. 2014, 136, 3354.

2.Ryu, J.; Kwak, J.; Shin, K.; Lee, D.; Chang, S. J. Am. Chem. Soc. 2013, 135, 12861.

3.Banerjee, S.; De, P. B.; Pradhan, S.; Shah, T. A., Punniyamurthy, T. Eur. J. Org. Chem. Just Accepted, 2019, DOI: 10.1002/ejoc.201801829.

A dinitro-functionalized metal-organic framework featuring visual and fluorogenic sensing of H2S in living cells and human blood plasma

Soutick Nandi1, Sooram Banesh2, Vishal Trivedi2, and Shyam Biswas1*

1Department of Chemistry, IIT Guwahati, 781039 Assam

2Malaria Research Group, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, 781039 Assam, India

*Corresponding author: sbiswas@iitg.ac.in

Here, we describe a new dinitro-functionalized Zr(IV) MOF (MOF = metal-organic framework) having UiO-66 (UiO = University of Oslo) framework topology called UiO-66-(NO2)2 (1).[1] It shows

fluorescence turn-on response towards H2S in simulated biological medium (HEPES buffer, pH = 7.4). By employing solvothermal conditions, 1 was successfully synthesized by reacting ZrCl4, H2BDC-(NO2)2 [H2BDC-(NO2)2 = 2,5-dinitro-1,4-benzenedicarboxylic acid] ligand and benzoic acid with a molar ratio of 1:1:10 in DMF (DMF = N,N-dimethylformamide) at 130 °C for 24 h. The material was characterized by infrared spectroscopy, X-ray powder diffraction (XRPD) and thermogravimetric (TG) analyses. The compound not only displays highly sensitive fluorometric sensing of H2S but also exhibits visually detectable colorimetric change towards H2S under day light. Moreover, the high selectivity of 1′ towards H2S is retained even when several other biologically intrusive species co-exist in the sensing medium. The limit of detection (LOD) of the compound is 14.14 μM which lies in the range of H2S concentration found in biological systems.[2] Fluorescence microscopy studies in J774A.1 cells revealed the efficacy of the probe for imaging H2S in living cells. Moreover, this material can detect H2S in human blood plasma (HBP). All these features clearly demonstrate that the material is a potential candidate for selective sensing of both extracellular and intracellular H2S.

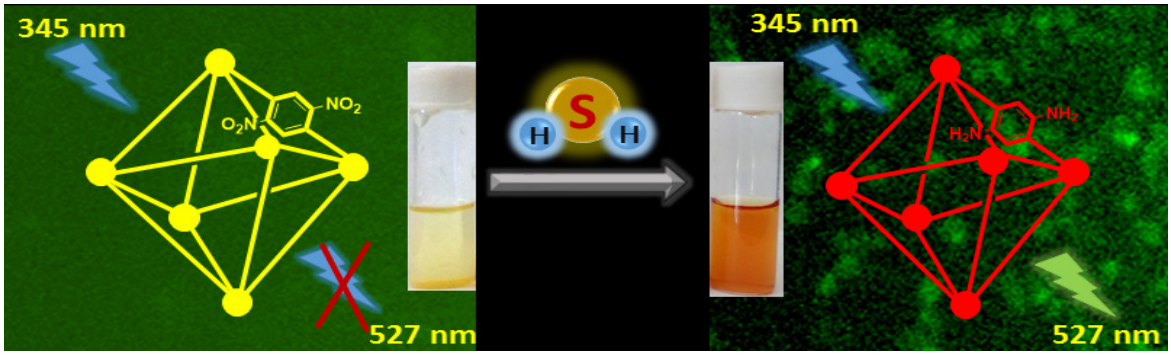


Figure 1. Graphical abstract of sensing behaviour of the MOF towards H2S.

References

[1] J. H. Cavka, S. Jakobsen, U. Olsbye, N. Guillou, C. Lamberti, S. Bordiga and K. P. Lillerud, J. Am. Chem. Soc., 2008, 130, 13850-13851.

[2] V. S. Lin, W. Chen, M. Xian and C. J. Chang, Chem. Soc. Rev., 2015, 44, 4596-4618.

Inhibitory Effect of Choline-O-Sulfate on the Human Islet Amyloid Peptide Aggregation : A Molecular Dynamics Simulation Study

S. Paul1 and S. Paul2

Department of Chemistry, IIT Guwahati, India

Email:srijita.paul@iitg.ernet.in

Type 2 diabetes mellitus (T2Dm) is a neurodegenerative disease, which occurs due to the self-association of human islet amyloid polypeptide (hIAPP), also known as human amylin. It was reported experimentally that choline-O-sulfate (COS), a small organic molecule having a tertiary amino group and sulfate group, can prevent the aggregation of human amylin without providing the mechanism of the action of COS in the inhibition process. In this work, we investigate the influence of COS on the full-length hIAPP peptide by performing 500 ns classical molecular dynamics simulations. From pure water simulation (without COS) we have identified the residues 11-20 and 23-36 that mainly participate in the fibril formation but in presence of 1.07 M COS these residues become totally free of β-sheet conformation. Our results also show that the sulfate oxygen of COS directly interacts with the peptide backbone which leads to the local disruption of peptide-peptide interaction. Moreover, the presence of

favorable peptide-COS vdW interaction energy and high coordination number of COS molecules in the first solvation shell of the peptide indicates the hydrophobic solvation of the peptide residues by COS molecules also play a crucial role in the prevention of β-sheet formation. Finally, from the potential of mean force (PMFs) calculations we observe that the free energy between two peptides is more negative in absence of COS and with increasing concentration of COS it becomes unfavorable significantly indicating that the peptide dimer formation is most stable in pure water, which becomes less favorable in presence of COS.

Fig. 1 Inhibition of hIAPP peptide aggregation in presence of COS

Reference:

1) M. Hagihara, A. Takei, T. Ishii, F. Hayashi, K. Kubota, K. Wakamatsu, N. Nameki, Inhibitory Effects ofCholine-o-sulfate on Amyloid Formation of Human Islet Amyloid Polypeptide, FEBS Open Bio. 2(2012) 20-25.

2) S. Luca, W. M. Yau, R. Leapman, R. Tycko, Peptide Conformation and Supramolecular Organization in AmylinFibrils: Constraints from Solid-State NMR, Biochemistry 46(2007) 13505-13522.

3) S. Paul, S. Paul, How Does Aqueous Choline-o-sulfate Solution Nullify the Action of Urea inProteinDenaturation, J. Chem. Inf. and Model. 58(2018) 1858-1869.

Spacer controlling self-assembly of diphenylalanine

Gopal Pandit, Subhajit Rom, Swapna Debnath, Sunita Paul, Sunanda Chatterjee*

Department of Chemistry, Indian Institute of Technology, Guwahati 781039, India.

E-mail: sunanda.c@iitg.ac.in

Amyloid precursor proteins (APPs) have an important role in self-assembly, resulting in different neuro diseases like Alzheimer's and Parkinson's1. FF is the core recognized motifs of the APPs associated with Alzheimer's disease. The role of aromatic pi-stacking interaction of the Phe is considered to be one of the most important factors driving its self-assembly. In this context FF dipeptide has been extensively studied due to its structural simplicity, biocompatibility and strong capability of assembling along with unique mechanical, optical, piezoelectric and semi conductive properties. Increase in the length of the side chain of Phe by incorporation of atom between the phenyl ring and the peptide backbone gives rise to higher homologous of Phe. Dipeptide made of the higher homologous are playing remarkable differences during assembly2. When Aliphatic amino acids residues like leucine, isoleucine and valine are incorporated in between the diPhe residues3, the resulting peptides still retained their self-assembling abilities.

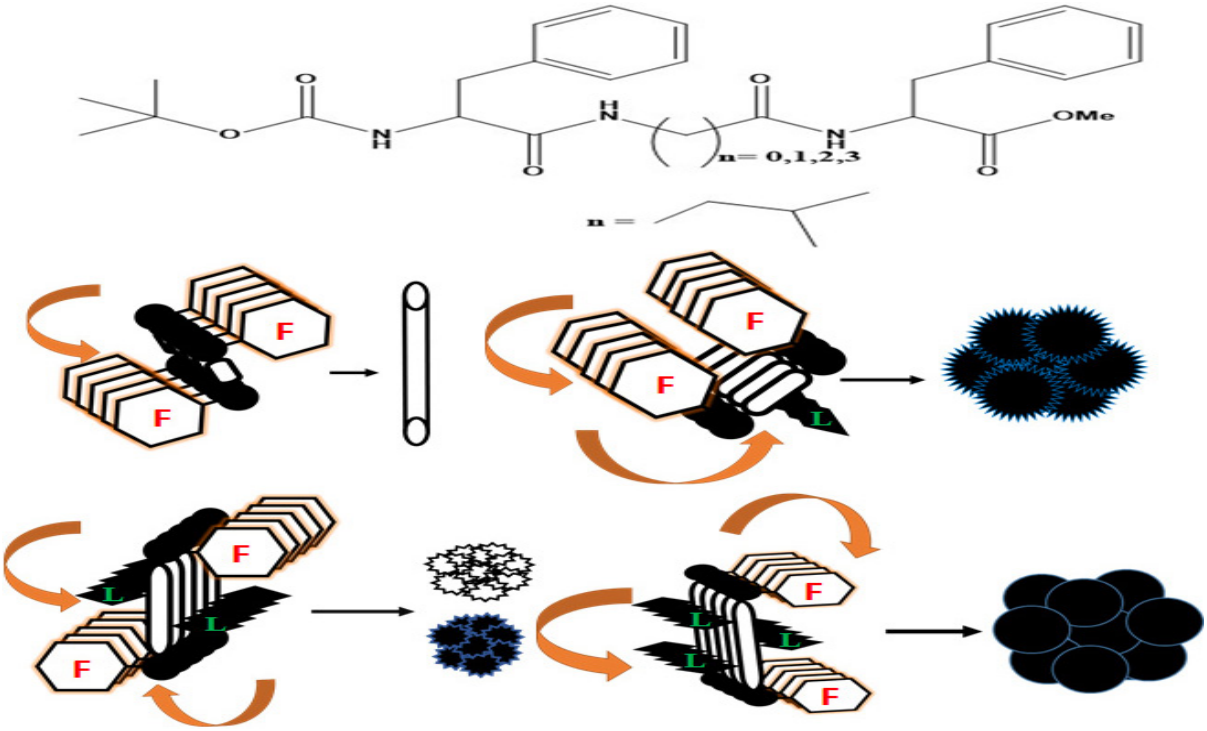


Figure 1. Schematic representation of the studying peptide and its self-assembly.

In the present work we have increased the distance in between two Phe residues systematically by incorporation of one, two and three leucine residues in order to study the effect of increasing the distance between Phe residues. We are studying its self-assembly by using different Spectroscopic (like NMR, CD, Fluorescence) and Microscopic (FESEM, TEM, AFM) techniques etc.

References

[1] Azriel, R.; Gazit, E.; The journal of biological chemistry. 2001, 276, 34156-34161.

[2] Pellach, M.; Gazit, E.; Chem. mater. 2016, 28, 4341-4348.

[3] Banerjee, A.; Banerjee, A.; soft matter 2008, 4, 1430-1437.

Vinylsilanes in Highly Diastereo- and Regio-selective Synthesis of Dihydropyrans

Upasana Borthakur, Subhamoy Biswas and Anil K. Saikia*

Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati 781039, Assam, India

Email-asaikia@iitg.ac.in

Dihydropyrans are important structural units found in many biologically active natural products such as laulimalideand aspergillide C (Figure 1).1 This is also important from a synthetic point of view because of the fact that the olefin functionality of the dihydropyrans can be modified to generate polyfunctional tetrahydropyrans by various oxidation and reduction reactions.2

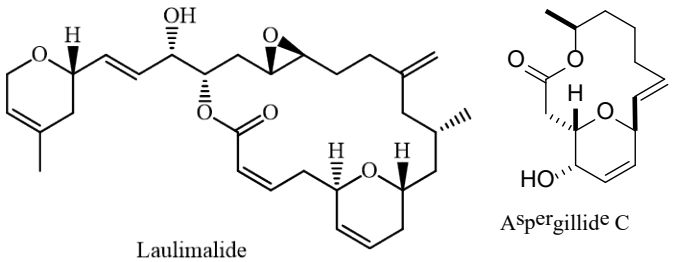
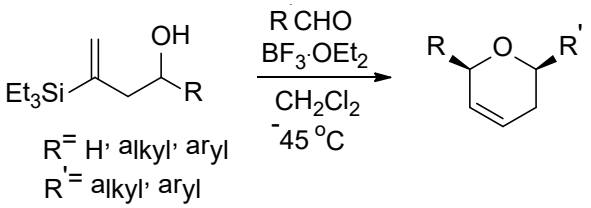


Figure 1Borontrifluoride etherate (BF3.OEt2) can be efficiently used for the synthesis of dihydropyrans from triethylsilyl homoallylic alcohols and aldehydes in good yields. The reaction is highly diastereo- and regio-selective (Scheme 1).



Scheme 1

References

(a) Wender, P. A.; Hegde, S. G.; Hubbard, R. D.; Zhang, L. J. Am. Chem. Soc. 2002, 124, 4956−4957;

(b) Nagasawa, T.; Kuwahara, S. Org. Lett. 2009, 11, 761−764.

(c) Yet, L. Chem. Rev. 2000, 100, 2963−3007;

(d) Sultana, S.; Indukuri, K.; Deka, M. J.; Saikia, A.K. J. Org. Chem. 2013, 78, 12182−12188.

Access to Multifunctional AIEEgens via Ru(II) Catalyzed Quinoxaline Directed Oxidative Annulations

Subhendu Ghosh,a Suman Pal,a Suresh Rajamanickam,a Rajib Shome,b Prakash Ranjan Mohanta,a Siddhartha Sankar Ghosh,b Bhisma K. Patel*a

aDepartment of Chemistry, Indian Institute of Technology Guwahati, North Guwahati 781039, India.

bDepartment of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, North Guwahati 781039, India.

patel@iitg.ac.in

Multifaceted application potential of AIEEgens opens up a new research paradigm to develop and design more such compounds. Herein, quinoxaline N-directed Ru(II)-catalysed oxidative annulation of 2-arylquinoxalines with internal alkynes leads to the formation of highly luminescent annulated quaternary ammonium salts in the presence of Cu(OAc)2.H2O. While the synthesised compounds exhibit emissions in green to yellow region with large Stoke shifts and reasonable quantum yields, their DFT calculation display 3D twisted conformation bearing donor-□-acceptor (D□□□A) configuration, where the two phenyl moieties could serve as the donors and the extended quinoxaline core as the acceptor. Single crystal analysis of quaternary salt 3aa, depicts the presence of multiple intermolecular non-covalent and weak π-π interactions that are possibly responsible for the luminescent behaviour in crystalline as well as solid state. Advent of AIEE in quinoxalinium salt 3aa in DMF/water is due to the presence of intramolecular motion (RIM) and their restriction in aggregated state. AIEEgen 3aa unveils mechanochromism upon grinding, where a few of them are utilised for development of latent fingerprints on an adhesive tape. Furthermore, a representative group of synthesised luminescent quinoxalinium salts portray dose dependent cell growth inhibition of HeLa cells with concomitant cell arrest in G1 phases. Hence, these AIEE luminogens are not only attractive as luminescent “light-up”

probes for cell imaging, but also important as anticancer agents.

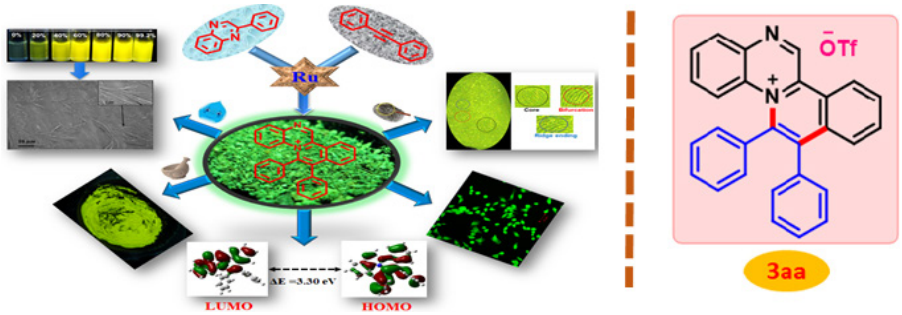


Figure 1: Multifunctional AIEEgens.

References:

1.K. Parthasarathy, N. Senthilkumar, J. Jayakumar and C. –H. Cheng, Org. Lett., 2012, 14, 3478

2.J. Mei, N. L. C. Leung, R. T. K. Kwok, J. W. Y. Lam and B. Z. Tang, Chem. Rev., 2015, 115, 11718

3.M. Jiang, X. Gu, R. T. K. Kwok, Y. Li, H. H. Y. Sung, X. Zheng, Y. Zhang, J. W. Y. Lam, I. D. Williams, X. Huang, K. S. Wong and B. Z. Tang, Adv. Funct. Mater., 2018, 28, 1704589

4. S. Ghosh, S. Pal, S. Rajamanickam, R. Shome, P. R. Mohanta, S. S. Ghosh, B. K. Patel, Under communication.

Time Dependent Evolution of Amyloid Nano Flower: An Early Stage Therapeutics for Alzheimer Disease

Subrata Mondal, Sachin Kumar, Parameswar K. Iyer*

Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati, Assam – 781039, India

Department of Bioscience & Bioengineering, Indian Institute of Technology Guwahati, Guwahati,

Assam – 781039, India

pki@iitg.ac.in

Alzheimer's disease (AD) is pathologically highlighted by the aggregation of intracellular neurofibrillary tangles shaped by tau proteins and extracellular feeble torment by amyloid β-proteins (Aβ) in the patient brain. Numerous studies have demonstrated that the aggregation of Aβ into amyloid fibrils containing trademark cross-β-sheet structure in the mind of AD patients is firmly connected to the pathogenesis of AD and dissolvable Aβ oligomers and/or protofibrils are the most poisonous species, in charge of neuron brokenness and death. Here, in this work, nontoxic, biocompatible water soluble polymeric conjugate have been used to modulate toxic amyloid aggregates in human CSF and as well as in preformed amyloid aggregates from commercial Aβ1-40. This modulation strategy leads to the formation of polymer-protein co-aggregates instead of toxic amyloid aggregates which is responsible for plaque formation and is related to disease progression. The intriguing prospect of amyloid fibrils using luminescent conjugate materials technique as a scaffold for polymer-protein hybrid materials is well delineated as this technique provides a direct link between spectral signal and protein conformation and can further be used to gain more information concerning the morphology of the protein deposits and facilitate a greater understanding of the conformational phenotype encoded in the native protein aggregates.

References:

(1) B. A. Yankner, L. K. Duffy, D. A. Kirschner, Science 1990, 250, 279−282.

(2) J. Hardy, D. J. Selkoe, Science 2002, 297, 353−356.

(3) S. R. Chowdhury, M. Agarwal, N. Meher, B. Muthuraj, P. K. Iyer, ACS Appl. Mater. Interfaces, 2016, 8, 13309–13319.

Substrate Controlled Remote Intermolecular Amination of Unactivated C(sp3)H bonds via Cross-Dehydrogenative Coupling

Suresh Rajamanickam, Garima Sethi, Rani Payeng and Bhisma K. Patel*

Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati - 781 039, India.

Department of Chemistry, Central University of Haryana, Mahendergarh - 123 031, India.

Department of Chemistry , Dr. B R Ambedkar National Institute of Technology Jalandhar- 144-011, India.

(suresh.r@iitg.ac.in)

The development of mild and efficient methodologies for the direct conversion of ubiquitous and inert C□H bonds into other important functionality such as C□C, C□N, C□O and C□X with high level of predictable selectivity in a sustainable fashion is of immense potential value in both academia and industrial research.From this perspective, it is observed that Cytochrome P450 enzymes have been practicing it for several billion years using intricate binding pockets with high degree of selectivity. However, it works specifically on a particular molecular target. But in literature, site selective C□H functionalization have been demonstrated for activated C□H bonds i.e.(i) adjacent to π□system,1a or heteroatom1b or (ii) via the use of directing group.2 All of the above strategies have been extensively studied in the past couple of decades. In this oral presentation section I am going to present the first intermolecular amination reaction on remote sp3 C□H bond via Cross Dehydrogenative Coupling in site selective manner.3

References:

(a) G.; Rout, S. K.; Rajamanickam, S.; Guin, S.; Patel, B. K. Org. Biomol. Chem. 2016, 14, 8178.

(b) Li, C-J. Acc. Chem. Res., 2009, 42, 335.

(c) Leow, D.; Li, G.; Mei, T.-S.; Yu, J.-Q. Nature 2012, 486, 518.

(d) Rajamanickam, S.; Patel, B. K. (Manuscript under communication)

Di-tryptophan containing peptides in fabrication of AuNP: peptide nanocarriers for drug delivery

Gopal Pandit, Swapna Debnath, Sunanda Chatterjee*

Department of Chemistry, Indian Institute of Technology, Guwahati 781039, India.

E-mail: sunanda.c@iitg.ac.in

Non covalent interactions causes molecules to self-assemble and give rise to supramolecular functional materials which have diverse applications ranging from electro-optics to drug delivery vehicles. Molecular assembly can be directed by tuning several factors like self-assembling building blocks, solvent, concentration, time of incubation, pH of the solution. Of the different classes of molecules that show self-assembly and hierchial morphologies, peptide based Nano systems have gained significant popularity owing to their biocompatibility, easy availability and cost effectiveness and have been used extensively in the field of biology as drug delivery systems, nanoreactors, tissue engineering scaffolds etc.

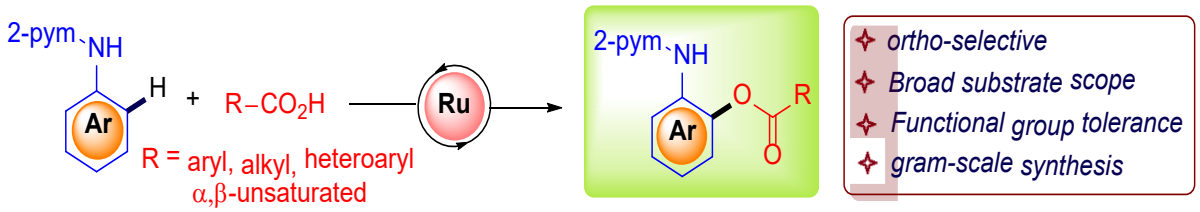
Ru(II)-Catalyzed Regioselective C-H Oxygenation of Aniline Derivatives using Removable Pyrimidine Auxiliary

Tanumay Sarkar, Sourav Pradhan and Tharmalingam Punniyamurthy*

Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati, 781039, India.

E-mail: tanumay@iitg.ac.in

Efficient Ru(II)-catalyzed positional selective C-H oxygenation of N-aryl-2-pyrimidines is described using carboxylic acids as acyl source. The reaction of a broad range of aryl carboxylic acids has been accomplished with diverse functional groups. These reaction conditions can be extended to the coupling of alkyl, heteroaryl and □□□-unsaturated carboxylic acids. The reaction using D2O as a co-solvent exhibits a significant H/D scrambling at the ortho-position which suggests that a reversible C-H metalation phenomenon is involved. Intermolecular kinetic isotope study indicates that the C-H bond cleavage might be involved in the rate-determining step. The broad substrate scope, functional group diversity and regioselectivity are the important practical features.



Scheme 1. Pyrimidine directed regioselective C-H oxygenation of aniline derivatives.

References:

[1] T. Sarkar, S. Pradhan, T. Punniyamurthy, J. Org. Chem. 2018, 83, 6444.

[2] K. Raghuvanshi, D. Zell, L. Ackermann, Org. Lett. 2017, 19, 1278.

[3] T. Okada, K. Nobushige, T. Satoh, M. Miura, Org. Lett. 2016, 18, 1150.

A Cascade Synthesis of S-allyl Benzoylcarbamothioates via Mumm-type Rearrangement

Tipu Alam, Anjali Dahiya, Wajid Ali and Bhisma K. Patel*

Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati-781039, India

E-mail: patel@iitg.ac.in

A catalyst and solvent free synthesis of S-allyl benzoylcarbamothioates has been achieved from the in situ generated benzoylcarbonimidothioates obtained by reacting MBH alcohols with aroyl isothiocyanates. An intramolecular thia-Michael addition of the adduct triggers a Mumm-type rearrangement leading to a stereoselective synthesis of highly functionalized S-allyl benzoylcarbamothioates.

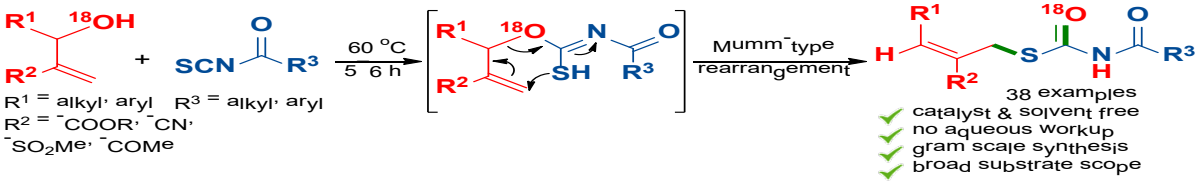


Figure 1. Cascade Synthesis of S-allyl Benzoylcarbamothioates.

The unique feature of the present protocol is the Mumm-type rearrangement that results in two different moieties viz. 2-methylthioacrylates and imides in same molecule. Both these motifs have immense biological properties. The present strategy can tolerate structurally discrete substrates with steric bulk and different electronic properties, which provides a straightforward and practical pathway for the synthesis of highly functionalized S-allyl benzoylcarbamothioate in excellent yield (up to 98%). The possibility of Mumm-type rearrangement has been confirmed by 18O labelling experiments.

References:

[1] A. Dahiya, W. Ali, and B. K. Patel, ACS Sustainable Chem. Eng. 2018, 6, 4272.

[2] A. Dahiya, W. Ali, T. Alam and B. K. Patel, Org. Biomol. Chem.2018, 16, 7787.

[3] R. Galeazzi, G. Martelli, G. Mobbili, M. Orena, and S. Rinaldi, Org. Lett. 2004, 6(15), 2571.

Vinylsilanes in Regioselective Synthesis of Azabicyclic Compounds

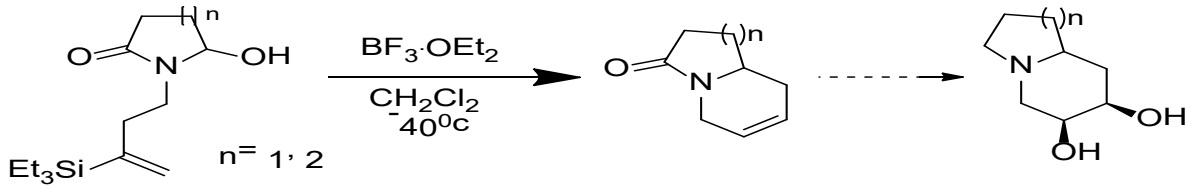
Upasana Borthakur and Anil K. Saikia*

Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati 781039, Assam, India

Email-asaikia@iitg.ac.in

Bicyclic compounds with a bridging nitrogen atom as part of both rings are known as azabicyclic compounds. Natural products containing azabicyclic moiety are known to exhibit broad biological activity and a diverse pharmacological profile. For example, poly-hydroxylated indolizidine, swainsonine exhibits potent glycosidase inhibitory activities and also show activity against carcinogenic cells and Human Immunodeficiency Virus.1 A marine alkaloid in this class, lepadiformine shows moderate cytotoxic activity against various tumor cell lines and shows high in vivo cardiovascular effects. 2

In continuation of our research in nitrogen heterocyclic chemistry, we have developed a methodology for the synthesis of 1,2,8,8a-tetrahydroindolizin-3(5H)-one and 2,3,9,9a-tetrahydro-1H-quinolizin-4(6H)-one using vinylsilane as precursor mediated by BF3.OEt2 at low temperature (Scheme 1).



Scheme 1

References:

[1](a) Winchester, B.; Fleet, G. W. J. Glycobiology 1992, 2, 199. (b) Winchester, B. Biochem. Soc. Trans. 1992, 20, 699. (c) Juge, M.; Grimaud, N.; Biard, J. F.; Sauviat, M. P.; Nabil, M.; Verbist, J. F.; Petit, J. Y. Toxicon 2001, 39, 1231.

[2] Juge, M.; Grimaud, N.; Biard, J. F.; Sauviat, M. P.; Nabil, M.; Verbist, J. F.; Petit, J. Y. Toxicon 2001, 39, 1231.

Ice-like Cyclic (H2O)6 Trapping and Aerial CO2 Fixation by Electron-rich Tripodal Receptors

Utsab Manna and Gopal Das

Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati, Assam 781039, India

E-mail: utsab.manna@iitg.ac.in

The development of two simple naphthyl and phenyl substituted modest tris-urea (L1 and L2) receptors and their tris-thiourea analogues (L3 and L4) derived from very common[tris(2-aminoethyl)-amine] skeleton for investigating their anion-coordination abilities inside the highly-electron-rich uncommon environment that were completely underexplored in solid state. The single crystal X-ray analysis establishes the formation of unique hexameric receptor-anion-water neutral molecular self-assemblies, where the conformationally flexible C3v-symmetric halide (F−/Cl−) encapsulated electron-rich naphthyl group containing N-bridged tripodal urea receptor L1 effectively entrap the chair-shaped ice-like neutral cyclic water hexamer within the hexameric cavity of receptor-halide bound host-guest association.

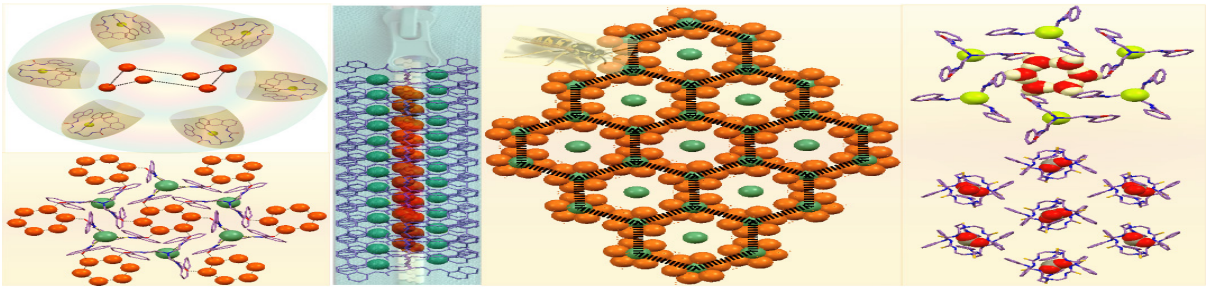


Figure 1.The comprehensive pictorial depiction of key outcomes in this research work.

On the other hand, the naphthyl based electron-rich thio-urea analog L3 even in the absence of any π-acidic or electron-withdrawing aryl terminals effectively entraps spherical fluoride, relatively larger spherical chloride and bromide, planar nitrate, and tetrahedral divalent sulfate anions inside the relatively smaller inner tripodal cleft (compared to many previously reported tren-based thiourea receptors) via 1:1 host-guest complexation mode, regularly assisted by n-TBA/TEA counter-cations. The efficient binding of anions of varied dimensionality consistently observed from single crystal X-ray

analyses are strongly corroborated by the detailed solution state NMR binding studies as well as from the Hirshfeld surface analyses of neutral host-guest complexes.
Subsequently, the phenyl substituted simple tris-urea receptor L2 and its thio-urea analog L4, despite their electron-rich tripodal cavities, are still capable of capturing chair-shaped cyclic water hexamer within the infrequent fluoride encapsulated hexameric L2 core (similar as receptor L1) as well as encapsulate divalent carbonate anion inside the dimeric capsular cage of receptor L4 via hydroxide ion induced aerial CO2 fixation. Moreover, structural analyses also elucidate the capturing of large dihydrogen phosphate [(H2PO4-)2] dimeric association within the neutral dimeric pseudo-capsular assembly of receptor L2, whereas the thiourea analogue L4 exhibits chloride and acetate bound 1:1 unimolecular capsular assembly and divalent sulfate bound dimeric cage via hydrogen-bonding activated proton transfer reaction from monovalent HSO4- anion.

References:

[1] U. Manna, S. Halder, G. Das Cryst. Growth Des., 2018, 18, 1818.

[2] U. Manna, G. Das Cryst. Growth Des., 2018, 18, 3138.

[3] U. Manna, G. Das CrystEngComm, 2018, 20, 3741.

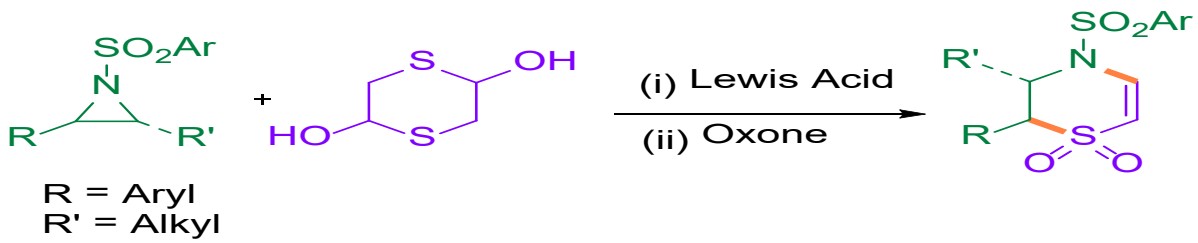
Bi-Catalyzed tandem C-N/C-S bonds formation of Aziridines with 2-Mercaptoethanol to access 1,4-thiazines

Murugan Vijay and Tharmalingam Punniyamurthy*

Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati-781039, India.

E-mail: tpunni@iitg.ernet.in

Nitrogen and Sulfur containing heterocycles are important structural bodies find broad utilities in agrochemical, medicinal and material chemistry.1 Among them 1,4-thiazine core structures are attractive as these motifs are often encountered in a variety of natural and biological active compounds such as anti-inflammatory, anti-mycobacterial, hypolipidemic and DPP-IV inhibitors.2 Aziridines are versatile building blocks for the tandem carbon-hetero atom bond formation, that can lead to diverse heterocyclic frameworks.3 Herein, we report regioselective ring expansion of aziridines with mercaptoethanol under lewis acid catalytic condition. 1,4-thiazines further oxidizes to biologically active 1,4-thiazine 1,1-dioxides.



References:

1.Fringuelli,R.; Milanese,L.; schiaffella,F. Mini Rev.Med.Chem., 2005, 5, 1061.

2.Bivara, M.; Porretta,G.C.; Dieidda, D.; Pompei, R.; Tafi, A.; Manetti, F. Bioorg.Med.Chem., 2003, 11, 515.

3.Tooulia, K. K.; Theodosis-Nobelos, P.; Rekka, E. A. Arch.Pharm., 2015, 10, 3010.

4.Callebaut, T.; Meiresonne, T.; Kimpe, N. D.; Mangelinckx, S. Chem.Rev., 2014 ,114, 7954.

5.Javorskis, T; Bagdziunas , G; Orentas, E. Chem.Commun., 2016, 52, 4325.

Aggrandizing electrochemical reduction of carbon dioxide to biofuels using a modified electrode in microbial electrolysis Cell

Abdul Hakeem Anwer1*, Mohammad Zain Khan1, Surajbhan Sevda2

1Environmental Research Laboratory, Department of Chemistry, Aligarh Muslim University,

Aligarh 202 002, Uttar Pradesh, India

2Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati, India

The bioelectrochemical systems are emerged in the last decade for generating bioelectricity from organic matter present in the wastewater using exoelectrogenic bacteria. Electrochemical reduction of CO2 to acetic acid (ERCA) is mainly hindered by CO2 mass transfer and high energy consumption. A modified cathode used in microbial electrolysis cells (MECs) that have high catalytic activity for CO2 reduction. Even though the absence of diffusion layer in poly (vinylidene fluoride) PVDF modified cathodes, it has potential to withstand in water without any leakage as compared to reported electrode prepared by using poly(dimethylsiloxane) diffusion layer and polytetrafluoroethylene binder. The PVDF binder-based tungsten oxide with reduced graphene oxide (rGO) cathode has been prepared on non-toxic stainless steel which has excellent performance in terms of power and current density as well as water leakage. The prepared electrode can be easily manufactured by using a single-step inversion process at room temperature. Additionally, augmenting of tungstate in rGO also promoted metabolism of microbes for electrosynthesis of biofuel in the MES reactor and increased acetic acid production compared to unmodified cathode. The MECs using this innovative modified cathode achieved an optimal power density of 1330 ± 40 mW/m2 along with CO2 (as a substrate) for biofuel production and a maximum current density of 5.13 ± 0.1 A/m2 was obtained in case of modified electrode MEC which was remarkably higher (29.8%) than unmodified electrode cathode (3.95 A/m2). Moreover, the modified electrode-MEC attained the highest production rate of acetic acid (37.9 mmole/L), which was significantly higher (43.0%) in comparison to the non-modified electrode MEC. In future work is needs for these cathode manufactures and this process need to be inexpensive and watertight

Keywords: Microbial electrosynthesis, Tungsten oxide & poly(vinylidene fluoride), Bioelectricity.

NUTRITIONAL EVALUATION OF SOME COMMON DRY FRUITS

Bitopi Mahanta1, B. Papori Bharali2, C. Purasmita Saikia3

Department of chemistry, Assam Kaziranga University, Jorhat, Assam, India

E-mail: bitopimahanta0@gmail.com , paporibharali1998@gmail.com , purasmitasaikia@gmail.com

Every person needs good health and for good health we want good things to care of our health. To attain good health, it is essential to follow good nutrients. Dry fruits have been recognized as an abundant source in providing essential nutrients which supplies good amount of carbohydrates, protein, fats,

minerals like iron, potassium, sodium, phosphorus etc. We have many qualities of dry fruits like Raisin (Vitis vinifera), Walnut (Juglans regia), Cashewnut (Anarcardium occidentale), Peanut (Arachis hypogaea), Dry coconut (Cocos nucifera), Date palm (Phoenix dactylifera). An investigation aimed at determining the proximate composition and mineral content present in these dry fruits was carried out and were determined on dry weight basis.
The study revealed that different varieties of dry fruits contains considerable amount of all the nutrients and hence are nutritionally rich food. It has a very rich amount of protein and fats as compared to starch, reducing sugar (raisin and cashew nut has high amount of reducing sugar compared to other) and minerals.

Keyword: proximate analysis, dry fruits, therapeutic, human diet.

References:

Hui,YH (2006). In Handbook of fruits and fruit processing., Blackwell Publishing AOAC, (1990) Official Methods of Anslysis. 15th edition. , Association of Official Analytical Chemists.

Re-visiting the antioxidant activity of Se- and Te- carbohydrates: A theoretical study

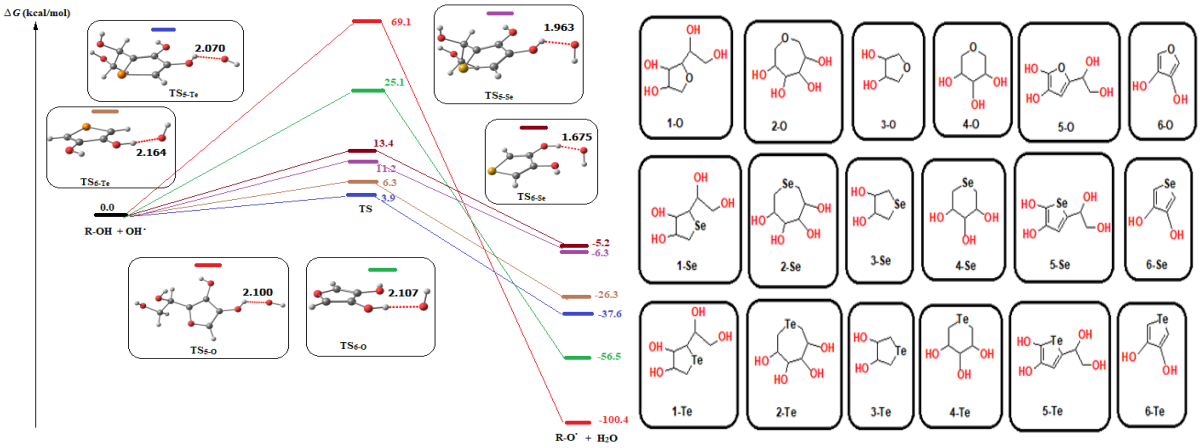
Chayanika Kashyap, Lakhya Jyoti Mazumder, Shahnaz S. Rohman, Sabnam S. Ullah and Ankur 3 Kanti Guha*

Department of Chemistry, Cotton University, Panbazar, Guwahati, Assam, India-781001

*E-mail: ankurkantiguha@gmail.com

An antioxidant is a molecule capable of inhibiting the oxidation of other molecules. Oxidation reactions can produce free radicals in the form of reactive oxygen species (ROS), such as superoxide anion radicals (O2•−), hydrogen peroxide (H2O2), hydroxyl radicals (OH•), and the singlet oxygen. In turn, these reactive ROS cause destructive and irreversible damage to the components of a cell, such as lipids, proteins and DNA. Antioxidants terminate these chain reactions by removing free radical intermediates, and inhibit other oxidation reactions.1 In addition to those of body origin antioxidants, human body can also take up synthetic or natural antioxidants in diets. Recently, stable Se- and Te-containing carbohydrates are synthesized which have capabilities to indulge with a wide range of biological oxidants including those generated by the inflammatory enzyme myeloperoxidase (hypochlorous acid, HOCl; hypobromous acid, HOBr; hypothiocyanous acid, HOSCN), peroxynitrous acid (ONOOH), peroxides (H2O2, ROOH) and singlet oxygen (1O2).2,3,4 The synthetic route of organoselenoids and organotelluroids allowed the incorporation of selenium and tellurium in place of oxygen of carbohydrates. It is believed that the antioxidants may follow mainly four mechanisms - 1. Hydrogen atom transfer (HAT) 2. Single electron transfer (SET) 3. Single electrom transfer followed by proton transfer (SET-PT) 4. Sequential proton loss electron transfer (SPLET).2,3,5,6,7

Herein, we have taken these organoselenoids and organotelluroids and studied their antioxidant properties by computing –OH bond dissociation enthalpy (BDE), ionization enthalpy (IE), proton dissociation enthalpy (PDE), electron transfer enthalpy (ETE) and radical stabilization enthalpy (RSE) using density functional theory. Using these parameters, this study predicted the probable mechanism of their action and investigated the effect of selenium and tellurium atom on these behaviors. We have also included two aromatic derivatives to investigate the effect of aromatization on the antioxidant ability of these compounds.



SCHEME: Schematic representation of the studied compounds

FIGURE: Reaction profile for OH• radical scavenging reaction. The optimized geometries of the transition states are also shown. Bond lengths are in Å.

References

[1] R.Borgohain, A. K. Guha, S. Pratihar, J. G. Handique, Comput. Theor. Chem. 2015, 1060, 17.

[2] M. P. Borpujari, R. Rohman, R. Kar, RCS Adv., 2015, 5, 78229.

[3] (a) L. Marchand, Biomed Pharmacother, 2002, 56, 296; (b) S. Shabaan, L. A. Ba, M. Abbas, T.Burkholz, A. Denkert, A. Gohr, L. A. Wessjohann, F. Sasse, W. Weber, C. Jacob, Chem. Commun, 2009, 4702; (c) R. Amorati, L. Valgimigli, P. Dinér, K. Bakhtiari, M. Saeedi, L. Engman, Chem. Eur. J. 2013, 19, 7510; (d) T. Marino, A. Galano, G. Mazzone, N. Russo, J. R. A. Idaboy, Chem. Eur. J. 2018, 24, 8686.

[4] R. J Anto, K. Sukumarana, G. Kuttana, M. N. A. Raob, V. Subbarajuc, R. Kuttana, Cancer Letters, 1995, 97, 33.

[5] R. Borgohain, A. K. Guha, S. Pratihar, J. G. Handique, J. Theor. Comput. Chem. 2016, 15, 1650028.

[6] (a) P. Trouillas, P. Marsal, A. Svobodova, J. Vostalova, R. Gazak, J. Hrbac, P. Sedmera, V. Kren, R. Lazzaroni, J. L. Duroux, D. Walterova, J. Phys. Chem. A 2008, 112, 1054; (b) J. M. Matxain, M. Ristilä, A. Strid, L. A. Eriksson, J. Phys. Chem. A. 2006, 110, 13068.

[7] (a) E. L. Borges, M. T. Ignasiak, Y. Velichenko, G. Perin, C. A. Hutton, M. J. Davies, C. H. Schiesser, Chem. Commun. 2018, 54, 2990; (b) C. W. Nogueira, G. Zeni, J. B. T. Rocha, Chem. Rev. 2004, 104, 6255 and references therein.

ARTIFICIAL MOLECULAR MACHINE: A NEW ERA OF SCIENCE

Devaleena Kalita, Bipasha Saikia, Pahari Phukan

Department of Chemistry, Assam Kaziranga University, India

E-mail: devaleena4@gmail.com

A molecular level machine is an assembly of a distinct number of molecular components that are designed to perform machinelike movements (output) which is a result of an appropriate external stimulation (input). Molecular machines are divided into two broad categories- artificial and biological. Artificial molecular machines refer to molecules that are artificially designed and synthesized whereas biological molecular machines can commonly be found in nature. In biology, the macromolecular machine frequently performs complex tasks essential for life like DNA replication and ATP synthesis.
In 1983, Jean-Pierre Sauvage created a Catenane, which is a two molecule linked together in a ridiculously small chain, free to rotate around each other. In 1991, Sir James Stoddart invented Rotaxane, where a ring shaped molecule rotates around a dumble shaped axal, bringing a new kind of motion to molecular machine. Recently molecular machines have been an widely focused area in broad field of chemistry. In 2016, Bernard Feringa invented the1st four wheeled molecular motor that spins in one direction and powered by light and heat-driven isomerization of a double bond. The first artificial molecular machine; a molecular shuttle was synthesized by Sir Fraser Stoddart for which he was awarded with the Nobel Prize, 2016. The best energy input to make molecular machine work is photons and electrons. With appropriately chosen, photo chemically and electrochemically driven reactions, it is possible to design and synthesized molecular machine that do work.
In our present work we propose to discuss about the synthesis and application of some artificial molecular machine that has importance in chemical as well as biological world.

Keywords: molecular machine, catenane, rotaxanes, molecular shuttle, nano-technology.

References: Balzani, V, Credi, A, M. Raymo, F, Stoddart, J.F, Artificial molecular Machine-Machine at the molecular level (Wiley- VCH, Weinheim, 2000)

Green and Practical Protocol for Bromination of Organic Compounds

Diksha Maheswari1, Manisha Hazarika1, Ranjoy Loying1

1Department of Chemistry, JB College (Autonomous), Jorhat, Assam

E-mail: maheswari.diks@gmail.com

A green, easy to operate and practical protocol for the regioselective oxybromination of aromatic compounds using KBr as the source of bromine in presence of an environmentally benign oxidant and catalyst is described. This method is very effective in bromination of organic substrates at room temperature in a selective manner. The catalyst is cheap, ecologically favourable, safe to handle and recyclable. High yields of products, mild reaction condition, high selectivity and redundancy of bromine and HBr are some major advantages of the synthetic protocol.

Keywords: Oxybromination, aromatic compounds, environmentally benign, regioselective, recyclable, etc.

GRAPHENE: THE FUTURE OF CANCER THERAPY

Dixita Rani Gogoi, Plabita Boruah

Department of Chemistry, Assam Kaziranga University, India

E-mail: dixitaranigogoi03@gmail.com

Nowadays cancer remains one of the main causes of death in the world. Current diagnostic techniques need to be improved to provide earlier diagnosis and treatment. Traditional therapy approaches to cancer are limited by lack of specificity and systemic toxicity. In this scenario na-nomaterials could be good allies to give more specific cancer treatment effectively reducing un-desired side effects and giving at the same time accurate diagnosis and successful therapy. In this context, thanks to its unique physical and chemical properties, graphene, graphene oxide (GO) and reduced graphene (rGO) have recently attracted tremendous interest in biomedicine including cancer therapy. Herein we analyzed all studies presented in literature related to cancer fight using graphene and graphene-based conjugates. In this context, we aimed at the full picture of the state of the art providing new inputs for future strategies in the cancer theranostic by using of graphene. We found an impressive increasing interest in the material for cancer therapy and/or diagnosis. The majority of the works (73%) have been carried out on drug and gene delivery applications, following by photothermal therapy (32%), imaging (31%) and photodynamic therapy (10%). A 27% of the studies focused on theranostic applications. Part of the works here discussed contribute to the growth of the theranostic field covering the use of imaging (i.e. ultrasonography, positron electron tomography, and fluorescent imaging) combined to one or more therapeutic modalities. We found that the use of graphene in cancer theranostics is still in an early but rapidly growing stage of investigation. Any technology based on nanomaterials can significantly enhance their possibility to became the real revolution in medicine if combines diagnosis and therapy at the same time. We performed a comprehensive summary of the latest progress of graphene cancer fight and highlighted the future challenges and the innovative possible theranostic applications. Cancer remains one of the main threats to humanity. Diagnostic and treatment techniques though being updated are still away from ideal. Traditional therapy approaches are limited by lack of systemic toxicity. In this scenario, nanomaterials could be good allies to give more specific cancer treatment effectively reducing undesired side effects and giving at the same time accurate diagnosis and successful therapy. In this regard, unique physical and chemical properties of graphene, graphene oxide (GO) and reduced graphene (rGO) have recently attracted tremendous interest in biomedicine including cancer therapy.

Herein we have planned to analyze all studies available on cancer therapy using graphene and graphene-based conjugates in chronological order. In this context, we aimed at the full picture of the state of the art providing new inputs for future strategies in the cancer theranostic by using of graphene. We found an impressive increasing interest in the material for cancer therapy and/or diagnosis. The majority of the works (73%) have been carried out on drug and gene delivery applications, following by photothermal therapy (32%), imaging (31%) and photodynamic therapy (10%). A 27% of the studies focused on theranostic applications. Part of the works here discussed contributes to the growth of the theranostic field covering the use of imaging (i.e. ultrasonography, positron electron tomography, and fluorescent imaging) combined to one or more therapeutic modalities. We found that the use of graphene in cancer theranostics is still in an early but rapidly growing stage of investigation. Any technology based on nanomaterials can significantly enhance their possibility to became the real revolution in medicine if combines diagnosis and therapy at the same time. We performed a comprehensive summary of the latest progress of graphene cancer fight and highlighted the future challenges and the innovative possible theranostic applications.

Key words: Graphene, Nanomedicine, Carbon materials, Cancer, Tumor, Theranostics, Therapy.

References: Lopez-Gomez M, Malmierca E, de Gorgolas M, Casado E, Fernandez-Fernandez A, Manchanda R, McGoron AJ. Theranostic applications of nanomaterials in cancer: drug delivery, image-guided therapy, and multifunctional platforms. Applied biochemistry and biotechnology. 2011; 165:

1628-51.doi:10.1007/s12010-011-9383-z.

Doxorubicin coated hydroxyapatite (HAp) – poly (lactide-co-glycolide) (PLGA) nancomposite: Preparation, characterization and biomedical application as a promising tool for controlling osteosarcoma therapeutics

Saikat Ghosh1, Sampad Ghosh2*, Nabakumar Pramanik1

1Department of Chemistry, National Institute of Technology, Arunachal Pradesh, PIN-791112, India.

2Department of Chemistry, Nalanda College of Engineering, Nalanda-803108, Bihar, India.

*Corresponding Author Tel.: +91-9434238986

E-mail address: justsampad@gmail.com (Dr. Sampad Ghosh)

Nano drug delivery systems are widely used cancer therapy in nowadays. It is used to accomplish a remarkable drug therapeutic index to increase the efficacy of nanocomposites against the cancer cells without affecting the other cells. Ceramic nanoparticles are very well-known to carry chemotherapeutic drugs to the infected sites. This interest is motivated by their potential to be applied as a promising biomaterial, especially used in various orthopaedic applications. In this current research study, Hydroxyapatite (HAp) was prepared by a simple in situ precipitation method and coated with a potent anticancer drug doxorubicin (DOX) using poly (lactide-co-glycolide) (PLGA) polymer. The interfacial strength of the composite was enhanced due to the use of polymer in the nanocomposite preparation. An interaction between HAp particle and PLGA matrix has been noticed, which leads to improve the physicochemical properties of the prepared composites. Such a novel nanocomposite was further characterized physicochemically using Fourier transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), Transmission electron spectroscopy (TEM), Particle size distribution (PSD). In addition, the biocompatibility and the anticancer activity of the nanocomposite were evaluated by a colorimetric assay (MTT assay). The synthesized DOX-HAp-PLGA nanocomposite shows a significant cytotoxicity towards osteosarcoma cells which may be potentially used as an anticancer agent against osteosarcoma diseases.

Ohmic type Resistive Switching in Bulk SnO2

Gyaneshwar Sharma, Harminder Kaur*

Department of Applied Sciences, Punjab Engineering College, Sector-12, Chandigarh

Presenting Author: hkaur@pec.ac.in

Phenomenon of resistive switching – fashionable alteration of resistive state from high to low (reversible) – under the gradient of electrical potential is observed in metal oxides thin film. From technology point of view, there is significant appreciation towards the insurgence of unconventional activity – realized at cost of intimation of various degree of freedom – for more promising nature and versatile potential. Such electrical response of transition metal oxides is exploited in Resistive switching based memory devices for their extra reliability, fast switching, high data storage capability, having room towards unprecedented low scalability (suitable for high storage density) over ferroelectric-magnetic-semiconducting analogous. Here, we report electric field induced switching behavior from one resistive state to other resistive state in bulk SnO2 materials. From the gradually rise in interest

towards more reliable and high energy storage devices, metal oxides with different morphologic structure are investigated. Instability in resistive state of metal oxides are driven through field induced lattice distribution, which causes a scattering of mobile electron of different strength. The emergence of resistive switching in "bulk SnO2" along with Ohmic nature is rarely reported. Resistive switching behavior is less studied in bulk form; but appearance of resistive switching in bulk state may provide a more space towards the theoretical studies and its proper understanding beyond the existing limit.

Reference:

1.D. S. Jeong, R. Thomas, R. S. Katiyar, J. F. Scott, H Kohlstedt, A Petraru and C. S. Hwang, Rep. Prog. Phys. 75 (2012) 076502

2.F. M. Simanjuntak, D. Panda, K-H Wei and T-Y Tseng, Nanoscale Res. Lett. 11 (2016) 368

3.K. M. Kim, D. S. Jeong and C. S. Hwang, Nanotechnology 22 (2011) 254002

4.D. S. Jeong, R. Thomas, R. S. Katiyar, J. F. Scott, H Kohlstedt, A Petraru and C. S. Hwang, Rep. Prog. Phys. 75 (2012) 076502

5.T. Wan, B. Qu, H. Du, X. Lin, Q. Lin. D.-W. Wang, C. Cazorla, S. Li, S. Liu, D. Chu, Journal of Colloid and Interface Science 512 (2018) 767–774.

6.S. Almeida, B. Aguirre, N. Marquez, J. McClure and D. Zubia, Integrated Ferroelectrics, 126, (2011) 117-124

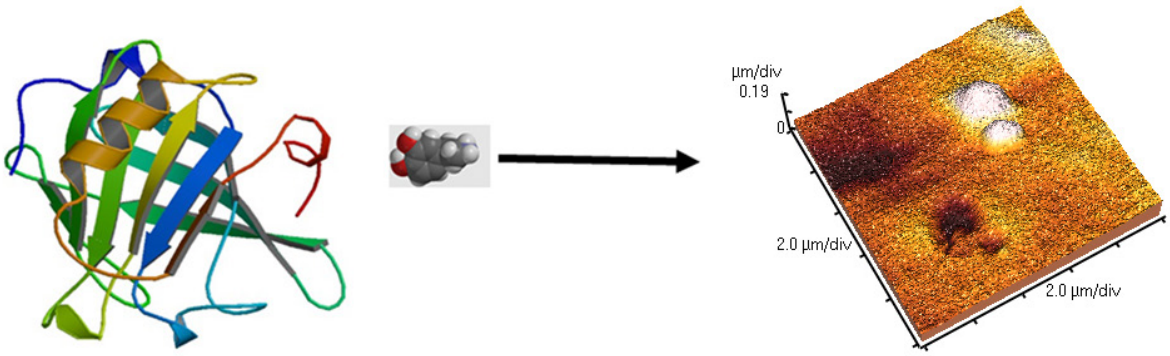
Dopamine inhibits the fibrillation of bovine β-lactoglobulin

Hasan Parvej, Suddhanta Choudhury and Umesh Chandra Halder*

Department of Chemistry, Jadavpur University, Kolkata-700032, India

Email: parvej.hasan300@gmail.com and uhalder2002@yahoo.com

Several diseases like Alzimer's, Parkinson's, type II Diabetes are due to the disorder of the corresponding cells through the deposition of protein aggregates via the formation of amyloid fibrils. β-Lactoglobulin (β-lg), the major whey protein having affinity for a wide range of organic compounds like fatty acids, retinol etc. forms fibrillar aggregates during its thermal exposure1. Dopamine is a neurotransmitter that is produced in the substantia nigra, ventral tegmental area, and hypothalamus of the brain2. Also dysfunction of the dopamine system has been implicated in different nervous system diseases. The nature of interaction of β-lg with dopamine remains unexplored. Fluorometric and atomic force microscopic studies suggest that the lesser formation of aggregates during thermal incubation in presence of dopamine. Our experimental findings demonstrate that dopamine can inhibit the fibril formation of β-lg. Docking simulation reveals a possible mechanism for different mechanism and modes of binding preferred by dopamine.



Reference:

1. S. Maity, S. Pal, S. Sardar, N. Sepay, H. Parvej, S. Begum, R. Dalui, N. Das, A. Pradhan and U. C. Halder, New J. Chem., 2018, 42, 19260-19271

2. M. Furkana, A. Rizvia, M. T. Alam, M. Zaman, R. H. Khan, A. Naeem, Int. J. Biol. Macromol., 2017, 102, 893–900

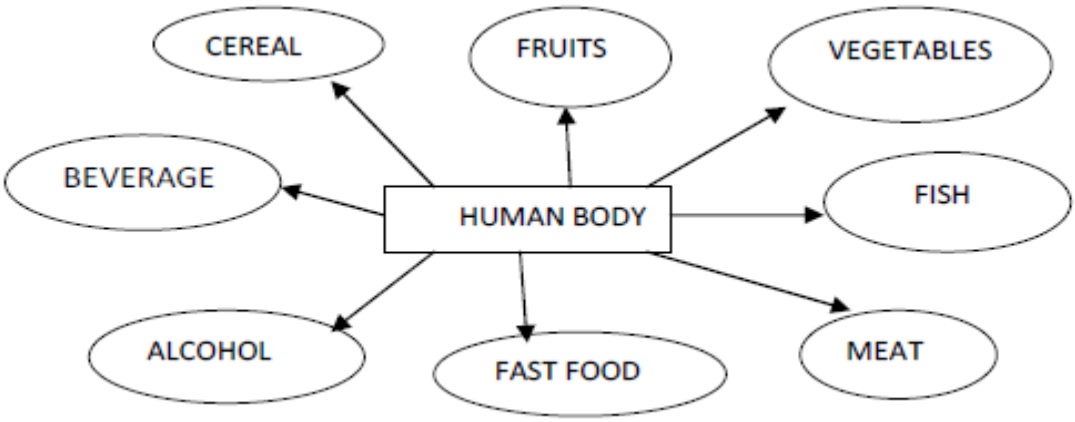
CHEMICALS: EFFECT ON HUMAN BODY THROUGH FOOD

Debakshi Kashyap, Hiya Patowary

Department Of Chemistry

The Assam Kaziranga University,Jorhat-785006

E-mail: patowaryhiya@gmail.com



Food is a basic necessity in our lives but in recent years due to increase in food demands more chemicals are used for their more production and preservation. These chemicals can be toxic when they enter human body and can have several ill effects. Here the main focus is on the chemicals that are present on our everyday diet. Several herbicides are spread on cereal plants to protect them from insects but this in turn is carcinogenic to the one consuming it. Fast food has high concentration of saturated fat and other

chemicals which leads to overweight, heart stroke. Several chemicals are used as ripening agent in fruits and vegetables such as acetylene, ethylene to ripen1 immature fruits. Formalin2 is spread on fish to keep it fresh for a longer time. Roxarsone, an arsenic3 based drug is feed to chicken to speed their growth. Beer and wine has ethanol which can cause stupor, unconsciousness. Beverages like coffee4 have acrylamide overexposure to which can cause damage to nervous system. The present study is to highlight the toxic chemicals present in daily diet, their effect on human body and ways to minimize their effects on a single platform

Keywords: Food, Herbicide, Toxic, Human body

REFERENCE:

1) Siddique M.W.; Dhua.R.S. (2010) Eating artificially ripened fruits is harmful. Current Science,1664-1668

2) Haque,E.; Mohsin,A.B.M. (2009) Intensity of formalin use for consumable fish preservation in Dhaka City, Bangladesh. Journal Of Fisheries International 4 (3),52-54

3)Jomova,K.;Jenisova,Z.;Feszterova,M.;Baros,S.;Liska,J.;Hudecova,D.;Rhodes,C.J.;Valko,M.(2011) Arsenic: toxicity, oxidative stress and human disease. Journal Of Applied Toxicology 31(2),95-107

4) Higdon,J.V.; Frei,B.(2006) Coffee and health: a review of recent human research.Critical reviews in food science and nutrition 46 (2),101-123.

ASSESSMENT OF WATER QUALITY IN GARAMPANI WILDLIFE SANCTURY OF ASSAM WITH SPECIAL REFERENCE TO FLUORIDE

A. Meghnath Kalita , B. Bikash Deka , C. Samiran Morang

Department of Chemistry, Dibrugarh University, Dibrugarh ,Assam, India

Email ID: meghnathjio70@gmail.com , bikashdeka450@gmail.com , samiranmorang26@gmail.com

Water is the most valuable natural resource for life on earth. Safe drinking water is a primary need of every human being; Groundwater is the most significant source of drinking water throughout the world though surface water plays a vital role in the supply of water for drinking. It was estimated that, only 0.9% of the total water resources on earth is obtained as groundwater and it is considered to be the major and the preferred source of drinking water in rural as well as urban areas.

Contamination of drinking water, either directly or indirectly by sewage and other waste or by human or animal excrement is the most common and widespread danger associated with water quality problems in the developing and underdeveloped countries. The drinking water contamination by fluoride is among the most dangerous environmental health challenges nowadays in all over the world. The presence of fluoride and its adverse health effects has been reported from different parts of World like USA, Africa, and Asia, China, India, Sri Lanka. The most common health problems associated with excess fluoride in drinking water are dental and skeletal fluorosis At present, in India, endemic fluorosis is thought to affect more than 1 million people. Several districts of Assam like Golaghat, Karbi Anlong, Nagaon, Dhemaji, Goalpara, Kamrup etc. have also been found to be affected by fluoride in groundwater Among the fluoride affected districts of Assam, groundwater sources of Karbi Anlong which is an adjoining district of Golaghat are found to be highly contaminated by fluoride. The present study aims to identify the fluoride hot spots of Garampani Wildlife Sanctuary of Karbianlong district and to ascertain the portability of water being used by local population.

Key Words: Water Quality, Flouride, hot water Spring, Ground water contamination

Reference:

1.Kulshreshtha, S. N. (1998). A Global Outlook for Water Resources to the Year 2025. Water Resources Management 12 (3), 167–184.

2.Bunnell, J. E., Finkelman, R. B., Centeno, J. A., Selinus, O. (2007). Medical Geology: a globally emerging discipline. Geologica Acta, 5 (3), 273-281

3.Bureau of Indian Standards (BIS) 10500:1991, Second Revision ICS No. 13.060.20; downloaded from: http://www.bis.org.in/sf/fad /FAD25(2047)C. pdf on January 06, 2010.

Deep green light emitting imidazole linked indoloquinoxaline materials for organic light emitting diodes

Subramanian Muruganantham and Rajalingam Renganathan*

School of Chemistry, Bharathidasan University, Tiruchirappalli- 620 024, Tamil Nadu, India.

E-mail: rrengas@gmail.com

A new Pro-active green emitter molecules having imdazole linked indoloquinoxaline through π-spacer was strategically devised and synthesized towards optoelectronic applications. The electroluminescence (EL) performance of BMIQ emitter revealed peak at 518 nm, which is depicted in deep green emission, the full width at half maximum (FWHM) obtained at 34 nm, which proven high color purity and corresponding CIE coordinates of x= 0.23; y= 0.42. Considerably, the fluorophores exhibit appropriate HOMO-LUMO energy level and good thermal stabilities with high glass transition (Tg) and onset decomposition temperature (Td). The device was significantly refined with 6.5 % of external quantum efficiency (EQE), which indicates very effective energy transfer occur in the system. Hence, the doped OLED device has achieved the maximum luminescence efficiency at 7866 cd m-2, current efficiency of 19.8 cd A-1 and maximum power efficiency of 9.3 cd m-2.

Keywords: Ambipolar, doped organic light emitting diodes, donor-acceptor, green emitter, imidazole, indoloquinoxaline.

Reference

1.A. Venkateswararao, P. Tyagi, K. R. Justin Thomas, P.-W. Chen and K.-C. Ho, Tetrahedron, 2014, 70, 6318-6327.

2.S. Muruganantham, N. Nagarajan, G. Velmurugan, A. Prakash, M. Katiyar, P. Venuvanalingam and R. Renganathan, Materials Chemistry Frontiers, 2017, 1, 1373-1383

GRAPHENE: DEVELOPMENTS AND FUTURE

Nisha nath, Rimpi gogoi

Department of Chemistry

The Assam Kaziranga University, Jorhat-785006

E-mail: rimpi3097@gmail.com

Graphene is a widely focused allotrope of carbon.1 It is visualized as the material for next generation technological applications such as sensing to low cost energy efficient electronic devices.2 Although the scope of applications of graphene is high but it is associated with lots of challenges of achievable outputs.3 Herein, we are trying to focus on the synthesis, structure and applications of graphene. The main objective of this presentation is to highlight the developments of the scientific arena associated with graphene in chronological order and to place the challen.

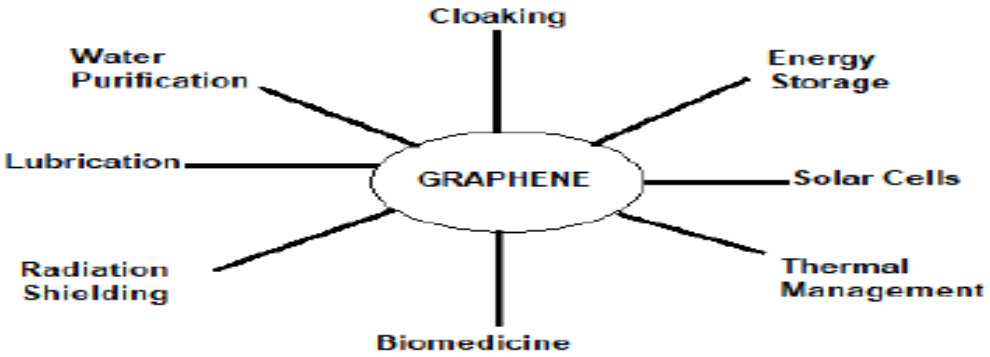


Figure: Uses of Graphene in different fields

Keywords: Graphene, Commercialization, Chemically modified Graphene, Synthesis,

References:

1. Liao, L.; Peng, H.; Liu, Z. J. Am. Chem. Soc., 2014, 136, 12194–12200

2. Iqbal, A.; Sajjad, S.; Leghari, S A K. ACS Appl. NanoMater., 2018, 1, 4612– 4621

3. Seabra, A. B.; Paula, A. J.; Lima, R. D.; Alves, O. L.; Durán, N.Chem. Res. Toxicol., 2014, 27, 159–168

MODERN APPLICATION OF METAL NANOPARTICLE IN DAY TO DAY LIFE

Purasmita saikia1 Bitopi Mahanta2 Papori Bharali3

Department of chemistry, Assam Kaziranga University, Jorhat,Assam,India

Email: purasmitasaikia@gmail.com, bitopimahanta0@gmail.com, paporibharali1998@gmail.com

Nanoparticle are the particle between 1-100 nm in size with a surrounding interfacial layer. Metal nanoparticles have interesting unique properties compared to the larger corresponding metal particle. Metal particles with nano and uniform sizes have been intensively investigated recently because they

have application in Optics, Electronics, Magnetic devices and as catalysts, photocatalysts, adsorbents and sensors.
“Everything, when miniaturized to the sub 100 nm scale, has new properties regardless of what it is,” Says Chad Mirkin, Professor of Chemistry (and material science, engineering, medicine, biochemical engineering and Chemical biological engineering) at Northwestern University. This is what makes nanoparticles the material of future. They have strange physical and chemical properties compared to their large particle kin. The thing that matters about nanoparticles is their scale. Because of the scale of nanoparticle they are used in everything from sunscreen to chemical catalyst to antibacterial agents from the mundane to lifesaving.

Key word: nanoparticles, applications, benefits

Investigation on common metalin sugarcane molasses of Dergaon area of Golaghat district of Assam

MonalisaBaruah1,SouravSankarNath1,PulakeshBorah1

UndertheguidanceofBhupenKBaruah,Asst.Prof

1 Department of Chemistry, JB College(Autonomous),Jorhat, Assam

E-mail: monalisabaruah13@gmail.com

Sugar cane molasses of Dergaon area of Golaghat district is very popular in all over Assam with respect to its quality and taste. Quality of sugar cane molasses of this area is not reported till now. Therefore, a study has been carried out to find out the metal ions present in it. The raw and process molasses have been studied for some common metals such as Na, K, Ca, Mg and Fe. Study reveals that it contains highest amount of Fe followed by K, Na, ca and Mg.

KeyWords: Sugar cane molasses, metal ions etc.

ALLOTROPES OF CARBON

Priyanka Saikia, Rishagni Chetia, Pallabi Saikia

Department of Chemistry

The Assam Kaziranga University, Jorhat - 785006

E-mail:saikiapallabi25@gmail.com

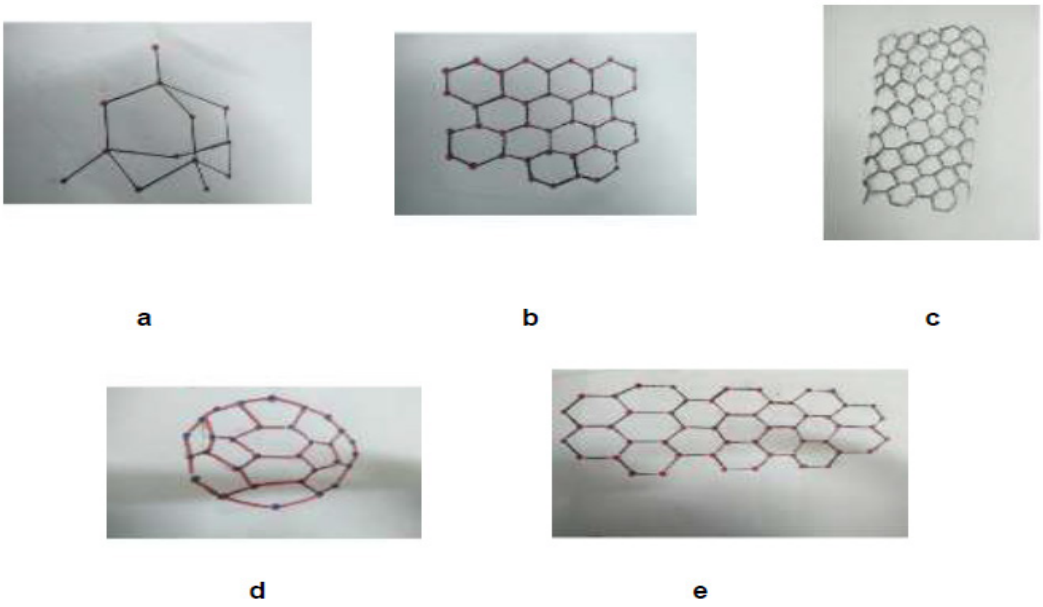


Figure: a) Diamond b) Graphite c) Carbon Nano Tubes (CNTs) d) Fullerenee) Graphene

Allotropes are the different structural modification of an element. Among all the allotropes carbon allotropes are of particular interest.1 Diamond and graphite are the two very common natural carbon allotropes.2 In recent decades various other artificial carbon allotropes are invented. Fullerene3 is the first of its kind that was discovered in 1985 by Robert F. Curl Jr, Harold kroto and Richard E. Smally. This molecule containing sixty atoms of carbon has been named Buckminster fullerene. Lots of scientific discussions and research interests have been focused on the synthesis as well as structure, properties and applications of artificial carbon allotropes like fullerene, graphite, graphene4 and carbon nanotubes (CNTs)5. Herein, we are trying to highlight the special aspects of artificial carbon allotropes in a single platform.

Keyword: Carbon allotropes, diamond, fullerene, CNTs, graphite, graphene.

Reference:

1) Karthik, P. S.; Himaja, A. L.; Singha, S. P. Carbon letters, 2014, 15, 219-237

2) Santos, N. F.; Cicuéndez, M.; Holz, T.; Silva, V. S.; Fernandes, A. J. S.; M. Vila, M.; Costa, F. M. ACS Appl. Mater. Interfaces, 2017, 9, 1331–1342

3) Thilgen, C.; Diederich, F.; Chem. Rev., 2006, 106, 5049–5135

4) Tiwari, S. K.; Kumar, V.; Huczko, A.; Oraon, R.; Adhikari, A. D.; Nayak, G. C. Critical reviews in solid state and material sciences, 2016, 41, 257-317

5) Barnard, A. W.; Zhang, M.; Wiederhecker, G. S.; Lipson, M.; McEuen, P. L. Nature,

2019, https://doi.org/10.1038/s41586-018-0861-0.

Environmental toxicology and chemicals effecting the environment

A. Rismita Neog1 ,and B. Chanda Deb2

1 Department of Chemistry, Assam Kaziranga University, Jorhat, Assam, India

2 Department of Chemistry, Assam Kaziranga University, Jorhat, Assam, India

E-mail: rismitaneog464@gmail.com

Toxicology1 is the quantitative study of the effects of harmful substances or stressful conditions on organisms. This broad field is broken down into three divisions and one of them is environmental toxicology. Environmental toxicology2 is the study of poisons or pollutants and their action on the environment. Scope of this topic includes: Air, Soil, Water, Food contamination and pollutions. Common environmental chemicals are pesticides3, volatile organic such as benzene, toluene, acid rain4, ozone layer depletion5. Toxic waste from cities and industries give rise to new diseases, for example, Carcinogenicity6, ecosystem impact and health hazards.

Keywords: Toxicology, Environmental toxicology, Pesticides, Acid rain, Ozone layer depletion, Carcinogenicity.

Reference:

1) R.Rajagopalan; Book- Environmental studies

2) Linlin Sai, Binpeng Qu, Juan Zhang, Jian Liu, Qiang Jia, Cunxiang Bo, Yu Zhang, Gongchang Yu; 24 Jan 2019.

ASSESSMENT OF WATER QUALITY IN GARAMPANI WILDLIFE SANCTURY OF ASSAM WITH SPECIAL REFERENCE TO FLUORIDE

A. Meghnath Kalita , B. Bikash Deka , C. Samiran Morang

Department of Chemistry, Dibrugarh University, Dibrugarh ,Assam, India

Email ID: meghnathjio70@gmail.com , bikashdeka450@gmail.com , samiranmorang26@gmail.com

Water is the most valuable natural resource for life on earth. Safe drinking water is a primary need of every human being; Groundwater is the most significant source of drinking water throughout the world though surface water plays a vital role in the supply of water for drinking. It was estimated that, only 0.9% of the total water resources on earth is obtained as groundwater and it is considered to be the major and the preferred source of drinking water in rural as well as urban areas.
Contamination of drinking water, either directly or indirectly by sewage and other waste or by human or animal excrement is the most common and widespread danger associated with water quality problems in the developing and underdeveloped countries. The drinking water contamination by fluoride is among the most dangerous environmental health challenges nowadays in all over the world. The presence of fluoride and its adverse health effects has been reported from different parts of World like USA, Africa,

and Asia, China, India, Sri Lanka. The most common health problems associated with excess fluoride in drinking water are dental and skeletal fluorosis At present, in India, endemic fluorosis is thought to affect more than 1 million people. Several districts of Assam like Golaghat, Karbi Anlong, Nagaon, Dhemaji, Goalpara, Kamrup etc. have also been found to be affected by fluoride in groundwater Among the fluoride affected districts of Assam, groundwater sources of Karbi Anlong which is an adjoining district of Golaghat are found to be highly contaminated by fluoride. The present study aims to identify the fluoride hot spots of Garampani Wildlife Sanctuary of Karbianlong district and to ascertain the portability of water being used by local population.

Key Words: Water Quality, Flouride, hot water Spring , Ground water contamination

Reference:

1.Kulshreshtha, S. N. (1998). A Global Outlook for Water Resources to the Year 2025. Water Resources Management 12 (3), 167–184.

2.Bunnell, J. E., Finkelman, R. B., Centeno, J. A., Selinus, O. (2007). Medical Geology: a globally emerging discipline. Geologica Acta, 5 (3), 273-281

3.Bureau of Indian Standards (BIS) 10500:1991, Second Revision ICS No. 13.060.20; downloaded from: http://www.bis.org.in/sf/fad /FAD25(2047)C.pdf on January 06, 2010.

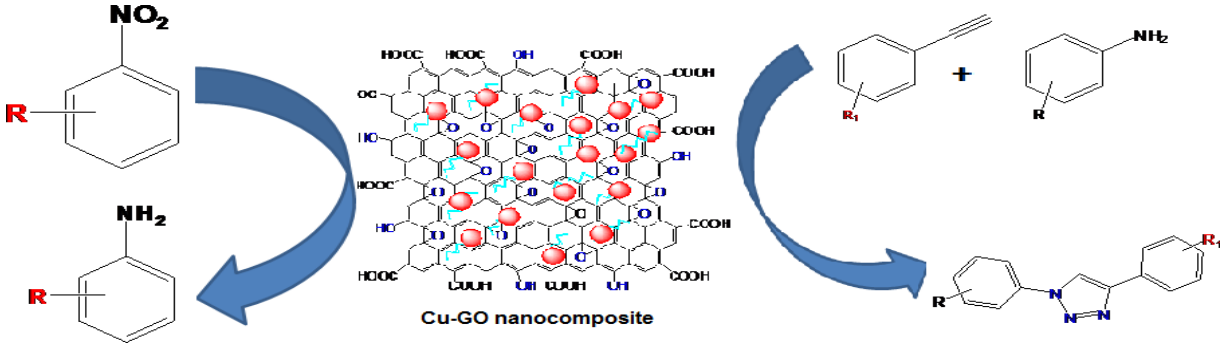
Exploring catalytic properties of Cu nanoparticle deposited graphene oxide nanocomposites.

Prasenjit Mandal(1)*, Sayan Kundu(2) and Asoke P. Chattopadhyay*(3)

University of Kalyani,(1,3)741235 and Indian Instuite of Technology Kanpur(2),208016

Mandalprasenjit21@gmail.com, kundu431997@gmail.com asoke.chattopadhyay@gmail.com

Graphene-based nanocomposites exhibit several interesting properties esp. regarding conductivity, magnetism, etc. They also serve as important catalysts in key bond forming reactions. The present work deals with two distinct chemical transformation reaction of Cu–graphene oxide nanocomposite heterogeneous catalyst. These nanocomposites have been characterized in the usual manner. They have been used in hydrogenation reduction of nitro-arenes, and nitrogen-containing heterocyclic structures for click reaction respectively. Effect of reaction conditions e.g. temperature, amount of the catalyst, nature of solvent etc. on product yield has also been studied in the two cases. Moreover, this catalyst is easily recoverable and can be reused for five times without appreciable loss of catalytic activity. Nevertheless, the novel properties of Cu-graphene oxide as a catalyst lead us to believe that Cu-graphene oxide composite will find application in various catalytic fields. Further applications of the nanocomposites have also been considered.



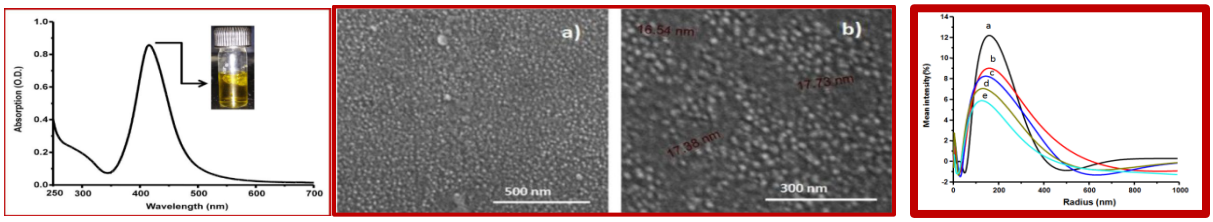
Silver nanoparticles: Synthesis, characterization and study of its inhibitory effect on the aggregation of Bovine Serum Albumin (BSA)

Shahnaz Begum, Subrata Sardar and Umesh Chandra Halder*

Department of Chemistry, Jadavpur University, Kolkata-700032, India

Email: subratachem2009@gmail.com and uhalder2002@yahoo.com

Amyloid fibrils (aggregated morphology of protein) are responsible for dangerous neurogenerative diseases like Alzheimer's, Parkinson's, Diabates type 2, spongiform encephalopathies (e.g. Mad cow disease) etc. Therefore, inhibition of protein aggregation is a challenging task in order to prevent these neurodegenerative diseases throughout the world. Here we report the synthesis, characterization and application of silver nanoparticles (AgNPs) to arrest the aggregation of bovine serum albumin (BSA) into amyloid fibrillar structure and thus stabilizing its native monomeric form. Our model protein system BSA, is a water-soluble monomeric protein of molecular mass of 66.4 kDa. It is composed of three homologous domains which are formed by six α-helices. Isoelectric point (pI) of BSA is 4.7 at 25°C. BSA has opportunity to interact with synthesized AgNPS through its free –SH group of the cysteine residue via the absorption on its surface and then undergoes conformational changes. Our experimental results are based upon UV-Vis spectroscopic study, gel electrophoresis (SDS-PAGE), Th T assay, ANS-fluoroscence study, circular dichroism (CD), dynamic light scattering (DLS) and transmission electron microscopic (TEM) images.



References:

A. Valstar, M. Almgren and W. Brown, Langmuir, 2000, 16, 922.

R. N. Rambaran and L. C Serpell, Prion., 2008, 2, 11.

N.K. Holm, S.K. Jespersen, L.V.Thomassen, T.Y. Wolff, P.Sehgal, L.A. Thomsen, et al., Biochim. Biophys. Acta, 2007, 1774, 1128.

S. Sardar, Md. Anas, S. Maity, S. Pal, H. Parvej, S. Begum, R. Dalui, N. Sepay, U. C Halder, International Journal of Biological Macromolecules, 2019, 125, 596-604.

Ultra-Weak Metal-Metal Bonding: Is There a Beryllium-Beryllium Triple Bond?

Shahnaz S. Rohman, Chayanika Kashyap, Sabnam S. Ullah, Ankur K. Guha*, Lakhya J. Mazumder and Pankaz. K. Sharma

Department of Chemistry, Cotton University, Assam, India-781001

*E-mail:ankurkantiguha@gmail.com

Metal-metal multiple bonding is a common phenomenon in d-block metals. However, such multiple bonds in s-block metals are rare. Among the s-block metals, beryllium possesses the highest electronegativity as well as ionization energy and hence, chemically bonded Be-Be interaction is the most studied s-block metal-metal interactions. [1,2] As for instance, ultra-weak and ultra-short Be-Be distances with little or no bond has frequently been observed. [3,4,5] The weak bond dissociation energy (BDEBe-Be) of 0.1 eV[6] in Be2 dimer is responsible for such little or no interaction. Many theoretical strategies were proposed for strengthening the Be-Be interaction. Among them the most noticeable proposal was put forward by Liu et. al [7]. In their work, they proposed a unique way of strengthening the Be-Be interaction by concerted electron donation from the vertical plane of the Be-Be midpoint to achieve true double π bonds. The calculated Wiberg Bond Index (WBI) value of the Be-Be bond in Li4Be2 molecule was found to be 1.963. Different bonding analyses showed the existence of only two π bonds in Li4Be2 without any σ bond. This remarkable proposalposed a question into our mind: Does a true Be-Be triple bond exist? Herein, with the aid of high level abinitio calculations we have shown that, indeed, a true triple bond exists between the Be atoms in Li6Be2 molecule. We have theoretically predicted a novel species featuring the first Be-Be triple bond in Li6Be2 molecule. The molecule has been found to be thermodynamically stable. The presence of the triple bond has been confirmed by adaptive natural density partitioning (AdNDP), electron localization function (ELF) and atoms in molecules (AIM) analyses. Moreover, the mechanical strength of the Be-Be triple bond has been analyzed by using compliance matrix which suggests its ultra-weak nature.

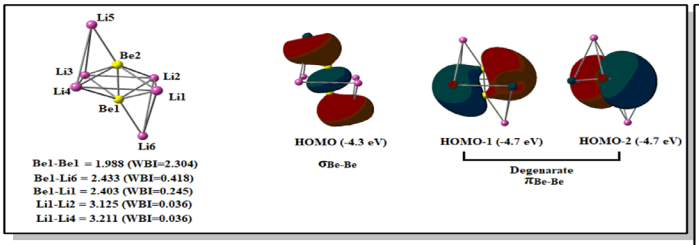


Figure 1. Global minimum of Li6Be2 and important frontier orbitals at CCSD/Def2-TZVP level.

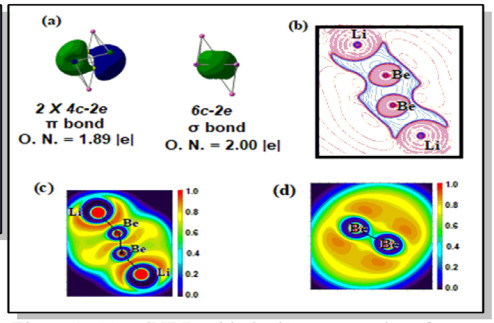


Figure 2. (a) AdNDP orbitals (b) contour plot of laplacian of electron density (red - positive region, blue - negative region) along Be-Be axis for Li6Be2 molecule (c)) ELF profile for Li6Be2 and (d) ELF profile of Li4Be2 molecule.

References:

[1] J. M. Merritt, V. E. Bondybey, M. C. Heaven, Science 2009, 324, 1548-1551.

[2] K. Patkowski, V. Špirko, K. Szalewicz, Science 2009, 326, 1382-1384.

[3] C. Yuan, X. F. Zhao, Y. B. Wu, X. Wang,. Angew. Chem. Int. Ed. 2016, 55, 15651-15655.

[4] Q. Zhang, W. L. Li, L. Zhao, M. Chen, M. Zhou, J. Li, G.Frenking, Chem. Eur. J. 2017, 23, 2035-2039.

[5] X. Liu, M. Zhang, S. Yu, Y. Geng, X, Zhang, Y. Ding, Z. Su, Phys. Chem. Chem. Phys, 2018, 20, 23898-23902.

[6] A. V. Mitin, Int. J. Quantum Chem. 2011, 111, 2560-2567.

[7] X. Liu, M. Zhang, S. Yu, Y. Geng, X, Zhang, Y. Ding, Z. Su, Phys. Chem. Chem. Phys, 2018, 20, 23898-23902.

EFFECT OF TEA DRINKING ON URINE FLUORIDE CONCENTRATION IN DENTAL FLUOROTIC PATIENTS

SimashreeSaikia1, Pallabi Borpuzari1,SikaTeronpi1

Under the guidance of Bhupen K Baruah, Asst.Prof

1 Department of Chemistry, JB College (Autonomous) , Jorhat, Assam

E-mail: simashreesaikia123@gmail.com

Dental fluorosis becomes a serious problem of Assam at present. Habitual consumption of large volume of tea drinks for 4/5 times is very common among the rural population of Assam. A study was carried out to find out the relationship between prevalence of dental fluorosis and urine fluoride concentration among the populations of Jorhat district of Assam. Fluoride ions are estimated in drinking water samples, tea drinks and in morning urine of the patients. Urine fluoride content was recorded higher for adults than children and the controlled samples. High positive correlation ($p < 0.001$) was found between fluoride concentration in water and urine, and tea drinks and urine.
KeyWords: Dental fluorosis, urine fluoride etc.

DETERMINATION OF QUALITY PARAMETERS IN MADE TEA SAMPLES

1Tribeni Gogoi, Pallabi Kalita, Rimjim Mahanta

Department of Chemistry, Assam Kaziranga University, Jorhat, Assam, India

E-mail: tribenigogoi48@gmail.com, pallabikalita72@gmail.com, rimjimmahantajrt@gmail.com

Tea is one of the most commonly used and lowest cost beverages in the world. After water it is the most widely consumed drink. It has several health benefits. Green tea and black tea may protect against various types of cancer. Because of the Catechins found in Green tea that are thought to be more effective in preventing obesity related cancer such as liver and colorectal cancer. But it is important to check the quality parameters such as moisture, total ash, water soluble ash to total ash, total ash, acid insoluble ash, alkalinity of water soluble ash (asK2O)etc prior to consumption. The study revealed whether the percentage content of the quality parameters in those samples are under the FOOD SAFETY AND SAFEGUARD ASSOCIATION OF INDIA (FSSAI).

Referances:

1.Tocklai Analytical Services Department Hand book

2.Sanyal.S,(2011).Tea Manufacturing Manual. Tea Research Association, Tocklai Experimental Station, Jorhat

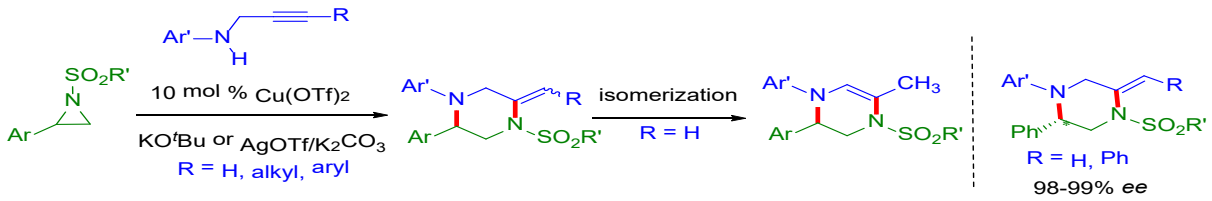
Stereospecific Ring Opening and Cycloisomerization of Aziridines with Propargylamines: Synthesis of Functionalized Piperazines and Tetrahydropyrazines

Bijay Ketan Das, Sourav Pradhan, and Tharmalingam Punniyamurthy*

Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati, 781039, India.

E-mail: tpunni@iitg.ac.in

Piperazines and their synthetic analogues remain a prime sub-structure for pharmaceutical drug discovery as they are core subunits in a wide range of medicinal and bioactive natural products. Recently, Lewis acid-catalyzed tandem ring opening/cyclization involving aziridines1 have appeared as a potential synthetic tool for the assembly of N-containing heterocycle frameworks.2 Herein we report a stereospecific Cu(II)-catalyzed nucleophilic ring opening of N-sulfonylaziridines with propargylamines and subsequent hydroamination with base or AgOTf/base to produce piperazines which leads to double-bond isomerization to furnish tetrahydropyrazines (Scheme 1).3 Optically active aziridines can be coupled with high enantiomeric purities (>98% ee).



Scheme 1

References:

[1] M. Sengoden, T. Punniyamurthy, Angew. Chem. Int. Ed. 2013, 52, 572.

[2] B. K. Das, S. Pradhan, T. Punniyamurthy, Org. Lett. 2018, 20, 4444.

Computational Fluid Dynamics Simulation on Discrete Sizes of Venturimeter

Mekharaj Kunwar Chhetri and Vijay Shankar

Department ofCivil Engineering,National Institute of Technology Hamirpur, Himachal Pradesh, India

E-mail: mekharajkc@gmail.com

A venturimeter is a tool used for measuring the mass flow rate of fluid passing through it. There are bunch of application of venturimeter in chemical, automotive, paper industries and water distribution. The calculation of flow rate is done with the aid of pressure difference due to obstruction in the pipe. Mass flow rate is directly proportional to pressure difference between section. In this study a Computational model of venturimeter is prepared which is employed for calibration of instrument efficiently and in easy way instead of costly experiment method. The methods used are Finite Volume Method and Finite Difference Method and the equation for solving is Reynold's Averaged Navier-Stokes equation. The geometry is designed using Auto Cad 2018 and analyzed using Ansys FLUENT. Iterations were performed before determining the final result. Maximum and minimum velocity, pressure, mass flow rate and the contours of pressure, velocity and turbulence is developed. Results are validated versus experimental data and were found in a good concord, hence Ansys can be used for research work. Venturimeter pressure recovery is better than other metering devices.

Keywords: Fluid, Finite Volume Method, Finite Difference Method, Reynold's Average Navier-Stokes equation, Contours.

References:

1. Anderson, John David, and J. Wendt. Computational fluid dynamics. Vol. 206. New York: McGraw-Hill, 1995.
2. Versteeg, Henk Kaarle, and Weeratunge Malalasekera. An introduction to computational fluid dynamics: the finite volume method. Pearson Education, 2007.
3. P. Hari Vijay & V. Subramanyam. 'CFD Simulation on different geometries of venturimeter'. International Journal of Research in Engineering and Technology, in 2014.
4. N.Tamhankar, A Pandhare, A. Joglekar, V. Bansode. 'Experimental and CFD analysis of flow through venturimeter to determine the coefficient of discharge'. International Journal of Latest Trends in Engineering and Technology, in 2014.
5. H.Ameresh, D. Sandeep, P. R. Raju, R. V. Reddy. 'Investigation of Mass Flow Rate in Venturimeter Using CFD Analysis'. International Journal of Research in Engineering and Technology, in 2017.

Impact of Land Use and Climate Change on Water Flux: A case study of Kunah Khad river watershed, Hamirpur (H.P) India.

Mohamad Umerjan Deva1, Vijay Shankar2

1 M.Tech Student, Department of Civil Engineering, NIT Hamirpur, H.P., India

2 Associate Professor, Department of Civil Engineering, NIT Hamirpur, H.P., India

E-mail: 1 ujan1118@gmail.com

Water is the precious gift of nature to the mankind and has been recognized as the most vital natural resources hence the need of proper planning management of the precious resource has become the matter of utmost urgency. Due to anthropogenic and natural activities like landuse, land cover practices and climate change, watersheds are subjected to changes like water flux variation, hydrological changes etc. Therefore in order to find the impacts affecting the watershed we are able to find them using Geographical Information System (GIS) and Soil and Water Assessment Tool (SWAT). The objectives of the study are to assess the daily and monthly stream flow in Kunah khad river basin using SWAT model, examine the effect of land use/land cover changes on the water flux of watershed for the past decade using Remote Sensing and GIS techniques and to examine the impact of hydrological changes on stream flow of the basin for the decade. Figure 1 represents the input parameters of the SWAT model and the output parameters. Figure 2 shows Digital Elevation Model(DEM) of the study area. Due to some factors like increase in settlement, reduction of vegetation, forest land, water bodies has resulted in some percentage change in land use/cover and it has impacted the discharge of watershed so in order to avoid the negative impacts of landuse land cover on discharge there is a need to focus on reduction of anthropogenic activities and also need is to make watersheds more sustainable.

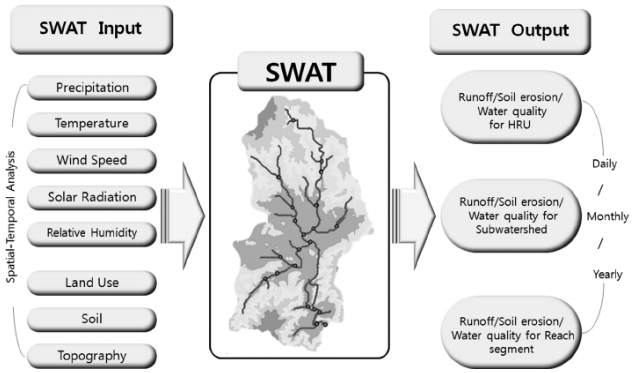


Figure 1: Overview of SWAT model

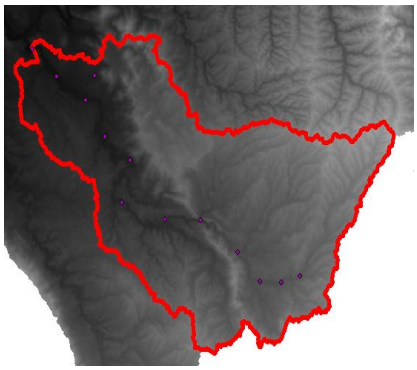


Figure 2: DEM of study area

References:

1. K., Faramarzi, M., Ghasemi, S.S., Yang, H., (2009), "Assessing the impact of climate change on water resources in Iran". Water Resources Research, 45.
2. Arnold JG, Srinivasan R, Muttiah RS Williams JR (1998) Large area hydrologic modelling and assessment. Part I: Model development. Journal of the American Water Resources Association 34 (1): 73-89.

3. Ayana, A.B., Edossa, D.C., Kositsakulchai E.,(2014), “Modelling the effects of land use changes and management practices on Runoff and Sediment Yields in Fincha Watershed, Blue Nile.” OIDA International Journal of Sustainable Development 07:11.

Estimation of Hydraulic Conductivity for Soils with Application of Salt and Acid

Ram Raj Meena1 Vijay shankar1

1Department of civil engineering National Institute of Technology Hamirpur, Himachal Pradesh

Email: ramrajkavtya@gmail.com

Rapid industrialisation, deforestation, non scientific agriculture practices, and other human activity adversely affect the health of soil. Industrial and vehicular gaseous emissions lead to phenomenon of acid rain. Excessive use of fertilizer and mining operation that exposes sulphide minerals to environment leads to increase in acidity of soil. The house hold sewage discharge mainly contains cleaning and disinfection products where primary constituent is sodium hydroxide (NaOH). Sewage discharge from pharmaceuticals, wood and paper industries, food industry, aluminium extraction plant, paints and glass manufacturing industries contains sodium hydroxide (NaOH). Waste water treatment plant uses sodium hydroxide (NaOH) to control water acidity and sodium hypochlorite as water disinfectant. Untreated industrial discharge when comes into contact of soil might increase basicity of soil. These effects may affect the irrigation system, soil properties of the construction site of building and dam structure. The main prerogative of this study is analysis the impact of salts and acids on hydraulic conductivity of three types of soil on 1 day, 7 days, and 15 days of applying the concentrations. In this study KSAT was used to determine the hydraulic conductivity of all the three type of soils. The methods on which the KSAT works are falling head method and constant head method which satisfies the Darcy’s law of soil permeability. In present study, the test for hydraulic conductivity is performed on 30 samples of soil, extracted from states of the India, i.e. loamy sand (Himachal Pradesh), fine sand and sandy loam (Rajasthan), soil type is defined by the United States department of agriculture and the temperature maintained for the experiments was between12°C to 23°C. The hydraulic conductivity of soil depends on the both sodium as well as the acid. Due to swelling of clay the hydraulic conductivity of soil is decreased. This study helps in showing the short term impact of salt and acids on soils.

Keywords: hydraulic conductivity, acid rain, industries, soil, salinity

References:

[1] Buelow, Maya C., Kerri Steenwerth, and Sanjai J. Parikh. "The effect of mineral-ion interactions on soil hydraulic conductivity" Agricultural Water Management 152 (2015): 277-285.

[2] Kargas, G., et al. "Temporal variability of surface soil hydraulic properties under various tillage systems." Soil and Tillage Research 158 (2016): 22-31.

[3] Leuther, Frederic, et al. "Structure and hydraulic properties in soils under long-term irrigation with treated wastewater."Geoderma 333 (2019): 90-98.

Integration of Neural Network Technique and Reference Evapotranspiration Modelling for Western Himalayan Region and Trans-Gangetic Plain Region

Sajal Maharshi and Vijay Shankar

Department of Civil Engineering,

National Institute of Technology, Hamirpur, Himachal Pradesh, India

E-mail: sajalmaharshi01@gmail.com

Reference crop evapotranspiration (ET0) is a major component in hydrological studies. ET0 modelling finds applications in various areas such as irrigation scheduling, crop yield simulation, hydrologic water balance factor and variability analysis. Owing to unavailability of lysimeters in most locations, direct measurements of ET0 are unlikely to be available. Hence, ET0 is usually estimated from indirect methods which include use of theoretical and empirical equations requiring meteorological variables. Most of ET0 estimation methods do not effectively represent the complex nonlinear dynamics in the ET0 measurement process. Artificial neural networks have a great significance in modelling nonlinear systems because they require lesser inputs, negligible computational efforts and a very short real-time control. India has been divided into 15 agro-climatic regions and 73 sub-regions (SR) by Planning Commission under Agro Climatic Regional Planning. This study aims to estimate ET0 for two agro-climatic regions of India, namely, Western Himalayan region and Trans-Gangetic Plains region, using neural networks. Study area consists of all district headquarters of the five states Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Punjab and Haryana; two union territories Delhi and Chandigarh; and two district headquarters of Rajasthan namely Sri Ganganagar and Hanumangarh. The two regions are further sub-classified into sub-regions SR-1, SR-2 and SR-3. ET0 is computed using two methods, that is, conventional FAO-56 Penman-Monteith method and artificial neural networks. Comparative analysis was performed for the two methods using performance evaluation indices such as mean square error and coefficient of correlation. Softwares used were CROPWAT 8.0 for P-M method and MATLAB for training and testing neural networks. It was found that the highest ET0 occurred in the sub-region SR-3 arid zone of Trans-Gangetic Plains region and the lowest ET0 occurred in the sub-region SR-2 zone of Western Himalayan region. Moreover, neural networks provided better results for both the agro-climatic regions in later duration of years with a considerable level of accuracy.

Keywords: Evapotranspiration, meteorological data, agro-climatic region, artificial neural network, machine learning.

References

1. Allen R. G., 1986. “A Penman for all season”, J. Irrig. Drain. Div., ASCE, 112(4), 348-368.
2. Allen R. G., Pereira, L.S., Raes, D. and Martin, S., 1998. “Crop Evapotranspiration”, FAO Irrigation and Drainage Paper 56, Rome.
3. ASCE Task Committee on Application of Artificial Neural Networks in Hydrology, 2000. Artificial neural networks in hydrology II: Hydrological Application.’ J. Hydrology Engineering ASCE, 5(2), 124-137.
4. Kumar M., Raghuwanshi N. S., Singh R., Wallender W. W., and Pruitt W. O., 2002. “Estimating evapotranspiration using artificial neural network”, J. Irrig. Drain. Div. ASCE, 128(4), 224-233.

5. Chauhan S., and Shrivastava, R. K., 2008. “Performance evaluation of reference evapotranspiration estimation using climate based methods and artificial neural networks”, Water Resource Management, 23(5), 825-837.
6. Dai X., Shi, H., Li Y., and Huo, Z., 2009.” Artificial neural networks models for estimating regional reference evapotranspiration based on climatic factors”, Hydrological Processes, 23(3), 442-450.
7. Kumar M., Raghuwanshi N. S., Singh R., 2010. “Artificial neural networks approach in evapotranspiration modeling: A review”, Irrigation Science, 29(1), 11-25.
8. Khanna, Annual Report (1989-90), Government of India (Planning Commision).

Study on Hydraulic Conductivity of porous media with Homogeneous and Heterogeneous grain size

Shivendra Kumar Chaubey1 Vijay Shankar1 Rajat Kango1

1Department of Civil Engineering, National Institute of Technology Hamirpur, Himachal Pradesh

Email:17m173@nith.ac.in

Hydraulic conductivity is described as the relative ease with which a porous medium transmits fluid and it depends upon material properties as well as fluid properties. By definition, it is the ratio of velocity to the hydraulic gradient of any porous media. In this analyses hydraulic conductivity test for various samples are performed which includes sand of size 4.75mm,2.36mm,1.18mm; marble chips of size 4.75mm, 2.36 mm;crushed aggregate of size 10mm,6.3mm,4.75mm and glass marble of average size 15.65mm. In the present study two different diameter of permeameter i.e. 5.08cm and 10.16cm is used to show the effect of surface area on hydraulic conductivity by using constant head permeability test. Hydraulic gradient and seepage velocity of samples are calculated with the help of discharge and pressure measurements in Permeameter. The result of this study shows that hydraulic conductivity increases when size of the material increases. Furthermore, Reynolds number increases with decrease in area of permeameter due to decrease in friction factor.

Keywords: hydraulic conductivity, permeability, porous medium, fluid, surface area, Reynolds number

References

[1] Kango, Rajat, M. A. Alam, and Vijay Shankar. "Investigations of wall effect on permeability through porous media at low flow rates." Water Science and Technology: Water Supply 18.1 (2018): 233-239.

[2] Kenney, T. C., D. Lau, and G. I. Ofoegbu. "Permeability of compacted granular materials." Canadian Geotechnical Journal 21.4 (1984): 726-729.

[3] Cabalar, Ali Firat, and Nurullah Akbulut. "Evaluation of actual and estimated hydraulic conductivityof sands with different gradation and shape." SpringerPlus 5.1 (2016): 820.

Experimental study of flexural behavior of High strength concrete

Research Conclave 2019, IIT Guwahati Swapnil P. Belsare1, Dr. Sanjay S. Jamkar2

Department of Applied Mechanics,

Government Engineering College, Aurangabad, Maharashtra, India

Email: swapnilbelsare@outlook.com

Flexural test results generated on twenty-seven singly reinforced concrete beams to evaluate the implications of using high strength concrete (HSC) are reported. The stress block parameters on the current IS456-2000 code are limited to concrete strength up to 55 MPa. This paper looks at the applicability of IS456-2000 stress block parameters for HSC beyond the scope of code IS456-2000. Particular importance has been given to the issues of maximum compressive strain, ultimate moment capacity of the beam, neutral axis depth, and deflection at the bottom centre of the beam. Concrete compressive strengths of 64, 79, and 85 MPa and tensile reinforcement of 1%, 1.2%, and 2% were used. Relevant information has been collected from the literature whenever necessary for the analysis and interpretation of test observations. Design provisions contained in the current codes of practices, particularly those in the IS 456-2000 and ACI 318-14 codes have been examined. It is observed that for a singly reinforced HSC beam, the ultimate moment capacity is relatively insensitive to the stress block model. Test results also show that the ultimate compressive strain value decreases as the compressive strength increase but such a drop in the ultimate strain can significantly reduce the ultimate load carrying capacity of the structure4. So here, the applicability of the IS 456-2000 and ACI 318-14 rectangular stress block parameters to HSC becomes questionable.

References

1. Indian Standard code of practice for plain and reinforced concrete, IS 456-2000, Bureau of Indian Standards (BIS), New Delhi.
2. ACI Committee 318, “Building code requirements for structural concrete (ACI318-14) and commentary (318R-14),” American Concrete Institute (ACI), Farmington Hills, Michigan, 2014.
3. N.P. Rajamane, M.C. Nataraja and T.P. Ganesan, “A technical look at ‘Individual test result’ criterion for concrete acceptance as per IS 456:2000”, The Indian Concrete Journal (ICJ), February April 2012, pp. 26-37.
4. C.V.R. Murty, “Shortcomings in structural design of IS 456:2000”, The Indian Concrete Journal (ICJ), February 2001, pp. 150-157.
5. N. Subramanian, “Limiting reinforcement ratios for reinforced concrete flexural members”, The Indian Concrete Journal (ICJ), September 2010, pp. 71-80.
6. Horia Constantinescu, Oana Gherman, Camelia Negrutiu, Sosa Pavel Ioan. “Mechanical properties of hardened high strength concrete”, 9th International Conference Interdisciplinary in Engineering, INTER-ENG 2015, 8-9 October 2015, Tirgu-Mures, Romania, Elsevier, Procedia Technology 22 (2016), pp. 219–226.
7. Andrew Logan, Wonchang Choi, Amir Mirmiran, Sami Rizkalla and Paul Zia, “Short term mechanical properties of high strength concrete”, ACI Material Journal, Vol. 106, No. 5, September-October 2009, pp. 1-7.
8. Halit Cenan Mertol, Sami Rizkalla, Paul Zia and Amir Mirmiran, “Characteristics of compressive stress distribution in high strength concrete”, ACI Structural Journal, Vol. 105, No. 5, September-October 2008, pp. 626-633.
9. M. A. Rashid and M. A. Mansur, “Reinforced high strength concrete beams in flexure”, ACI Structural Journal. Vol. 102, No. 3, May-June 2005, pp. 462-471.

10. Togay Ozbakkaloglu and Murat Saatcioglu, “Rectangular stress block for high strength concrete”, ACI Structural Journal, V. 101, No. 4, July-August 2004, pp. 475-483.
11. J. C. M. Ho, A. K. H. Kwan and H. J. pam. “Minimum flexural ductility design of high strength concrete beams”, Thomas Telford Ltd., Magazine of Concrete Research, Vol. 56, No. 1, February 2004, pp. 13-22.

Numerical study of p-sv-wave propagation of effects of curvature of synclinal basement topography on the ground motion characteristics

Vinay Kumar and J.P. Narayan

1Asstt. Professor, THDC-IHET, B. Puram, Tehri, Uttrakhand, vinaytomar23@gmail.com

2Professor, Dept. of Earthquake Engineering, IIT Roorkee, jaypnfeq@iitr.ac.in

The effects of curvature of Basement Topography (BT) on ground motion characteristics are studied in this paper. Seismic responses of various BT models have been computed using a 2D fourth order accurate staggered-grid finite-difference algorithm for P-SV-wave propagation simulation in visco-elastic medium. The incorporation of realistic damping in the time-domain Finite Difference (FD) simulation is based on the GMB-EK rheological model. The analysis of simulated results indicated a drastic change in ground motion characteristics and the curves for average spectral amplification are in asymmetrical form because of presence of diffraction and mode conversion of waves from the bottom and corners of the BT. Results of this study illustrate that consideration of BT effect is as much important for seismic hazard analysis. These results will also be helpful for future building construction.

Key Words: Finite Difference Method, Focusing and Defocusing, Basement Topography Effects, Effects,

Net CO2 fluxes and seasonal variability in Bay of Bengal

Abhishek Dixit , Lekshmi K, Rishikesh Bharti, Chandan Mahanta

Department of Civil Engineering, IIT Guwahati, India

E-mail: abhishek.dixit@iitg.ernet.in

Oceans play a key role in global carbon cycle. They act as source or sink of atmospheric carbon dioxide depending on the partial pressure of CO2 (pCO2) gradient (Fig 1 and Fig 3) which further depends primarily on sea surface temperature and CO2 aqueous concentration. In this study, the moored pCO2 observations from autonomous pCO2 (MAPCO2) system deployed at 15°N 90°E (Fig 2) in Bay of Bengal (BOB) were used to derive CO2 fluxes to examine variability over time scale at BOB. Calculated CO2 fluxes shows that BOB is mild source of CO2 (0.4128 g-C/m2/year) to atmosphere,

unlike other part of global oceans that shows strong CO2 source/sink characteristics. It can be stated that surface water of BOB seems close to equilibrium in terms of CO2 fluxes on annual time scale. Also, normalised pCO2 at observed SST and mean SST show the influence of seasonality on seawater pCO2 which is further reflected on seasonal CO2 fluxes (Fig. 4).

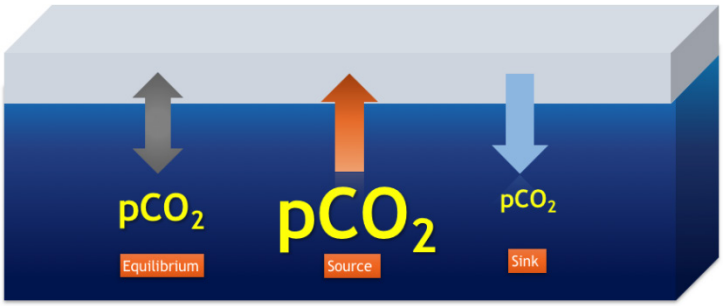


Fig 1. Condition for source and sink of CO_2. pCO_2 in yellow and red represent seawater and atmospheric pCO_2. Bigger font size represents a higher value.

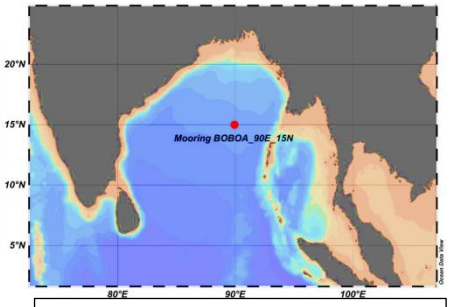


Fig 2. Graphical depiction of BOB. Red dot shows the location of deployed

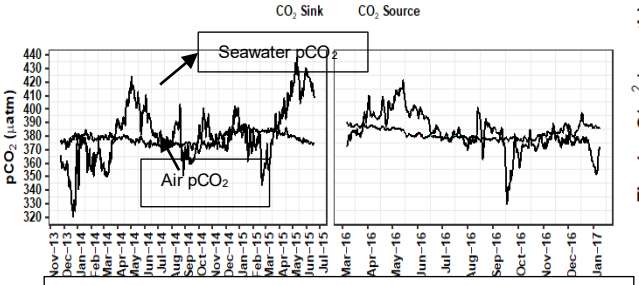


Fig 3. CO_2 source and sink characteristic variation. Source characteristic in blue and sink characteristic in red

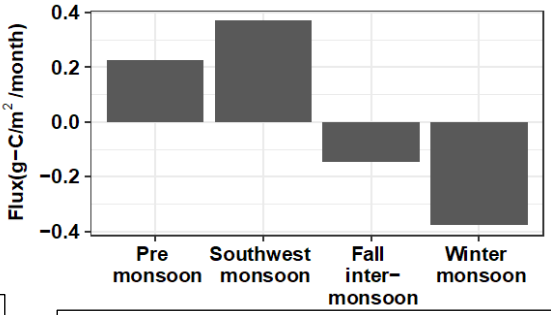


Fig 3. Seasonal average of CO_2 fluxes

Time Series Analysis of Shift, Dispersion, and Trend of Monsoon Season for Guwahati City Using Fuzzy Segmentation

Amrutha Suresh1, Sreeja P.2

1Research Scholar, Indian Institute of Technology Guwahati. Guwahati, Email: a.suresh@iitg.ac.in

2Associate Professor, Indian Institute of Technology Guwahati, Guwahati, Email: sreeja@iitg.ac.in

Abstract

Climate change has a potential impact on the water resources of a region as well as the occurrences of the extreme events. Present study critically examines the shift, dispersion, and the trend of the monsoon season for urban Guwahati, India. Historical rainfall and temperature (maximum and minimum) collected over a period of 30 years (1980-2009), have been considered for analyzing the climate change. Instead of considering the crisp boundaries for seasons, the time-series climate data was partitioned into internally homogeneous segments indicating comparable climatic conditions. In this study the time series climate data are segmented into different seasons using fuzzy segmentation. The homogeneity of the climatic variables within each season is ensured by the simultaneous identification of local

probabilistic principal component analysis (PPCA) models. The present study defines the shift or creep of the seasons as the movement of the center of the segment/season with time, whereas the dispersion as the variation in the length of the segment/season with time. The trend in the monsoon season over time was also investigated by averaging the climatic variables for each segment with a length $\mu \pm 1.5 \times \sigma$, where μ is the center of a season and σ is the standard deviation at the time scale, and performed the trend analyses. The present study shows that the dispersion corresponding to the pre and post monsoon season are significantly oscillating. The mean trend observed in the climate data was supporting the fact that there is a change of climate pattern for Guwahati city.

Keywords: Monsoon, Rainfall, Probabilistic principal component analysis (PPCA), Gath-Geva clustering

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Evaluation of Metal Fractions in river bed ediments of Kolong River, Assam

Ankit Pratim Goswami1 , Sanjib Das1 and Ajay Kalamdhad1

1Department of Civil Engineering, Indian Institute of Technology Guwahati, Assam

E-mail: ankit.goswami@iitg.ac.in

The Kolong River or Kailang is a tributary of the Brahmaputra River, which diverts out from the Brahmaputra River in Hatimura region of Jakhalabandha (Nagaon district, Assam, India) and is about 250 km (160 mi) long. The river flows through the heart of the Nagaon urban area dividing the town into Nagaon and Haiborgaon. The Kolong River while flowing though it path flows through the heart of the Nagaon, Morigaon and Kamrup districts and transverses through densely populated residential, industrial and commercial areas. It carries a portion of the municipal and other wastes from neighbouring communities and also serves as the natural drainage for storm water runoff. Toxic heavy metals may also find their way to aquatic environment from agricultural environment from agricultural runoff, leaching of metals from garbage and solid waste dumps and animal and human excretion. The turbulent nature of the river, particularly during the high flood season, is responsible for flushed out of the contaminants to the river. During the lean flow period, when the river is tranquil, the contaminants grow in concentration, accumulate and get stored in accumulation the bed sediments. Distribution and transport of heavy metals in aquatic environment is an important area of study. The present study is an attempt to characterize bed sediments with respect to the Kolong River system. Trace metal concentration were measured in the bed sediments along with carrying out their metal speciation study to understand their form of presence in the sediments and also to understand the toxicity form. Geoaccumulation Index (Igeo), was calculated to express the anthropogenic effect on sediments. Igeo shows continuous anthropogenic effect on the sediments for the 2nd Sampling (June'18) but in the case of 1st sampling (May'18) is discontinuous indicating the effect of rise in level of water during the monsoon season.

Keywords: Kolong River, heavy metals, bed sediments, metal speciation, Geoaccumulation Index.

Use of Numerical Inversion Technique To Determine Soil Hydraulic Properties from Mini Disc Infiltrometer Data

Aparimita Priyadarshini Naik1 and Sreeja Pekkat2
1Research Scholar, Department of Civil Engg., Indian Institute of Technology Guwahati, Assam – 781039, India
Email: 1aparimita@iitg.ac.in

2Associate Professor, Department of Civil Engg., Indian Institute of Technology Guwahati, Assam – 781039, India
Email: 2sreeja@iitg.ac.in

Soil hydraulic conductivity is one of the main properties considered to govern flow in porous media. Characterizing soil hydraulic properties of the unsaturated zone is mandatory for reliable modeling of flow process and effective flood/drought modeling. The objective of this study is to evaluate and understand the variability in soil hydraulic properties of an area comprising of different soil textures. A handy mini disc infiltrometer was used to carry out infiltration experiments which were then analyzed to determine near saturated hydraulic conductivity. To verify its accuracy, simulations in HYDRUS 2D/3D were carried out by providing suitable initial and boundary conditions. The governing flow equation and soil hydraulic model were described by Richard's equation and van Genuchten's (1980) model respectively. The suitability of van Genuchten soil hydraulic model parameters given by Carsel and Parrish (1988) were checked for the different soil textures obtained in this study. It was found that except for loamy sand soil, all other textures were giving either over or under estimated results when the values from Carsel and Parrish are used. Therefore, inverse simulation in HYDRUS was carried out to determine the best fit parameters using optimization algorithm. Statistical methods like correlation coefficient (CC), the root mean square error (RMSE), and the Nash-Sutcliffe efficiency index (NSE) were used to evaluate the modelled results obtained with optimized parameters and it is observed from reduced RMSE and NSE values that the new parameters could describe the water flow/infiltration process in a better way.

Keywords: Infiltration; Hydraulic conductivity; HYDRUS; Inverse Simulation; Parameter Estimation

Uncertainty Quantification in Soil Water Characteristic Curve: A Copula Approach

1Prakash, A., 2Hazra, B., 3Sreedeep S

1Research Scholar, mail: atma.prakash@iitg.ac.in,

2Assistant Professor, mail: budhaditya.hazra@ iitg.ac.in,

3Professor, mail: srees@iitg.ac.in. [Department of Civil Engineering,]

Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India.]

Soil water characteristic curve (SWCC) is a fundamental constitutive relationship required for modeling unsaturated behavior of geomaterials. SWCC maps the variation of the degree of saturation (S) with

suction (ψ). Although the SWCC was originally supposed to be "characteristic" or unique for a geomaterial, it is now well established that there are numerous uncertainties associated with the measurement of WRC. This main objective of this study is to demonstrate the usefulness of copula approach for quantifying the uncertainties associated with SWCC. Two databases for Fly ash and Bentonite respectively are utilized for this purpose. Finally for simple application purposes, confidence intervals for the SWCC using the copula approach are created.

Keywords: SWCC, Copula, Confidence intervals

Treatment of unstabilized landfill leachate by Coagulation- flocculation process using different coagulants

Chakka Nagendran Subrahmanyam, Chejarla Venkatesh Reddy and Ajay Kalamdhad

1 Department of Civil Engineering, IIT Guwahati, India

E-mail: subra174104125@iitg.ac.in

Leachate generation and management is recognized as one of the greatest problem associated with environmentally sound operation of the landfills. An understanding of leachate composition is critical for understanding long-term impacts of landfills due to pollution potential of leachate to ground water and surface water. The results showed that there are many landfills, especially in developing parts of the world like India, Bangladesh, Africa, and Latin America, where open dump systems are used for final disposal of solid waste rather than engineered landfills. In the near future, regulations in developing countries will likely require installation of liner systems, leachate collection systems, and treatment operations. A major requirement for successful leachate treatment is quantifying its typical composition. The main problem of leachate is its diverse composition of persistent organic pollutants, which must be removed before discharge into the environment. The main objective of this research was to investigate the efficiency of coagulation and flocculation processes for removing suspended solids, colour and COD from landfill simulation reactor. The application of different coagulants to leachate from laboratory scale landfill to determine the optimum conditions for removal of organic matter, colour and turbidity is studied. The coagulation-flocculation examined the effectiveness of alum, ferric chloride, bentonite clay, ferrous sulphate hepta hydrate, calcium hydroxide. The coagulant dosage and pH has typically been determined through jar test. Chemical treatment for LFL using potash Alum coagulant has been found that reduction of turbidity (96.7%), BOD5 (31.9%), COD (49.1%), TS (90.9%) and color (91%). The results indicate that coagulation and flocculation processes can be used effectively for unstabilized leachate treatment systems, especially for removing suspended solids, colour and COD.

Keywords: landfill leachate, leachate treatment, turbidity, organic matter, Coagulation-flocculation

State-of-the-Art Review on Thermal Properties of Lightweight Foamed Concrete

Chandrashekhar Dattatray Wagh1, Indu Siva Ranjani2

1 Research Scholar, Department of Civil Engineering, IIT Guwahati, India

2 Assistant Professor, Department of Civil Engineering, IIT Guwahati, India

E-mail: c.wagh@iitg.ac.in

Almost 40% of the energy is consumed to overcome the heat flow and acquisition via surface coating and building wall units. Using materials with low thermal conductivity (T.C) during design and construction of building will help to reduce this energy consumption to a great extent. Foam concrete which is classified as lightweight concrete (Density 400-1850 Kg/m3) can be considered as one of the suitable material. It is a cement paste or mortar with air voids entrained by suitable foaming agent. It possess high flowability, low self-weight, minimal consumption of aggregates, controlled low strength and excellent thermal insulation properties. Air being poorest conductor of heat owning to its molecular structure, light weight foamed concrete (LFC) which signifies greater porosity due to air entrainment possess lower thermal conductivity which varies as per the degree of porosity. This reduction in thermal conductivity, especially via improved insulation can be considered as most basic factor for decreasing energy consumption. The thermal conductivity of LFC typically is 5 to 30% of that of normal weight concrete and range from between 0.1 and 0.7 W/mK for dry density values of 600 to 1600 kg/m3 respectively.

So far there have been many studies on mechanical properties of foam concrete but still there is almost complete lack of research on thermal behaviour of foam concrete. In this prospect, the main objective of this research is to provide a critical review on thermal properties of foamed concrete and its potential of being used as an alternative insulating material in construction industry.

Assessment of depth wise distribution of arsenic and other heavy contamination in soil of Golaghat District, Assam

Leichombam Menan Devi* and Chandan Mahanta

Department of Civil Engineering, IIT Guwahati, India

*Corresponding author, E-mail: menan.lc@iitg.ernet.in

Arsenic contamination in the environment has been a concern to humans for many years now, with major emphasis on the contamination of groundwater. However in the recent years arsenic contamination of soil has also become a major issue and therefore remains important to examine and understand the extent of contamination. Furthermore, when screening for pollutants in soil, the results are often required directly, since classification of the soil is needed before determination of remediation techniques. The present study thus aims to assess the variation and distribution of As and various other heavy metal concentration along the various depths of soil. Samples were collected from arsenic affected area of Golaghat district, Assam. The concentration of arsenic and other heavy metals were

studied in the soil samples collected from different depths ranging from 0 to 60 ft. This study provides information on depth wise distribution of As and other heavy metals in the study region. The presence of heavy metals in soil sample indicates that there is appreciable contamination of the soil and significant variation along the depths of soil. This study is to understand the extent of contamination and the processes involved in mobilization and release of As into groundwater systems. Also, to determine the various remediation techniques to be applied for the contaminated site.

Keywords: Soil contamination, Arsenic, Heavy metal, Depth wise distribution.

Effect of organic contaminants on geotechnical behaviour of liner material

N.Mittal

Department of civil Engineering, IIT Guwahati, India

E-mail:mitta174104093@iitg.ernet.in

Due to rapid urbanization and industrialization, the geo-environment and groundwater reserves in most parts of the world are getting damaged due to the harmful effect of pollutants disposed of into the geo-environment. Liner materials are used to prevent the migration of these pollutants into the ground water. Due to high swelling capacity, contaminant adsorption capacity and low hydraulic conductivity, bentonite is primarily used as a liner material in waste containment. However, when bentonite comes in contact with leachate, its swelling property and its hydraulic conductivity gets affected. The extent of the effect of leachate on behaviour of bentonite also varies from bentonite to bentonite depending upon its mineralogical composition. Organic contaminants like ethanol, methanol, tetra-chloromethane etc. are major part of industrial waste which is getting dumped in ground. So, in this study the effect of various organic contaminants on swelling, liquid limit, permeability and consolidation of bentonite is determined and compared with that of distilled water. The increase in contaminant percentage shows increase in permeability and decrease in swelling capacity of bentonite.

Hydrilla verticillata - Anaerobic treatment of an aquatic weed

Nora Brumm, Internship IIT Guwahati, Civil Engineering

Invasive species are globally found and are defined as non-native species that harm the native ecosystem. Due to increasing human activity the spread of invasive species expand and is now globally found, mainly in India and the US. Hydrilla verticillata is a known aquatic weed and is listed as one of to the most problematic ones. Due to its resistance to low pH, low light, a high range of chemicals and eutrophic as well as oligotrophic conditions it often competes native species out and imbalances the ecosystem (Jain & Kalamdhad, 2018). It is often found in areas that are influenced by human activity (Wilkie & Evans, 2010). Its widely spread roots and bonds allows an easy absorption of nutrients and

minerals due to its large surface. This leads to a huge quantity of generated biomass (10 tons of dry matter/ hectare, year) and its fast growth makes a complete erase almost impossible (Jain & Kalamdhad, 2018). As a consequence of the introduction of Hydrilla verticillata, eutrophication and a loss of ´biodiversity occur. It forms dense mats that provides a living environment for species (often pest species) and reduces the light income into the waterbody. They also decrease the water flow, hinder shipping an clog the canalization and facilities. The best way of controlling Hydrilla verticillata depends on each waterbody and its surroundings itself. Focusing on mechanical treatment it is found to be promising because of the further possible treatment of the rich organic matter of the water plant. The high moisture content and the low lignin content make Hydrilla verticillata suitable for anaerobic treatment within which biogas is produced – an important source of renewable energy (Wilkie & Evans, 2010). In this study the anaerobic treatment of Hydrilla verticillata is regarded. Therefore, a Bio methane Potential (BMP) study, a Batch study and a Continuous study are conducted.

References

1. Jain, S. M. & Kalamdhad, A. S., 2018. A review on the management of Hydrilla verticillata and its utilization as a potnetial nitrogen-rich biomass for compost or biogas production. Bioresource Technology Report, pp. 60-78.
2. Wilkie, A. C. & Evans, J. M., 2010. Aquatic plants: an opportunity feedstock in the age of bioenergy. Biofuels, pp. 311-321.

Bio-mineralization of soil for erosion Prevention using indigenously cultured bacteria

Prabhakar Choudharyl,Mayur Kedare2 andChandan Mahanta1

1 Department of Civil Engineering, IIT Guwahati, India

2 Department of Biosciences and Bioengineering, IIT Guwahati, India

E-mail: chandan@iitg.ac.in

Microbially induced calcite production is a widely explored engineering solution in fields of liquefaction control, piping prevention, concrete strengthening, mineral plugging and metal sequestration etc. The project discusses about indigenously cultured bacteria that would be used for stabilizing the flume based channel in order to study the erosion activity under different sections of channel, velocity and discharge. Since the laboratory cultured bacteria faces challenges such as reduction in population due to predation and competition as well as stress from abiotic factors such as pH, osmotic pressure, temperature and availability of nutrition when cultured from a different environment. The paper here discusses indigenously cultured urease positive bacteria and inoculation of those cultured bacteria in the same environment to check its effectiveness in producing calcite crystals which would strengthen the soil structure.

Bacteria were isolated from soil medium then urease positive colonies were identified by plating on urea based selective media. These urease positive bacteria were augmented in a cohesionless soil (sand) along with nutrient medium and calcium chloride as a precipitating medium. The 5 days curing of sandy soil showed aggregation, indicating formation of calcite as a result of urease activity.

Conclusively, this process of calcite production can be used as a secondary line of defence along with other river training works which are used for erosion control on river banks.

Keywords: Microbially induced calcite production (MICP), Urease positive bacteria, Urease enzyme, soil erosion.

Bioremediation of sulphate containing wastewater using rice straw

R. Bhande1, P. K.. Ghosh2

Department of Civil Engineering, IIT Guwahati, India

Department of Civil Engineering ,IIT Guwahati, India

E-mail: ranjeeta@iitg.ernet.in

Bioremediation is widely used treatment processes for sulfate-containing wastewaters discharged from various industries such as mining, tannery, pulp and paper, and textiles. Sulfate rich wastewaters such as the Acid Mine Drainage (AMD) are usually deficient in electron donors and require external addition of electron donors in order to achieve complete sulfate reduction, therefore the cost of treatment is a major challenge. Anaerobic decomposition of rice straw using a paper mill sludge leading to produce the soluble COD in the waste water which could be efficiently utilized as carbon source for treating the sulfate containing wastewater. Percentage extraction of sCOD from the batch reactor is 29.4 % at 15th day, corresponding to a VFA production of 4325 mg/L. Sulfate removal efficiency from bioreactor were achieved up to 66.2 % at 55 day of HRT. Throughout this study BOD to COD ratio were maintained in between 0.2-0.7.
Keywords: Bioremediation; Rice Straw; Sulfate removal

Assessment of granular activity at different superficial upflow air velocities in sequencing batch reactors

Sachin Kumar Tomar, Saswati Chakraborty

Department of Civil Engineering, Indian Institute of Technology Guwahati, Guwahati 781039, India

The present study aims to investigate the impact of superficial upflow air velocities on granular activity. Three sequencing batch reactors (R1, R2 and R3) were operated at three different superficial upflow air velocities (0.88, 1.48 and 2.07 cm s-1, respectively) with phenol (400 mg L-1), thiocyanate (100 mg L-1) and ammonia nitrogen (100 mg L-1) as a pollutant. Cumulative chemical oxygen demand (COD) removal with time was evaluated to analyse granular biomass activity. In R1, R2 and R3, the activities values were 11.22, 14.10 and 12.19 mg COD removed mgVSS-1 day-1, respectively. Biomass activity increased with rise in air velocity to an optimal value, indicating that rise in air velocity can provoke the metabolism of granules in a distinct manner (R2) and also conclude that stronger aeration can trigger the biomass washout resulting into reduction in biomass activity (R3). Biomass activity was lower for the granules developed at weaker aeration intensity (R1) because of lower air supply for the metabolism of granules. This study addresses an experimental explanation for obtaining the optimal superficial upflow air velocity at which maximum granular biomass activity can be achieved for treating multiple toxic pollutants.

Key words: Superficial upflow air velocity; Granular biomass activity; Biomass washout

A Study on the Applicability of Alum Sludge for the Treatment of Acid Mine Drainage (AMD)

A. Shweta Singh* and B. Saswati Chakraborty

Department of Civil Engineering, IIT Guwahati, India

*Corresponding Author, E-mail: shwetasingh@iitg.ernet.in

Batch studies on the potential applicability of alum sludge obtained from the drinking water treatment plant for the remediation of acid mine drainage (AMD) was investigated. Total initial metal concentration present in the alum sludge was analysed. Synthetic AMD having metal concentrations of Fe (100 mg/L), Mn (2 mg/L), Co (1 mg/L), Al (25 mg/L), Ni (1 mg/L), Cr (1 mg/L) and Zn (5 mg/L) at pH 2 ± 0.50 was used throughout the study. The sorption capacity as well as ability of alum sludge in raising the pH of acidic AMD under varying dose was evaluated. Results showed increase in pH and sorption of metals with the increase in alum sludge dosage. pH raised to 5 ± 0.06 at higher alum sludge dose of 200 g/L. Similarly, the sorption study of metals under varying alum sludge dose of 0, 25, 50 and 100 g/L were studied and it was found that maximum removal of Fe, Mn, Zn, Al, Co, Ni and Cr were 53.39%, 64.66%, 91.45%, 22.35%, 92.23%, 98.97% and 100%, respectively at 100 mg/L. Thus, results indicated that higher dose of alum sludge is required in raising the pH of AMD and therefore not very effective in the treatment of AMD.

Keywords: Alum sludge, Acid mine drainage, Wastewater treatment.

A review on impact assessment of invasive terrestrial weed and their management

Subhradip Pal1, Heena Kauser2, Ajay Kalamdhad1 and Meena Khwairakpam2

1 Department of Civil Engineering, IIT Guwahati, India

2 Centre for Rural Technology, IIT Guwahati, India

E-mail:pal174104129@iitg.ac.in

Invasive terrestrial weed management is one of the biggest challenges in the field of solid waste management. The widespread of terrestrial weed is due to the environmental condition that is favourable for its growth. These weed acquire nutrients from the surrounding plant hampering the growth of other plants.Species invasion has become a serious issue worldwide. Mikania micrantha kunth, Parthenium hysterphorus, chromolaena odorata, saccharum pose some of the world's most noted terrestrial weed problems. Introduction of invasive species takes place due to transportation and trade amongst various countries. The management strategies employed for the removal of such plant is not sufficient. Many researchers have put forwarded their views regarding the invasiveness of such plant. Some appropriate technology such as composting, vermicomposting and anaerobic digestion might be a good step for transforming these plants into valuable products like compost and biogas. The aim of this study is to review the effect of some noxious terrestrial weed on environment and discuss their management.

Key words: Invasive weed, composting, vermicomposting, anaerobic digestion

Suriya Prakash Ganesan

Biochar application in landfill liners is persistent in environment and gives durable advantageous impacts in fields, for example, enhancing soil fertility, decontaminating land, sequestering carbon and decreasing green hose gas generation. Research on biochar application in landfill has grown tremendously because of its potential for vegetation development and improved water retention. Vegetation growth enhancement by biochar eventually control erosion by lessening surface runoff and by improving detention and infiltration. However, amid early plant establishment period the top layer of landfill covers is susceptible for erosion loss as vegetation grows relatively slow in compacted soil. Along these lines, the performance of the compacted Biochar Amended Soil (BAS) in context to erosion potential isn't well understood. The significant objective of this study was to investigate the erosion potential of compacted BAS sourced from four distinct plant and animal based feed stock. Biochar were produced in-house and amended with soil at 5% and 10% by weight, since the application rate may vary from 2% to 20% dependent on its prerequisite. Altogether, 27 pinhole erosion tests were performed to gauge the erosion rate of bare soil and BAS at optimum compaction state. It was revealed that addition of biochar to soil did not significantly alter the erosion potential of silty sand which was juxtaposed with the surface functional groups.
Keywords: biochar amended soil; erosion; pin-hole test

Sustainable Water Harvesting Structure By Condensation Of Water Through Atmosphere for Rural Area

Akshay Chavan1, Sagar Davate2 , Manav Dodiya3(UG Student1 2 3)

(Pillai HOC College of Engineering and Technology 1 2 3)

Abstract: Living beings require food, water and shelter for survival. People from some rural areas lack safe drinking water causing several health issues and deaths. Water harvesting structures (WHS) is a vertical conical structure designed to collect clean water from the air. In this research work, WHS is constructed by using easily available material such as bamboo and mesh which absorbs the water from surrounding air. This absorbed molecules gets stuck in mesh and forms water droplets through condensation and collected under the action of gravity. Rasayani was the nearest suitable area for collection of water through enough rain, fog and dew. Because of meteorological characteristics of the area, it was easy to collect water with WHS. Water harvested was pure and can be utilized for various domestic purpose like drinking, cooking, etc. This research signifies that WHS can be built by reusable materials with minimal maintenance and zero energy sources.
Keywords:
Condensation, Sustainable material, Water scarcity, economical.

Water Quality Assessment In and Around the Assam Engineering College Campus

Das K. N.1,Goswami U. P.1, Deka D.1, Basumatary D.1, Thakuria R.1, Mushahary B.1and Hazarika J.1

1Department ofCivil Engineering,Assam Engineering College,India

E-mail:jayshree@iitg.ac.in;krishanundas@gmail.com

The water quality assessment is one of the most important criteria, which is required for the evaluation of quality of water. The present study is done by the method of Water Quality Index (WQI) which is a single valued data that could be used to comment on the quality of water. It also provides the recommendations for the utility of water in the best way possible. The study is carried out in and around the Assam Engineering College Campus to know the various aspects of water quality and to enunciate a valid quality analysis in response to the present water quality. The water quality analysis is carried out on the basis of different elementary parameters- TDS, pH, magnesium, total hardness, nitrate, chloride, iron, alkalinity, turbidity, calcium and manganese. Different sites are chosen as per the college concerns and of local importance under which we have considered all the hostels in the campus, surface water as well as ground water bodies and the raw water coming to the campus for treatment. The different water quality parameters were tested by "Spectroquantpharo100" a testing machine from Germany used by Public Health Engineering Department of Bamunimaidam, Guwahati. This machine uses the principles of refraction of light originated from a source of lamp of tungsten halogen. The site data evaluated so far gives the present state of water quality. From the results of the WQI analysis it came into notice that the supply water coming to the campus as well as ground water sources available in the AEC campus is of good quality. The surface water collected has outranged some of the parameters and hence would require treatments and purifications before usages. Further change could come in the results due to both human and natural activities in the studied area over a period of time. Thus continuous monitoring is required to analyze the variations that could be seen in the quality of water in the area in the future.

Keywords: Water Quality Index, Water Quality Assessment, SPECTROQUANT PHARO 100

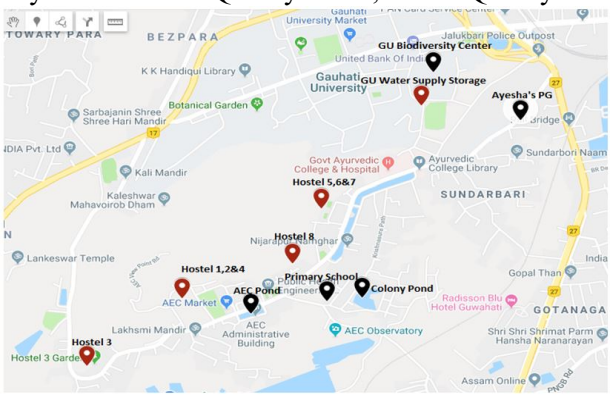

Figure 1 Map of the study area

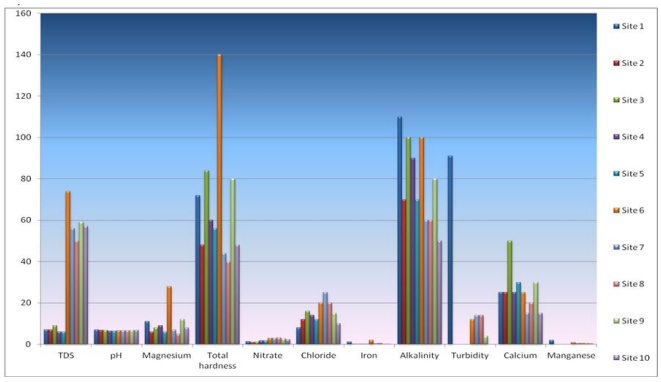

Figure 2 Bar diagram of the results of each site

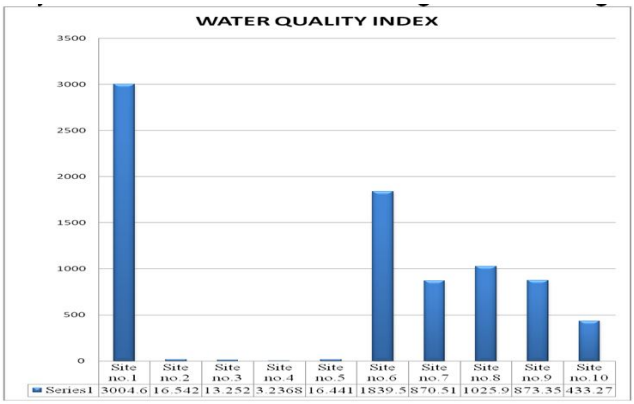

Figure 3 Water Quality Index of each site

References:

1) Srivastava, A. K., Mishra, D. K., Tripathi, S. and Singh, P. (2007): Determination of Water Quality Index and Suitability of Ground Water in a College in Balrampur, U.P., Nature Environment and Pollution Technology, 6(2), 315-319.
2) Devi W.S., Singh K.R. and Meitei N.S. (2015): Assessment of Water Quality Index of Nambol River, Manipur, India, Universal Journal of Environmental Research and Technology, 5, (3), 165-172.
3) Pal J., Pal M., Roy P.K. and Mazumdar A. (2016): Water Quality Index for Assessment of Rudrasagar Lake Ecosystem, India, ISSN: 2248-9622, 6(1) (2), 98-101.

Analysis of Intelligent Transport System and its application in improving the traffic condition of Guwahati city

[1]Pradyumna Kalita, Abhishek Goswami, Manab Jyoti Adhikary

[1]Department of Civil Engineering, Jorhat Engineering College, India

E-mail: pradyumnakalita98@gmail.com

Intelligent Transport System (ITS) is the application of sensing, analysis, control and communications technologies to ground transportation in order to improve safety, mobility and efficiency. With the conception of smart city transmuting cities into digital societies, making the life of its citizens easy in every facet, Intelligent Transport System becomes the indispensable component among all. It aims to achieve traffic efficiency by minimizing traffic problems.

Guwahati is one of the most developed cities in north-eastern region. With the development in technology, economic conditions, there are also problems rising. One of biggest problem in Guwahati city is traffic related problems. With increase in population the problem of traffic congestion is arising. Many of us are quick to blame traffic congestion on the drivers. But there are many factors that are out of hand. With increase in the no. of cars, motor vehicles, the parking spaces around the city in malls, roadside, and other institutions are gradually decreasing. Peoples spend a lot of time and fuel looking for parking spaces in streets and economical institutions.

In our present work we have analysed different techniques and methods to lower the rate of traffic problems of Guwahati city. Real time traffic monitoring system can be put to work to control the traffic congestion. There has always been the necessity of accurate and real time traffic information among the commuters and drivers. In present time with the increased use and availability of GPS enabled smartphones, a traffic monitoring system based on cell phone GPS data is highly practical. Vehicles equipped with a GPS system driving through the traffic of different roads can generate useful information like vehicle speed, geo location and information regarding the road. So an application can be developed using these data and give information about the real time traffic condition of a city at any given time to any user. Moreover cameras can be placed at several traffic points of road segments at some intervals to monitor the vehicular activity on the roads, rate of traffic congestion, its cause and send the information to proper authority to work on it at the right time. For the parking space availability problem smartphone application can be developed that will give us the information about the availability of parking at various institutions, malls etc. Through the app people will also be able to book their parking space for a specific time, on a specific date without facing any problem. These things will deliver proper contribution in transforming cities like Guwahati to a smart and efficient city for its peoples greater good.

Key-words: intelligent transport system, road traffic, smart city, GPS, smartphone app

Non-Invasive Method To Estimate Vs_{30} using HVSR Technique for Near Surface Investigation

Samir Saurav and S.K. Pal

Department ofApplied Geophysics,IIT (ISM) Dhanbad,India

E-mail:samsauvik@gmail.com

The determination of average shear wave velocity (Vs) up to30m depth is used in building codes to evaluate ground type classes for seismic design analysis, which are suitable to evaluate ground motion prediction. Seismically, shear wave velocity provides better understanding and direction in evaluating shear modulus, which can be linked to a material's stiffness as being most critical engineering parameter. A non-invasive method has been used for this study using TORMINO instrument to obtain Vs profile from the fit of Horizontal to Vertical (H/V) curve restrained to independent data collected at Patna region for assessment of both site response and structural dynamics characterization which is based on Vs(30) parameter. Horizontal to Vertical Spectral Ratios (HVSR) technique is based on ambient noise measurement and seismic methods. Vs profile is obtained from several H/V curves that are combined to get a synthetic view of main seismic reflectors (e.g., bedrock, gravel layers, etc.). The resonating layer and bedrock are used for H/V peak that help in figuring out the size of seismic reflectors needed to give some signal of their existence at each frequency by active method by providing source with the help of hammer weighing 15kg. Most data provide Vs section to a depth of 30m. However, some data also generate Vs section to much deeper depth beyond 100m, which significantly add some advantages over analysis over the area. The H/V curves showing low-frequency peak below 50Hz indicate deep bedrock and their inversion provides approximate Vs profile down to greater depths because of geology at Patna as the most parts made up of recent alluvium, clay, silt, sand, gravel pebble with a concentration of calcareous materials making groundwater occurs under phreatic condition. The obtained Vs value at the various point has been investigated and compared for interpretation based on NEHRP (BSSC 2001), IBC 2009/ UBC 1997 and Eurocode 8 (2007) code provision. This study indicates that the passive ambient noise or microtremor (surface and interface wave) can be well interpreted to analyse geotechnical and seismic characterization of near-surface soils.

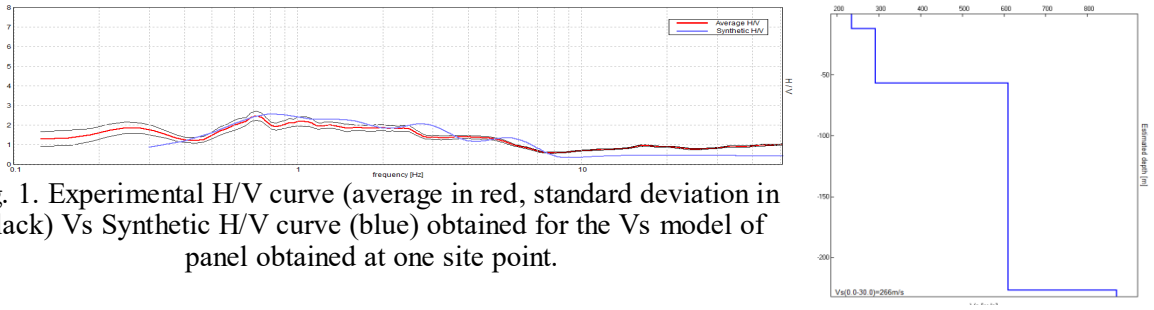

Fig. 1. Experimental H/V curve (average in red, standard deviation in black) Vs Synthetic H/V curve (blue) obtained for the Vs model of panel obtained at one site point.

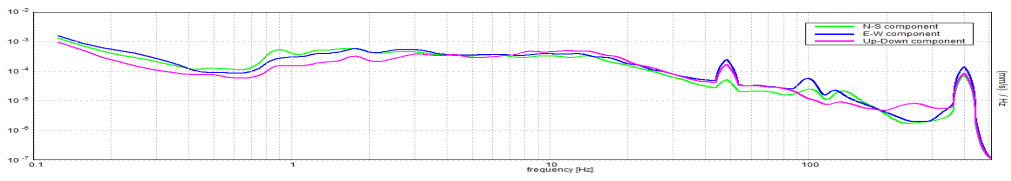

Fig. 2. Single component amplitude spectra used to obtain the H/V curve of fig. 1.

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References:

1) Ranjan, S. K., Pal, S. K., and Singh, K. K .K., 2015, An approach to improve shallow surface investigation using Joint analysis of Rayleigh and Love waves. Current science, 109(7), 1239-1242.
2) Castellaro, Silvia, 2016. The Complementarity of H/V and Dispersion Curve. Geophysics, Vol. 81, No. 6. 10.1190/GEO 2015-0399.1.
3) Sitharam, T.G., Anbazhagan. P. and Mahesh. G.U. 2007. 3D Subsurface Modelling and Preliminary Liquefaction Hazard Mapping of Bangalore City Using Spt Data and Gis. Indian Geotechnical Journal, 37(3): 210-226.

4) Ecp-202 Permanent Committee, "Ecp-202:2008. – Egyptian Code for Soil Mechanics Design and Construction of Foundation" Hbrc, Giza, 2008.
5) BSSC, 1994. NEHRP recommended provisions for seismic regulations for new buildings, Part1- Provisions, FEMA 222A. Federal Emergency Management Agency, 290p.
6) IBC 2009/ UBC 1997.
7) Eurocode 8 (2007).

MEGHALAYAN AGE: THE SCIENCE BEHIND

Sukanya Dutta Neha Hussain Jyoti Nayan Panging
DEPARTMENT OF GEOLOGY
JAGANATH BAROOAH COLLEGE,JORHAT.
Contact-9101440263
Email ID-sukudutta01@gmail.com

Abstract : Scientists have created a new phase in Earth's geologic history and named it Meghalayan, after a stalagmite from a cave in the Indian state of Meghalaya that helped define climatic events 4,200 years ago, making the beginning of the phase that continues till today. The Meghalayan age began with a mega-global drought that devastated ancient agricultural civilization from Egypt and China and the evidence of the climatic events have been found in sediments on all seven continents, including those from Meghalaya. The two other ages: the middle Holocene northgrippian age and the early Holocene Greenlandian age with their beginnings, defined at climatic events that happened about 8,300 years and 11,700 years ago. Thus the three ages comprise the Holocene Epoch, which represents time since the end of the last ice-age. Its GSSP is in Mawnluh cave which lies in the Khasi hills, located near Sohra (Cherrapunji) 58kms from Shillong, the capital of Meghalaya. The age and climate during that period was determined with the help of oxygen isotope(O18 /O16) and Uranium-Thorium dating methods. Though it has been declared as an age, not everyone is satisfied with it. Many Geologists are still looking for evidence.
Through this poster, an attempt is made to present an overview of the science behind the Meghalayan Age.

KEYWORDS- Meghalayan Age, stalagmite, Holocene, Isotope.

Cost-aware Deployment of Enterprise Applications in Federated Cloud Data Center

Moustafa Najm and Venkatesh Tamarapalli
Department of Computer Science and Engineering, IIT Guwahati, India E-mail: {Moustafa.najm, t.venkat}@iitg.ac.in

1. INTRODUCTION: Nowadays, many enterprise applications with a global coverage and a huge volume of data communication are deployed on the cloud, such as social media, e-commerce, and online games. When a single data center (DC) is unable to satisfy the requirements of such applications, the federated paradigm where multiple cloud providers can share their resources presents a scalable and flexible platform to serve these applications. Federation has many features which benefits the cloud providers and the user, such as high availability, profit maximization, improved QoS and avoiding vendor lock-in for the user. The main goal of each cloud provider (CP) is minimizing the operating cost. Energy consumption contributes a major fraction of DC's operating cost. NRDC has expected that U.S. DCs will consume 140 billion (KwH) by 2020 which costs CPs $13 billion. Further, enterprise applications contain large number of virtual machines (VMs) with complex communication among these VMs. A recent study has predicted that the annual DC traffic will reach up to 20.6 ZB by 2021 costing CPs $ 4.45 billion. Subsequently, energy and bandwidth are essential factors that affects the cost of CPs, and they must be considered during VM placement to minimize the operating cost. This work is motivated by the following observations from the literature. First, the requirements of enterprise applications make the federated cloud as the most suitable platform for deploying such applications. Second, Although the problem of VM placement has been widely explored within a single DC, federated DCs pose new challenges such as spatial and temporal cost diversity, possibility of sharing resources with other CPs and inter-DC communication. Third, WAN communication used between DCs in the federation is costly. While previous research focus mainly on optimizing energy consumption, we argue bandwidth cost should be taken into account also to minimize the total cost. Fourth, most of the works in literature place individual VMs. However, VMs of an application need to communicate with each other to perform a particular task, e.g. multi-tier applications. Because of this, it's useful to allocate groups of correlated VMs together to improve the performance and reduce the bandwidth usage. The problem addressed in this work is the placement of enterprise applications in federated DC with the objective of minimizing energy and bandwidth costs simultaneously by allocating groups of VMs and leveraging the variation in electricity price across DCs in the federation.

2. PROPOSED METHOD: Towards solving this problem, we propose a heuristic based algorithm for VM placement which allocates clusters of VMs that are highly correlated in terms of communication. The algorithm includes two tasks; grouping and allocation. Grouping creates clusters of VMs based on the density of traffic among the VMs by removing lowest weight links recursively keeping the high communicated VMs in one cluster. This task aims to reduce the bandwidth cost associated with the communication between DCs. Allocation task maps the clusters of VMs that are created by the grouping task to the DCs in the federation starting with the DC having minimum electricity price. This task aims to minimize the cost of energy. Instead of allocating individual VMs, the proposed algorithm allocates clusters of correlated VMs. It reduces the costs of energy consumption and bandwidth together in simple steps.

3. RESULTS AND CONCLUSION: We have evaluated the proposed algorithm using different real scenarios, and comparing it with common bin backing methods; first fit, worst fit and best fit. We have also implemented first fit with electricity price awareness. The simulation platform is a federated cloud composed of eight DCs belongs to three CPs in different areas. We have studied the impact of application size on the costs. Simulation results show that the proposed method reduces the cost of energy up to 40% comparing to other methods. It also reduces the cost of bandwidth significantly; that is up to 70% for applications with large size. The reason behind that is that the proposed algorithm keeps the dense communication within a DC and it tries to minimize the traffic between DCs. We have also demonstrated the advantage of the federation by testing the proposed algorithm with federated and non-federated setup. Simulation results showed that the proposed algorithm obtains lower costs in the federated setup compared to non-federated scenario. Accordingly, our algorithm performs better than others in all scenarios, especially for large applications, and it achieves superior results in federated setup. We can conclude that the proposed algorithm fits perfectly for deployment of enterprise applications in the federated cloud.

REFERENCES :
[1] P. Eugster, C. Jayalath, K. Kogan, and J. Stephen. 2017. Big Data Analytics beyond the Single Data center. Computer 50,6(2017),6068.

[2] Z. Li, J. Ge, H. Hu, W. Song, H. Hu, and B. Luo. 2018. Cost and Energy Aware Scheduling Algorithm for Scientific Workflows with Deadline Constraint in Clouds. IEEE Transactions on Services Computing 11, 4 (2018), 713–726.

[3] G. Venkatesh and K. Arunesh. 2018. Map Reduce for big data processing based on traffic aware partition and aggregation. Cluster Computing (05 Feb 2018).

Unsupervised Pre-training on Improving the Performance of Neural Network in Regression

Pallabi Saikia
Department of Computer Science and Engineering, IIT Guwahati, India
E-mail: pallabi.s@iitg.ac.in

The work aims to empirically analyse the performance of the prediction capability of Artificial Neural Network by applying a pre-training mechanism. The pre-training used here is same as the training of Deep Belief Network where the network is formed by stacking Restricted Boltzmann Machine one above the other successively. A different set of experiments are performed to understand in what scenario pre-trained ANN performed better than randomly initialised ANN. The results of experiments showed that pre-trained model performed better than randomly initialised ANN in terms of generalised error, computational units required and most importantly robust to change in hyperparameters such as learning rate and model architecture. The only cost is in additional time involved in the pre-training phase. Further, the learned knowledge in pre-training, which is stored as weights in ANN, are analysed using Hinton diagram. The analysis could provide a clear picture of the pre-training that learned some of the hidden characteristics of the data.

Planar Graph 5 Colouring in Parallel External Memory Model

The problem of colouring a graph with minimum possible colours has a lot of applications in networking, resource allocation, scheduling etc. Planar graph colouring is a special case. The aim is to design an algorithm for five colouring planar graph in the Parallel External Memory (PEM) model. We have an optimal algorithm to colour a planar graph with 5 colours in parallel RAM model. We will be using similar approach to design an efficient algorithm for PEM model. As a starting point, we are working on 3 colouring of List in PEM model. Later on we will be designing a 3 colouring algorithm for rooted tree in PEM model. Then these two problems will provide sufficient foundation to design PEM algorithm for 5-coloring planar graph.

KEYSTROKE DYNAMICS AUTHENTICATION SYSTEM

Abhilekh Das
Department of Computer Science and Engineering
National Institute of Technology Rourkela
Rourkela, Odisha, India.
E-mail: abhilekh.cse@gmail.com

In this arena of the massive explosion of modern technologies, computer security is of utmost importance. Due to the availability and expansion of internet technology the PIN and the Password method have become quite insufficient for avoiding unauthorized access of data. In order to curb this, keystroke authentication can be applied. Thus keystroke dynamics is a behavioural biometric characteristic which is based on the fact that different people type in a unique manner. A major inhibitor of the growth of biometrics like retinas, fingerprints, etc has been the cost to implement them. The biometric characteristic is unique as human behavior to type their password is different from person to person. The Keystroke Dynamics Authentication System is described based on security metrics like False Acceptance rate (FAR), False Rejection rate (FRR) and Equal error rate (EER). The three used features for keystroke dynamics are: Hold time, Keydown-Keydown time, Keyup-Keydown time. This model consists of 2 phases: Enrollment phase and Verification phase. Three detectors have been used for the Verification purpose, namely Euclidean Detector, Manhattan Filtered Detector and Manhattan Scaled Detector.
Keywords: Keystroke dynamics, Manhattan Filtered, Manhattan Scaled, Equal error rate (EER).

Web Service Selection Mechanism in Service Oriented Architecture based on Publish Subscribe Pattern in FOG environment

Amit Ranjan
Department of Computer Science and Engineering, NIT Rourkela, India
E-mail: 217CS3435@nitrkl.ac.in

Fog computing reduces latency and increase the throughput by processing data near the body sensor network. In this work, we have considered a service oriented architecture based on publish subscribe pattern for web service selection in fog environment. With the advancement in fog environment, a large number of web services in fog environment provide same functionality but differs in their quality of service (QoS) parameter. This work focuses on an approach based on genetic algorithm for the selection of a workflow which comprises of different fine grained web services. This work only considers the non-functional aspects of web services mentioned in service level agreement (SLA). In this work, we propose a fitness function that takes both quality of services and user preference in consideration while computing the fitness value. Moreover, genetic algorithm is used as an optimization algorithm to get an optimum workflow considering service level agreement and user preference assigned to each QoS parameters. The conducted experiment shows that better result is obtained from the new fitness function.

Application of Sound Reduction Technique With The Purpose Of Reducing Pollution

Authors: Debasish Nath, Layanu Komal Baruah
Student of B.Sc 6th Semester, Dept. of Computer Science, Lalit Chandra Bharali College, Maligaon.
Email: debasish.chimu@gmail.com, layanubaruah@gmail.com

Noise can be defined as unwanted sound. There are many cases and applications where reducing noise level is of great importance. Noise can interfere with sleep, speech, and cause discomfort and effect health adversely. Loss of hearing is only one of the effects of continuous exposure to excessive noise levels. Industrial machinery, air/surface transportation and construction activities are main contributors in noise production or "noise pollution". Noise Pollution is not only an annoyance; it is an environmental health hazard. Noise can be found anywhere that life exists. The importance of noise issue could be well understood by looking at regulations that have been passed by the government to restrict noise production in day to day life. A lot of research has been done about noise pollution in the last 4 decades, but yet there is still more work to be done on how to control and lessen the affects that noise has on human and animal life. Noise control is a major factor in the planning, design and construction of transportation corridors. Architects, acoustical engineers and transportation planners are searching for creative ways to eliminate or greatly reduce noise levels.
The challenge lies in attaining desired sound levels while simultaneously maintaining or enhancing the visual environment. We will be setting up an experiment to determine what kinds of materials absorb sound waves of varying frequencies most efficiently.
Keywords: Unwanted Sound, Noise Pollution, Regulations, Sound Waves.
References:
1. Perception of Sound-Human Ear.” Sound and Noise. N.p.,22 Feb. 2011.Web.1 Jan.2013.
2. Maxwell, Clinton “Cool Ideas: How Sound Insulations Work.” Cool Ideas. N.p.,2012.Web.Jan.2012.
3. Schmid, Randolph E. “Aging Nation Faces Growing Hearing Loss” 18 Feb. 2007. 28 Jan 2009.

ABSTRACT

An autonomous robot is a robot that is designed and engineered to deal with its environment on its own, and work for extended periods of time without human intervention. Distinct path following autonomous robots are gaining much popularity for applications in various fields like production line, driverless cars etc. This paper describes a technique for an autonomous path following rover that can handle objects on its path and find the alternative path with no objects. The Path is basically detected by an ambient light sensor which allows the rover to traverse till any object is detected by the IR sensor that is mounted on the rover. It avoids the object by finding an alternative path. We have used National Instruments myRIO which is the control system of this unit that has wide variety of sensors, actuators, and displays and a more efficient processor. This model can be upgraded for more real-world applications.
Keywords; Autonomous Rover, myRIO,NI LABVIEW, IR Sensor, Ambient Light Sensor.

Proactive Disaster Detection

Kaustubh Hiware
Department of Computer Science and Engineering, IIT Kharagpur

Disasters can refer to any unforeseeable situation or crisis which results in a huge damage or loss to life and/ or property. The broad spectrum of disasters encompasses natural calamities like earthquakes, floods, disease outbreaks and even anthropogenic incidents like terrorist attacks. Online Social Media (OSM) sites, especially microblogging sites like Twitter and Weibo, have been shown to be very useful for gathering situational information in real-time. A few Information Systems have already been implemented in various countries for emergency informatics, and their efficacy has been demonstrated in a variety of situations. Previous work on real-time earthquake detection in Japan was deployed by using Twitter users as social sensors. The work demonstrated that social media was able to detect earthquakes faster than conventional seismographic sensors. However, merely detecting the onset of a disaster is not sufficient. It is also essential to gather other vital situational information pertaining to the disaster, such as the regions which are presently affected and those which are prone to future risk. This would assist in post-disaster relief operations as well by identifying evacuation routes. Consequently, an important component of this task involves accurately extracting geographical locations from the tweet texts and associate the information available online with the physical location. We specifically seek to infer the location from the tweet text as opposed to geotagged information, for two important reasons.

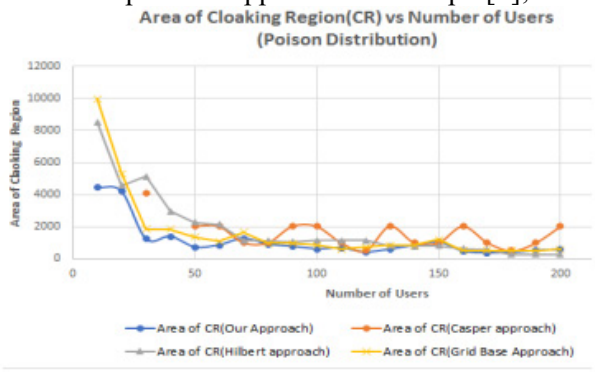
Geotagged tweets are very sparse in number, especially in developing countries and accounts for only 0.36% of the tweet traffic.
The tweet's geo-tagged location is not always a valid representative of the incident mentioned in the tweet text. For instance, the tweet "Will discuss on TimesNow at 8.30 am today regarding Dengue Fever in Tamil Nadu." clearly refers to Tamil Nadu, but the geo-tagged location is New Delhi.
We thus propose an automated, real-time location inferencing tool with the overarching goal of developing an early-warning system that can be used to identify disasters. Although there exists several methodologies such as Stanford NER, TwitterNLP, for extracting locations from the texts, they are not fast enough to deployed on a real-time setting. Moreover the existing Information Systems which are used for disaster relief operations such as Ushahidi and Mapbox require users to explicitly specify the location. Our proposed system intends to tackle both these issues.

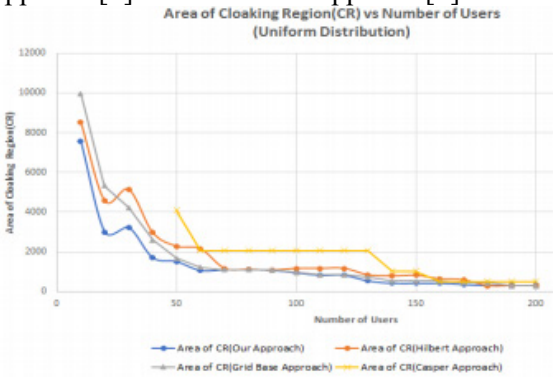
Ripple : A Noble Grid Based Privacy Approach for Location Based Services

P. Biswas1and A. Sairam2 1 Department of Computer Science and Engineering, IIT Patna, India 2
Department of Mathematics and Computing, IIT Guwahati, India
E-mail: pratima.pcs13@iitp.ac.in

Introduction -Nowadays, location based services(LBS) are popular and utilitarian information services but the use of these services cause a serious privacy threat[1] to the users as these services require user's current location to provide the requested information .Many approaches have been proposed to achieve privacy in Location based Services(LBS). Most of them implement k -anonymity and granularity privacy mechanism to hide current location of the mobile users. In the mechanism an extended region known as Cloaked Region (CR) is sent in place of user's precise location which must contains minimum k number of users to the service provider. The area of cloaked region is a significant and critical parameter as it highly affects the Quality of service (QoS) of the approach. Larger cloaked region tends to poor Quality of service. However small cloaked region may compromise location information of subscriber. Thus to achieve good quality of services with desired security the privacy mechanism need to find minimum cloaked region with at least k users within that region. Further k users nearest to each other yield minimum cloaked region. Motivation and Objective Most of the existing approaches do not guarantee to evaluate nearest neighbors of the query point which tends to poor QoS and few approaches find nearest neighbors but they suffer from heavy computational overhead. Our objective is to propose an effective privacy mechanism which guarantees to evaluate nearest neighbors to improve quality of

service with less computational load. Our ContributionIn this work our contribution are mention below is : • Propose a noble framework for privacy preserving location based services which ensure to return k nearest neighbor for better QoS. • Reduce computational time by using ripple search pattern in which there is no need to consider all the location of users in the vicinity to calculate the k nearest users. To further reduce the searching time the max heap is used in the algorithm. Proposed ApproachIn the proposed approach the 2-D plane having n users is divided into cells of equal size. The cell of query issuer acts as center and the search area increases iteratively around the cell till the privacy constraint k meets which looks like a square ripples around the cell .After the k constraint satisfies two more iteration are considered to ensure nearest neighbor of the query generator. Performance AnalysisThe time complexity of our algorithm is O(nlog(k)) where, n is total number of points in system and k is number of points to be sent with query point. The overall space complexity is O(n) to store all the points lying in the 2-d plane. Experimental Result The proposed approach is implemented in C++ programming language. We consider 100x100 2-D plane to analyze our algorithm The locations of all the n users in the plane are generated according to Uniform Distribution and Poisons Distribution. These locations serve as input to the implemented program. The value of n varies from 20 to 200 and k is taken to be 10. We compare our approach with Casper[2], Hilbert approach[4] and Grid-Base approach[3] as





shown in fig. The performance improvement of our work in case of Poison Distribution as compared the Casper, Hilbert and Grid-based approach is 52.26%, 30% and 21.21% respectively. The performance improvement of our work in case of Uniform Distribution as compared the Casper, Hilbert and Grid-based approach is 58.16%, 30% and 8.5% respectively. Conclusion Therefore we propose a new privacy approach namely Ripple which provide minimum cloaked region to maintain Quality of service while preserving desired privacy of the user. Proposed approach guarantees to impart (k-1) nearest neighbor of the user generating the query. The algorithm uses max heap to reduce the searching time. Experimental result shows significant improvement in the cloaking region returned by our approach as compared to other existing approaches..

References

[1] M. Gruteser and D. Grunwald, Anonymous usage of location based services through spatial and temporal cloaking, In Proceedings of the 1st international conference on mobile systems, applications and services (MobiSys),San Francisco, California, pp 31-42, 2003.

[2] M. MF, C. CY and A. WG, The new casper: query processing for location services without compromising privacy, In Proceedings of the 32nd International Conference on Very Large Databases (VLDB), Seoul, Korea, pp 763-774,2006.

[3] L. Mou and A. Lbath A Grid-based Location Privacy-Preserving Method for LBS Users,) In Proceedings of the 1st ACM SIGSPATIAL International Workshop on Privacy in Geographic Information Collection and Analysis, USA, pp 763 774,2014.

[4] Ghinita, Gabriel, Panos Kalnis, and Spiros Skiadopoulos. "MOBIHIDE: a mobilea peer-to-peer system for anonymous location-based queries." In International Symposium on Spatial and Temporal Databases, pp. 221-238. Springer, Berlin, Heidelberg, 2007.

How Data Mining is Contributing to Cancer Research

Subhasree Majumder
Department of Computer Science & Engineering, NIT Meghalaya, India
E-mai:t18cs005@nitm.ac.in

Cancer is the leading cause of deaths in India and worldwide, having doubled its rate of taking lives since 1990. According to a 2018 report by WHO's IARC, 18.1 million new cases of cancer has been registered with 9.6 million cancer deaths in 2018 [1]. A simple search of "breast cancer" produces more than 2.5 million search results. With this plethora of scientific publications available, and other data like pathological lab reports, clinical data, data mining gives us the tool to assist cancer research.

Methodology and Results:

In this research, we try to give an overview of the data mining techniques being used in health analytics in cancer domain. Our research takes into consideration, literature on cancer research over the past 10 years and summarizes the applications where data mining techniques can be put into implementation.

We start our journey by looking into text mining and its tools such as NER, Regular Expressions, Information retrieval and Information extraction which can be used to structure, unstructured patient data from electronic health records [2] [3].

Next, we look into how data mining techniques such as classification, clustering and association rule mining which can be used to predict cancer staging, reduce the number of unnecessary biopsies, mine cancer literature to know about biomarkers and hence, help in early detection of cancer [4] [5].

Finally, we discuss about how data mining is used in nutrigenomics which is a recent research topic that deals with finding the direct consequences of using bioactive compounds derived from day to day food like broccoli on gene expressions [6]. We also look into the available state-of-the-art products which are using the power of data mining to get more insights on cancer research.

Conclusions:

Data Mining over the years has proved itself to be instrumental in cancer diagnosis, predictions and opening up new paradigms in cancer research. Knowing about what all things have been done and what is the current trend in the domain, gives us a direction to continue our research work and help contribute efficiently.

References:

[1] Bray, Freddie, et al. "Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries." CA: a cancer journal for clinicians 68.6 (2018): 394-424.

[2] Napolitano, G., Fox, C., Middleton, R., & Connolly, D. (2010). Pattern-based information extraction from pathology reports for cancer registration. Cancer Causes & Control, 21(11), 1887-1894.

[3] Zhu, F., Patumcharoenpol, P., Zhang, C., Yang, Y., Chan, J., Meechai, A., ... & Shen, B. (2013). Biomedical text mining and its applications in cancer research. Journal of biomedical informatics, 46(2), 200-211.

[4] Yang, H., & Chen, Y. P. P. (2015). Data mining in lung cancer pathologic staging diagnosis: correlation between clinical and pathology information. Expert Systems with Applications, 42(15-16), 6168-6176.

[5] Jurca, G., Addam, O., Aksac, A., Gao, S., Özyer, T., Demetrick, D., & Alhajj, R. (2016). Integrating text mining, data mining, and network analysis for identifying genetic breast cancer trends. BMC research notes, 9(1), 236.

[6] Martín-Hernández, R., Reglero, G., & Dávalos, A. (2018). Data mining of nutrigenomics experiments: Identification of a cancer protective gene signature. Journal of Functional Foods, 42, 380-386.

Non-Parametric (Data-driven) Scene Parsing of Natural Images

Veronica Naosekpam1, Alexy Bhowmick2
1,2 Department of CSE & IT, School of Technology,
Assam Don Bosco University, Guwahati, India
venaosekpam11@gmail.com

Abstract: Scene parsing is the task of densely labelling each pixel in an image with a predefined class label. It is a long-standing challenge in Computer Vision. We present a novel approach for non-parametric scene parsing using recent features extraction techniques for scene retrieval and super-pixel based correspondence on benchmark datasets.

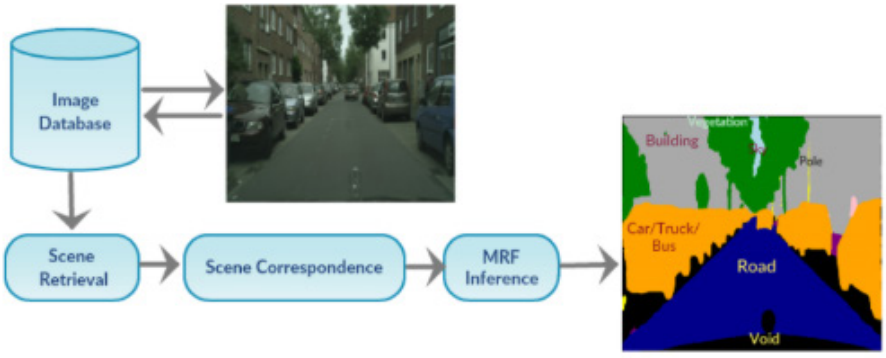


Fig 1. Typical pipeline of non-parametric scene parsing

Introduction/Problem: Scene parsing methods can be broadly divided into two categories [4]: i) Parametric, and ii) Non-parametric methods. The non-parametric approach exhibits several advantages over the traditional parametric approach: i) Requires (almost) no training, ii) Scalable to a large number of categories, and iii) Suitable for ''Open Universe'' datasets. Figure 1 shows a typical pipeline of non-parametric scene parsing approach.

Challenges: The overall scene parsing performance is dependent on correct scene retrieval and accurate scene correspondence.
There is no chance of recovery in later stages in case of an incorrect retrieval.
Finding dense correspondence e.g. SIFTFlow [1] is a major bottleneck (complex and expensive).

Methodology: We propose alternative strategies for each stage in the pipeline:
Firstly, using sophisticated feature vectors (e.g. VLAD [3]) in lieu of Gist [2] improved retrieval performance.
Secondly, adopting partial (super-pixel based) correspondence is known to provide better spatial support.

Lastly, off-the-shelf Markov Random Field (MRF) integrates labels for contextual smoothing and produces final labeling result. The benchmarks used are INRIA Holidays [3] for image retrieval, SIFTFlow (LabelMe Outdoor) for overall scene parsing.

Results: Scene retrieval with Gist [2] (a 512-dimensional global representation) is not accurate and affects overall scene parsing; as evident from our Gist-based scene retrieval experiment on INRIA Holidays [3] (Table 1).

Discussion: Scene retrieval is a critical phase in the overall pipeline.
The use of super-pixels provide computational efficiency and
spatial support.

Method	Gist	VLAD
map	36.5 %	56.5 %

Table 1: Gist vs VLAD on Holidays Dataset

Conclusion: The results are from initial scene retrieval experiments. The entire scene parsing pipeline is a work in progress.

Keywords: scene, labeling, scene parsing, correspondence, data-driven.

References:

[1] Liu, Ce, Jenny Yuen, and Antonio Torralba. "Siftflow: Dense correspondence across scenes and its applications." IEEE transactions on pattern analysis and machine intelligence 33.5 (2011): 978-994.

[2] Oliva, Aude, and Antonio Torralba. "Modeling the shape of the scene: A holistic representation of the spatial envelope." International journal of computer vision 42.3 (2001): 145-175.

[3] H. Jegou, M. Douze, C. Schmid, P. Prez, Aggregating local descriptors into a compact image representation, in: 2010 IEEE Computer Society Conference on Computer Vision and Pattern Recognition, 2010, pp. 3304–3311.

[4] Tighe, Joseph, and Svetlana Lazebnik. "Superparsing: scalable non-parametric image parsing with superpixels." European conference on computer vision. Springer, Berlin, Heidelberg, 2010.

Development and Design Strategies of Evidence Collection Framework in Cloud Environment

Yunus Khan and Sunita Varma Ph.D. Scholar, Shri G.S. Institute of Technology and Science Indore M.P. India

(RGPV Bhopal) Professor and Head, Shri G.S. Institute of Technology and Science Indore M.P. India

Now a days cloud computing is one of the popular and widely used concepts in information technology paradigm. It is committed to improving the IT business technically and economically. On the other hand, digital forensic is the process of collection, identification, preservation, examination and analysis of data or information for the proof in the court of law as an evidence. It is very difficult and challenging to apply digital forensic operation in a cloud environment because CSP's are dependent on each other either they provide IaaS, PaaS or SaaS. So the cloud forensic is one of the applications of digital forensic in a cloud environment is just a subset of network forensic. It's a cross-field of digital forensic and cloud computing. In this paper, we investigate all the research issues, problems and implementation ethics of cloud forensic from the initial level. We found that lots of issues and challenges are remaining to address in this domain. Some major research domains are architectures, data collection and analysis, anti-forensic, incident first responders, roles and responsibilities, legal, standards, and some learning issues. In our research work we mainly focus on the data collection, cloud forensic architectures and also implement a cloud forensic framework in the context of cloud service models. This research work is tested using different private cloud solution such as eucalyptus, Open Nebula, VMware, vcloud and Hadoop platform. In our research work we implement pattern search facility using the proposed approach in open source software called digital forensic framework. We also implement in near future digital forensic triage using Amazon elastic map reduce. In this research we also implement designed and development of forensic method for the PaaS and SaaS delivery model of cloud computing. Also apply machine learning principles to design and develop new digital forensic methods, improve the efficiency of investigation using machine learning algorithms for future extraction priority of evidence classification of evidence in virtual machines. Index Terms: Digital Forensic, Data Collection, Evidence Segregation, Dependency Chains, IDS, Multiple Jurisdictions and Tenancy, and VMware.

References:

[1] Saad Said Alkahtny, Thesis On "A Forensically Enabled Iaas Cloud Computing Architecture", University Of Plymouth, Http://Hdl.Handle.Net/10026.1/9508. Jan 2017.

[2] Mark Tangiwai Mathew Piwari, Thesis On "Digital Forensics In The Cloud: The Reliability And Integrity Of The Evidence Gathering Process", Auckland University Of Technology Newzeland 2016.

[3] Almarzooqi, A. And Jones, A., 2016, January. A Framework For Assessing The Core Capabilities Of A Digital Forensic Organization. In IFIP International Conference On Digital Forensics (Pp. 47-65). Springer International Publishing .

[4] Almarzooqi, A., Jones, A. And Howley, R, 2016 May. Applying Grounded Theory Methods To Digital Forensics Research. In The 11th Annual Adfsl Conference On Digital Forensics, Security And Law.
[5] Alecsandru P˘Atra¸Scuand Victor Valeriu Patriciu, "Implementation Of A Cloud Computing Frameworkfor Cloud Forensics", Proceedings Of The 18th International Conference On System Theory,Control And Computing, Sinaia, Romania, October 17-19, 2014978-1-4799-4601-3/14/$31.00 ©2014 IEEE.
[6] Victor R. Kebande & H.S. Venter, "Novel Digital Forensic Readiness Techniques In The Cloud Environment", In Australian Journal Of Forensic Sciences, Published In January 17, 201

Design Thinking Behind Multipurpose River Valley Projects in India

Abhijit Sen and Sougata Karmakar*
Department of Design, IIT Guwahati, India
*E-mail: karmakar.sougata@gmail.com

India's tryst with destiny in 1947 heralded a series of large scale developmental projects. Multipurpose river valley projects were built at a time when the building of large dams was a matter of national pride and an affirmation of a country's technological autonomy and political equality with the West. Extending over large geographical areas across states, they were designed to address multiple socio-economic needs of a nascent nation. These projects have stood the test of time and continue to sub serve the original mandate. Design thinking that led to the conception and creation of river valley projects have not been explored. Therefore; it would be relevant to explore the design thought process that resulted in such projects which play a critical role in addressing diverse needs. This present paper attempts to understand the "Design Thinking" behind the creation of multipurpose river valley projects in India.

Among of the various multipurpose river valley projects, the Damodar Valley Corporation (DVC) was the first (established in 1948), multipurpose river valley project of independent India on the river Damodar. To unfold the design thinking process at the backdrop of multipurpose river valley projects, the current study considered the case study of DVC, since it was one of the first and the largest (24,235 sq. kms) post-independence experiment in socioeconomic intervention modelled on the Tennessee Valley Authority (TVA) of the USA. All the available hard copy documents available in the library of DVC and other softcopy literature available from various electronic resources were consulted to write the current review to understand the inception and development of DVC project. Available information pertaining to planning and holistic design thinking for the success of DVC have been presented under various headings and sub-headings in the current review.

Consisting of 4 dams, 1 barrage and a 2494 km long canal network, it was designed for flood control, irrigation, socio-economic development and power generation. Seven decades on, the DVC has been successful in moderating floods to a large extent. It is a source of water for irrigation and drinking. The silt carried by the Damodar river enables three crops annually in the lower command area. It has created both direct and indirect employment and inclusive growth.DVC is also one of the leading integrated power organizations in India supplying power to 8 states. DVC is a prime example of a successful design story. It is also a story of how a grand design turned a "River of Sorrow" into a "River of Opportunities".

Behind every creation is some design thought. Right exploration of design thinking models practiced in creating multipurpose river valley projects like DVC would serve as templates for designers planning large scale projects, governments planning infrastructure projects involving large populations and economists/bureaucrats framing public policies. Additionally, the design thought philosophy in the present area can add to the existing list of design approaches.

Keywords: Critical thinking, Design, Renewable Energy, Planning, River

Framework of a tool assisting design practitioners to filter and organize visual inspiration material for preparing moodboards

Abhishek Kanthed
Department of Design, IIT Guwahati
a.kanthed@iitg.ac.in

A variety of digital tools have been developed aiming to reduce time, cost and human errors and improve designers' efficiency at various phases in a product development process. There are digital tools to help designers to recruit participants in earliest phases of design research[1]; to assist designers make surveys and collect & analyze quantitative data easily[2]; remote diary study tools that helps collecting and analyzing the qualitative data from participants[3]; remote usability testing & live prototype testing tools[4] etc. However, there have been very few digital tools that help the designers' in the most important and time-comsuming part of the product development phase while they transform the customer needs identified from the qualitative research into the product features. During this phase of the process designers tend to undertake a wide ranging exploration of the design space in order to come up with a variety of ideas to create the best possible solution.

One of the venerable tools that designer's often use for idea development are moodboards. A moodboard is a graphical/semantic composition that has many inspirational functions, such as: defining a design context, triggering ideas during concept generation and structuring anchors for designer's creativity. The study aims to propose a framework for a digital tool that uses the qualitative data collected through semi-structured interviews to identify various customer needs and propose relevant visual inspirational material enabling designers prepare moodboards efficiently.

REFERENCES

[1] Bolt, Nate. “Ethnio.” Ethnio, 2012, Available from: ethn.io/ [Accessed 5 November 2018].
[2] Okuniev, David. “Turn Data Collection into an Experience | Typeform.” Free Beautiful Online Survey
& Form Builder | Typeform, 2012, Available from: www.typeform.com/ [Accessed 5 November 2018]
[3] Winnick, Michael. “In-Context Insights via Remote Qualitative Research.” Dscout, 11 Sept. 2011, Available from: dscout.com/ [Accessed 5 November 2018]
[4]D.N. “Full-Spectrum Research & Customer Experience Software.” FocusVision, 1990, Available from: www.focusvision.com/ [Accessed 5 November 2018]

Devices for Early Diagnosis of Disease

Ankit Chowdhury1 , Pankaj Upadhyay2 and Dr Dipankar Bandyopadhyay3
1 Department of Design, IIT Guwahati, India
2 Centre for Nanotechnology, IIT Guwahati, India
Email id: a.chowdhury@iitg.ernet.in; pankaj.upadhyay@iitg.ac.in; dipban@iitg.ac.in

The population of India is rising every year, a truism that we know since our school days. In a scenario where a large number of people lives at a substantial level, ensuring quality health facilities at primary healthcare becomes necessary. These primary healthcare centres are widespread across the country in the form of Sub-centres, Primary Healthcare Centres and Community Health Centres. Centre for Nanotechnology, IIT Guwahati has developed state of the art rapid diagnostic technologies for primary healthcare and point of care testing. A research to understand the point of care testing devices and primary healthcare facilities in India has reflected major issue in the system like most of them are

operated in low resource setting lacks quality diagnosis, reliable health data, trained technicians to name a few. This thesis puts emphasis on the design and development of a multi-diagnostic device which can ensure quality rapid diagnosis. The device is built on the concept of modularity which makes it robust, rapid to technical upgradation, customizable, ease of maintenance. It has a touchscreen user interface and provides internet connectivity. with an increase chronic diseases in India, this device is an effort to improve the healthcare system, by providing early diagnosis of diseases at the level of primary healthcare.

Ankit Jain
1 Department of Design, IIT Guwahati, India
Email id: ankitjain.2015@iitg.ac.in

Entrepreneurship means different things to different people. Some might see entrepreneurship as starting and running of an informal or micro enterprise. Some might call it as a problem solving for the society through a business model and many more definitions. In this report we want to consider entrepreneurship education with respect to India, (Guwahati to be more precise) and explore what entrepreneurship means to secondary school students. Children in schools are given formal education on various subjects such as maths, science, history, language and so on. These courses do offer a wide variety of career options, but these are what makes them job seekers. India needs 1 crore jobs each year and data shows that it is startups and not established enterprises who can cater to such needs. In order to bring this change we need large number of startups in the upcoming years. The greatest hurdles to entrepreneurship are poor entrepreneurial culture of the population and unwillingness to take risk. Also in India being an entrepreneur is socially not acceptable, as compared to our american counterparts. In spite of bad entrepreneurial mindsets we Indians are extremely creative and with some guidance we can reach our dreams easily. In this sense our project proposes the development of certain instructional material through various means (need to be explored and ideated) that can be implemented very early in secondary school education on and empower the entrepreneurial attitude. We want to develop this project based on the notion that entrepreneurship is all about taking an initiative to ask “what if” and taking up courage to solve a problem. We believe that primary focus needs to be on developing entrepreneurial attitude and rest of the skillset will follow. Through this project we want to discover what different learning approaches for a topic as abstract as entrepreneurship, develop instructional material for the same and implement it as a methodology to develop a framework for entrepreneurship education among school going children in India. Hence we are building a sustainable future for our country.

Urban Solid Waste Management

Arpit Jain, Jemmy Seth, Suman Ji, Naveen Kumar Chaurasia
Indian Institute of Technology Guwahati, India
Email id: arpit.jain@iitg.ac.in

Solid waste management in India has become a menace and with rapid urbanization and population growth, this menace is bound to grow. This study analyses the current solid waste management system of India (taking the Guwahati city as the focal point for generalization), possibilities and associated issues. The study was conducted to detect the issues in the current system and propose various concepts to tackle identified issues. This study followed a system analysis and design methodology under which detailed survey was carried out at the Guwahati Municipal Corporation (GMC) and with various street

workers. The study revealed various loopholes in the standard operating procedures of the GMC and the overall ecosystem of the solid waste management in the city. Having identified those loopholes various concepts were generated through ideation workshops to tackle the issues of ragpickers life, household segregation, making value out of waste, issues related to dustbins on the roads and complaint registering, mainstreaming critical but neglected stakeholders like kabadiwalas. With these concepts the system could be revised for better efficiency even by using the existing resources or by investing a very less amount of money in creating new resources.
Keywords: Solid waste management, System analysis and design, Stakeholders

ENHANCING LIVELIHOOD POSSIBILITIES OF DOKRA CRAFTSMEN THROUGH THEIR CRAFT: REDESIGN OF DOKRA DOOR HANDLES

Gaurav Vaidya1, Battula K. Chakravarthy 2
1 Department of Design, IIT Guwahati, India
2 IDC School of Design , IIT Bombay, India
E-mail: gaurav.vaidya @iitg.ernet.in

Dokra casting is a non-ferrous metal casting process followed by traditional metal craftsmen in eastern part of India. This project is an attempt to make aesthetically appealing objects using Dokra Casting process. These casted objects find use in day-to-day life rather than being just a decorative piece. Working with dokra craftsmen has been a major part of this project. While exploring the methods and techniques to make quality articles, it was also thought how making such usable metal articles would easy and beneficial to the craftsmen in the villages to earn better livelihood. These products will not only be good looking but they will also serve the functional need that is meant for. These everyday utility products will invoke sensitivity about the craft, its rich background and inherited tradition in minds of people seeing or using it.

Squeezify – A tangible interactive video game

Rushikesh Khumkar; Jemmy Seth; Rahul Rabha; Chirag Agrawal; Asst. Prof. Keyur Sorathia
Department of Design, IIT Guwahati, India
Email id: khumkar.kishor@iitg.ac.in; jemmy.seth@iitg.ac.in; rahul.rabha@iitg.ac.in; chirag@iitg.ac.in; keyur@iitg.ac.in

Cerebral Palsy is considered as a neurological disorder, affecting the body movement and posture and caused due to a non-progressive brain injury or malformation that occurs while the child's brain is under development. It is damage to the brain that cannot currently be fixed. Every case of cerebral palsy is unique to the individual. It affects the fine and gross motor skills and oral motor functioning and affects daily living activities such as dressing, drinking from a glass of water, eating, etc. Eight children with cerebral palsy, all having different levels of abilities were studied and keenly observed during their physiotherapy session in Shishu Sarothi, a rehabilitation centre in Guwahati for children with multiple disabilities.Our research findings suggest that there is a lack of engagement in the games or equipments used by children with cerebral palsy for the development of motor skills. Several studies underline that using interactive video games for therapy and rehabilitation can be useful. Our design aims at making the use of TUIs to help increase the engagement and motivation of the children and enhance the development of their motor and cognitive skills. 'Squeezify' is a video game involving tangible and tactile interactions through a programmable electronic soft ball, along with audio feedback to train several movements, such as grasping, extension and movement of the shoulder and the hands. In further study we are going to measure how fast is their development as compared to the conventional

physiotherapy exercises.

Morphological Study of a Flood-Prone Char Settlement:

A Case of Dhansiri Kash Chapori, Brahmaputra Valley, Assam

Kankana Narayan Dev1, Dr. Amarendra Kumar Das2
1,2Department of Design, Indian Institute of Technology, Guwahati, Assam, India.
Corresponding author Email: kankana.dev@gmail.com,dev176105005@iitg.ac.in

Chars and Chaporis are the sandbars or small sandy islands in the braided river formed by the mighty River Brahmaputra all along its 728-kilometres east-west stretch in Assam. They account for about 5 per cent of the total area of the state and are spread across 14 districts and 55 blocks. According to the Assam Human Development Report, 2014 Chars and Chapori areas are an integral part of the fluvial process of the river and its tributaries. Their rich alluvial soil is ideal for crops such as mustard, sugarcane, jute, peanuts, sesame seeds, black gram, potatoes and other vegetables which had been attracting human habitation in these areas despite the perpetual annual risk of floods. There are 2,251 char villages in the Brahmaputra valley sustaining a population of more than 24 lakhs. The recurrent annual floods wash away the built structure of the homesteads and have made open defecation a norm in these settlements along with limited infrastructure developments and very little supply of drinking water and electricity. This study is made to understand the spatial features of Dhansiri Kash Chapori settlement located in the Darrang District of Assam. The village is mapped physically along with a demographic study and a structured survey questionnaire of selected participants of the flood affected community. Findings are analysed to identify design interventions suitable to the flood-prone area with community consultation. The landform of a char changes every ten years. Therefore continuous preparatory measures need to be adopted based on the study to avoid forced displacement due to erosion and building disaster resilience.
Keywords: Char; Community-consultation; Design; Disaster; Flood

Spatial Features of the Built Environment in the state of Assam

Kankana Narayan Dev1, Dr. Amarendra Kumar Das2
1,2Department of Design, Indian Institute of Technology, Guwahati, Assam, India.
Corresponding author Email: kankana.dev@gmail.com
dev176105005@iitg.ac.in

The built environment of a region is its identity to its culture and historical background. The architectural features of a settlement are influenced by different aspects of climate, availability of local materials, human behaviour which leads to different plan forms based on different context. Building typologies of Assam which have evolved throughout the ages are found to be sustainable and effective during earthquakes and floods. Typologies of the housing of Assam is studied along with its development over time, emphasising the importance of context and culture. Assam has a vibrant artistic heritage and being a multi-linguistic, multi-culture & multi-ethnic society it has a strong cultural influence based on which built environment has evolved. The study includes the understanding of various traditional typology existing in Assam through secondary sources and later analysing the spatial elements in a neighbourhood cluster (Chuburi). In the neighbourhood study the existing typology has been studied, and the progressive development of the built form is analysed. The spatial features identified as a result of the study can influence the future design and development of the built environment suitable to the present context with necessary modification.
Keywords: Architectural; Built-environment; Culture; Design; Development; Housing; Typology

Conceptual Design and Evaluation of a Novel Self-transfer-Assistive Device

Kelifa Seid
Department of Design, Indian Institute of Technology, Guwahati, Assam, India.
Email: kelifa.sm@iitg.ac.

Research presented in this paper is part of a doctoral project and its aim is to determine whether the required muscle activities during transfer from a wheelchair using the proposed methods are within a limit, as well as to determine the suitable transfer mechanism through a conceptual design synthesis. Experimental data collection based on surface electromyography is conducted on six healthy subjects to investigate the relationship between the grip force and muscle activities, thereby to decide the best supporting device which is ergonomically and biomechanically have an excellent interface with the users. Digital human modeling was adopted in order to evaluate the man–machine interference and an ergonomic fit. A paired sample t-test was conducted on the recorded RMS values of the EMG signals from the selected muscles and found a statistically significant difference between the two methods of transfer. Based on the EMG results, it has been observed that the assisted transfer condition requires no or a minimum muscular effort as compared to the non-assisted transfer. Finally, a proposed concept has been designed virtually is based on the findings from EMG results and ergonomic aspects.

Brass Metal Handicraft: Challenges in Adaptation of New Technology

Kiran Kumari Mahato1 , Pratul Chandra Kalita 2
Department of Design, Indian Institute of Technology, Guwahati, Assam, India.
Email: kiranmahato2011@iitg.ac .in, pratulkalita@iitg.ac.in

Application of new technology in manufacturing process improves quality, efficiency and safety. Craftsman are unable to accommodate with rapid roll out of manufacturing technology by acquiring new knowledges and skills after completing their regular day to day activity. It caused the rejection of emerging new technologies by craftsman. A case study of brass metal manufacturing industry of Assam has been considered. It has been observed that previously some effort done for technological improvement but those tools are found in idle state. The reason for lack of competencies to adapt new technology are: new skill required, unease of use, high cost, affordability, less volume flexibility and more space requirement. This research is carried out to improve the ‘manufacturing process’ involved in brass metal craft manufacturing process with tool design intervention. Initial field study was conducted to identity and priorities the scope of design intervention in tool design to ease the manufacturing process of brass metal craft. It comprised of study of existing manufacturing process, tools and machinery involved and problems associated with existing process. Concepts were developed based on appropriate technology. After refinement of concepts, CAD model and prototype developed, validated and tested with craftsman. The result established that newly designed tool is adaptable, affordable and easy to use. It can also substantially improve the quality and productivity. The paper discusses the initiative of design Intervention, as an interface between traditional and modern tools developed for brass metal manufacturing, without affecting sustainability of craft activity and characteristic identity of the handicraft.
Keywords: product design, metal handicraft, adaption, appropriate technology, tool design, design for development, design management,

Designing for Habits

Lokesh Fulfagar1 , Prof. Pankaj Upadhyay1
1 Department of Design, IIT Guwahati, India
Email: lokesh.fulfagar@iitg.ernet.in

A resurgence of interest has been seen in the past two decades in the domain of habitual behaviour. Studies have shown that as much as 40% of our daily actions are account of the unconscious decisions translating from our habits. And with technology getting increasingly interactive and closely rooted in our lives, it is creating unprecedented opportunities to encourage, enable and empower more effective behavioural interventions than ever before. The designers being the craftsmen behind these interactive products need to understand these habit models, and find a way to integrate it into the products they design to make sure they leverage this power of persuasion in right direction to craft experiences which drive habits and behaviours that users desire knowingly or unknowingly. But with a vast and multi-disciplinary non-reviewed literature in this domain, it often becomes hard and difficult to cover and exploit the entire existing literature in the design process. As a part of this study, all the varied significant theories and models in this domain are reviewed and compiled along with the existing solutions present in the market. The study also includes a user survey conducted with 52 participants to examine current habit and behaviour patterns, driving motivations, problems, etc. Based on this study, potential domains for intervention in this area have been proposed along with design directions for developing novel and impactful solutions.

Redesign of Hand File for Goldsmiths in Unorganised Sector of India

Lokesh Fulfagar1 , Nakul Kasture1
1 Department of Design, IIT Guwahati, India
Email: lokesh.fulfagar@iitg.ernet.in

Indian subcontinent has one of the world's largest and one of the most effective labour force in informal sector. The labourers are often faced by problems related to musculo-skeletal disorders which are not addressed due to their remote presence. Proper knowledge regarding use of hand-held tools and awareness regarding its health implications is the need of hour in numerous sectors. The hand file used by goldsmiths for various steps in jewellery making is an important tool to be considered here. In this study, we have redesigned the hand file for goldsmiths using ergonomic principles and anthropometric data. The methodology involved study and evaluation of current hand file designs, field study, conceptualisation and design of an ergonomic file for improving the hand working posture, and finally user evaluation of the new design. The final design removed the awkward work posture based on the application of detailed ergonomic and user-centric methodologies and is expected to reduce the risk of injuries, extending the life of their career.

Door fitting in Body side of car with uniform gap and flushness

M. Mahato
Department of Design, IIT Guwahati, India
Email: manoharmahato@iitg.ac.in

In automotive industry, maximum use of flexible manufacturing is extensively increased, which include the design of manufacturing and assembly cells for variable design over time. Body assembly process is one among them. Body assembly processes consist of number of sub-processes. Door assembly in body side is one among them. Since all these operation done before painting of the body therefore body

is usually called Body in white, BIW in short in this condition. The door fitting is a critical characteristic in BIW because of various problems like water ingress, wind noise, difficulties in closing and look of the car. All these problems occur due to ununiformed gap and flushness between door and body side of the car body. Therefore this process is studied and reviewed in detail for design intervention. New tools in door fitting process ensure above problem by checking measured points in door fitting area through various sensors and calibration tools. The fitting process is designed such a way that door location, proper orientation and uniform gap between door and body side can be maintained. Also the tool is suitable to accommodate multi model. To tackle these problem calibration tools introduced in all the handling tools used during final fitment of the door with body side, which will calibrate those tool in a set time frequency. These tools will confirm the tool with deviation present in the work cell. These deviations are sensor errors, part manufacturing deviations and robot grasping errors.

Design and development of a semi-automatic handloom for productivity improvement

M. Mahato; A K Das
Department of Design, IIT Guwahati, India
Email: manoharmahato@iitg.ac.in; dasak@iitg.ac.in

Handloom weavers are shifting towards other work from their traditional work i.e. weaving as per handloom census conducted by Government of India. A detailed literature review of existing handloom and field survey conducted to know the existing problems with special focus on productivity of handloom. It is found that low productivity is the primary reason for this work shifting. Research has been initiated to increase productivity of weaving loom to improve livelihood of the weaving community. A physical model has developed by automating handloom partially after concept finalisation for feasibility check and measure increment on productivity. Measurement is done with unit picks per minute (ppm) in weaving. It is also considered in the design to not affect the ornamentation capability of handloom.

Elderly and Communication Technologies: Overcoming the barriers of digital illiteracy

Nakul Kasture
Department of Design, IIT Guwahati, India
Email: n.kasture@iitg.ac.in

Despite the steady growth in the adoption of information and communication technologies, studies suggest that a major portion of the elderly populace still lag behind in accepting and accessing the communication technologies. Communication is important for elderly people to solicit assistance with daily living activities; gain access to health and legal information; achieve lifelong learning goals or enjoy intergenerational contact with the family. In this study, through interviews and discussion with elderly people, we have investigated the communication needs, attitude towards technology and barriers to adoption of communication technology (primarily smartphones). Presence of social support systems helps in adoption whereas language and education, awareness, fear of trying, understanding and recognizing the elements of the interface act as barriers along with the accessibility issues. We propose an assistive digital solution which will help elderly people in learning and operating the communication device.

Design Intervention for effective and engaging non-drug therapy of Alzheimer's disease

Nilotpal Nayan1 , Mukesh Kumar Ranjan2 and Pratul Chandra Kalita*
Department of Design, IIT Guwahati, India
E-mail: n.nayan.@iitg.ac.in1; kumar.ranjan@iitg.ac.in2; pratulkalita@iitg.ac.in*

Dementia-like Alzheimer's disease is a major challenge for the well-being of elderly people. In recent years the no. of cases of Alzheimer's disease has increased significantly, and it has pulled the attraction of researchers. People suffering Alzheimer's disease lose the efficiency of cognitive spheres like memory, planning skills, perseverance and initiative. Due to inefficient cognitive abilities, patients face a lot of problems while doing activities of daily living and sometimes it leads to some serious consequences like death. As drug therapies are ineffective in case of Alzheimer's disease, researchers had tried to use close-to-reality simulations and video games called serious games for cognitive training. During the gameplay, users have to use their cognitive spheres like memory, planning skills to succeed challenge. It has been concluded from research that completion of the challenge is necessary for cognitive training, and patients have to play games for at least 4 weeks for noticeable results. But, as the gameplay of serious games lacks user aspiration and context, users generally lose their interest in the game and do not complete training. Different profile of elderly people have different kinds of cognitive and physical disability, so they need personalised assistance to complete the challenge. As serious games lack personalised assistance, sometimes it increases the stress of users and causes them to quit training. We are planning to design a user-centric serious game which has gameplay based on users aspirations and context. This serious will use activity recognition and provide personalised assistance to the different profile of users.

Meme builds Culture, Culture brings Design

(A methodology for culture specific design)

Pallavi Rani1, Amrita Bhattacharjee2
1&2 Department of Design, IIT Guwahati, India
E-mail: r.pallavi@iitg.ac.in; amrita.2015@iitg.ac.in;

Memes is a unit of cultural transmission, or a unit of imitation that propagates through human population thus giving rise to a culture. A meme could be an imitation of idea, behaviour and/or style that passes down generation after generation within a culture. It is basically cultural fidelity that spreads from individual mind to mind in form of writing, speech, gestures, rituals, or other imitable phenomena. Memes is the origin of cultural evolution and culture has reciprocal relationship with art and science. In design, art and science combines each other and generate functionality. It creates cross-disciplinary learning environments in different design disciplines spanning across Communication Design, Industrial Design, Interdisciplinary Design, IT-integrated Design, and Textile, Apparel & Lifestyle Accessory Design. While ideating any culture specific design (following any discipline of design) designer seeks to answer various questions regarding human nature & behaviour, the nature of the world we inhabit, and the relationship between the two. To study the required queries a design thinking process is intended to discuss in this workshop. The proposed design thinking process will increase potential to understand and observe the community and culture from various aspects in terms of art, science, literature, philosophy and life style.

Child Designed Personas to Aid Design

Pampana Sai Haasini
Department of Design, IIT Guwahati, India

Persona creation is a crucial step in the Design process. Designers frequently use personas to model potential users. However, these personas need to be better estimates of the users that they represent. Designers, practitioners and researchers have recognised the important of design process and its constituent steps but there is fair amount of disagreement of ways of creating personas. In addition, very little is known when personas had to be designed for children. On the other hand, we see an increasing use of technology by the children for recreation and education alike. Child Computer Interaction (CCI) researchers have been paying attention in finding better ways of creating personas for children. One of the proposals is to include Children in the persona creation process. The current study brings before the reader our attempt at creating personas with an explicit help by the children. We report our process, insights from observation sessions and the results of our study.

Key Words: Persona; Children; Child generated Personas, Child Computer Interaction .

Design for Adoption and Diffusion of Do-It-Yourself in Rural Base of the Pyramid Communities

Prarthana Majumdar
Department of Design, IIT Guwahati, India

The launch of FabLabs in 2001 was a conspicuous moment in human history. The alienation of people from labor that the Industrial Revolution resulted in and the passive consumerism of modern society, started giving way as a sustainable model. The West has witnessed the growth of several Do-It-Yourself (DIY) movements ever since. However, if we look at the emerging world, rural communities always had a myriad of DIY activities. It could be in the form of making houses, granaries, weaving their own clothes, growing their own food, etc. that they have sustained for survival. These activities form a part of their tradition that has been passed down from generation to generation. But with free primary education in most countries and high rates of urban migration, even these communities are gradually moving away from hands-on work. In this doctoral project, we are investigating how these practices can be revived. How can we design DIY product systems which catalyze motivation among the youth to do DIY activities again? And, how do we diffuse a new/ old DIY practice in such a community through an understanding of their social dynamics? In short, how can we make them make again?

Factors influencing the successful adoption of "WhatsApp" by the low-income urban population in India!

Raman Saxena
Department of Design, IIT Guwahati, India
E-mail: raman.saxena@iitg.ac.in

Among the social networking applications, WhatsApp has become the most popular messenger application among all sections of the society. The widespread adoption and use of WhatsApp across the

socio-economic classes and age group across the globe including India is seen as a success story of a successful technology adoption.

Keywords: Urban Poor, TAM, WhatsApp Features, Adoption, Usefulness, Ease of use, Mobile phones, Social media, Script, Visual Language, Storyboard, Social influence, Business, Literacy, Script, Internet.

Sahaya : Accommodating Special User needs during Rail Travel

Rashida Khatoon
Department of Design, IIT Guwahati, India

There is a lack of organizations that cater the need of elderly, patients and differently abled comprising Special User group at mass transits. The Special user group needs several utilities and personal assistance.

A field study was conducted on a group of Special users at Guwahati railway station that consisted of a questionnaire, unstructured interviews, and observations. It was found that there is no authority that deals with special users, poor management system maintenance and deficiency of wheelchairs, no training programme for porters and no record keeping for their conduct, lack of mobility vehicles, emergency medical facility, maintenance personnel etc. Currently, E- wheelchairs are available that can be booked online at the time of booking tickets or can be booked by dialling 139 through Interactive Voice Response (IVR), but users are not satisfied by the services and hence rarely use them. The key challenge is to bridge the gap between Responsible Organization and Special user, by designing a system that could understand the user needs and requirements and projects them, while a user can understand and use them.

The overall aim is to make mass transits user-friendly for the Special group, by designing a self-sustained system that manages all the amenities for special group clubbed with an interactive mobile application that could bring all the services at their fingertips. The application will create an interactive network of Service provider comprising of attendants, medical personnel, Equipment manager etc and the User. As many as 2.08 crore households in the country have differently-abled persons constituting 8.3 per cent of the total homes, about 4-8% of the population in India are differently abled. One in every 10 children is born with or acquires a physical, mental or sensory disability. The 2001-11 Census data almost 25% of the Indian population is expected to be more than 65 years old in 2060, 75% elderly considered participation in society to be restricted because of problems encountered on the way when entering/exiting the bus or railway station. Studies show that Special User group is turning self-dependent. They prefer to take smart services and use the mobile application frequently.

Relevance to industry: This service can prevail on any mass transits. The idea concentrates on providing an interactive platform where you get personal assistance and all other amenities required. The system design assists the user from mass transits to private vehicles, to another mass transit or to their homes and vice versa.

Design Intervention in Empowering Youths to make Self-Directed Investments

Rishikesh Khumkar, Suman Ji
Department of Design, IIT Guwahati, India

Financial Literacy is now globally acknowledge as an important element of economic and financial stability and development. In recent years, countries have become increasingly concerned about the level of financial literacy among their citizens. Owing to the rapid changes around, the youths specially will have a tough time ahead dealing with the increasingly sophisticated financial products and services emerging in the market. Given the complexities of the growing financial world, it would be difficult for the younger generation to learn from their past generations and they would have to largely rely on their own financial knowledge. The low levels of financial literacy among youths is reflected by their inability to choose right financial products and practices and often a lack of interest in undertaking sound financial planning. A major focus has been laid on financial inclusion and financial capability aspects along with financial literacy to enhance the financial well-being of the individuals.

The newly employed youths form a major part of the work force of India and are a crucial contributor to the economic and social development of the country. The last pioneers of Millennials or Generation Y, have entered or will now be entering into the prime years of their early adulthood. This is a crucial time where, making substantial long-term investments for future goals from now itself could be useful. Investing at a young age isn't always easy, but the benefits are numerous and can't be overlooked. A recent survey revealed most people do not invest on their own because they feel they do not have the financial background or knowledge and are afraid. Tension also exists between the financial knowledge acquired and the ability to apply this knowledge while making financial choices in real life. If young people allow this fears to continue to influence their investing behaviour, they risk missing out on the huge benefits provided by investing early. A need therefore arises to improve on the financial literacy levels of the young generation and to empower them to make self-directed investments. This paper studies and investigates the current financial literacy levels along with the study of financial behavior and attitude of the younger generation of the country. The insights of the study can be further used in designing possible interventions to improve the financial capability and literacy of the youths through bringing a change in there financial behavior.

Going Further than Gestures for Smart Watches : Defining Smart Watch based Gestures for Cross Device Interaction in Indian Context

Sajal Chaplot, Hakim Singh Gurjar
Department of Design, IIT Guwahati, India
E-mail: sajal.chaplot@iitg.ac.in; hakim.gurjar@iitg.ac.in

We explored the gesture based input using smart watch in cross device systems in Indian context. We created a library of individual and/or combination of wrist, arm and hand gestures for 6 elementary tasks viz. navigation, selection & deselection, zoom in & out, cut-copy-paste, scroll and switching. With a small scale user study, we show that all users in a certain age range, perform certain type of gestures most suitable for a particular type of task. Also the designed gestures were inspired from existing use of gesture for smartphones; interactions in real life and abstract ideas. We also define unique gestures and/or gesture combinations for each of these tasks. Based on formative evaluation and user study we validate our defined gestures. Our study provides a direction for gesture design for smart watch in Indian

Context. Although we also provide a library which can be utilized directly, a significant further work is needed to define gestures which are common across different age groups as well as different cultures.

References:

1. T. Horak, S. K. Badam, N. Elmqvist, and R. Dachselt. 2018. When David Meets Goliath: Combining Smartwatches with a Large Vertical Display for Visual Data Exploration. In Proc. CHI '18. ACM, 13 https://doi.org/10.1145/3173574.3173593
2. Euan Freeman, Stephen Brewster, and Vuokko Lantz. 2014. Towards Usable and Acceptable Above-device Interactions. Proceedings of the 16th International Conference on Human Computer Interaction with Mobile Devices & Services, ACM, 459–464 http://dx.doi.org/10.1145/2628363.2634215
3. Shaikh Shawon Arefin Shimon, Courtney Lutton, Zichun Xu, Sarah Morrison-Smith, Christina Boucher, and Jaime Ruiz. 2016. Exploring Non-touchscreen Gestures for Smartwatches. In Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems (CHI '16). ACM, New York, NY, USA, 3822–3833 http://dx.doi.org/10.1145/2858036.2858385

Abstract

Atal Tinkering Labs(ATL) are installed by the Govt. of India in schools around the nation, as a very ambitious initiative. Under this initiative, schools are provided with tools and equipment to create prototypes for the ideas and mentors to guide them through the innovation process. But the tools are not alone sufficient to achieve the goal of making an innovative nation, as the students and teachers are not that tech-savvy and the mentors are not well equipped to guide the students thoroughly. There is a lot of potential in modifying the school curriculum in accordance with ATLs tools and equipment to make the learning process more hands-on, collaborative and participative. The ideas and inspirations to solve the problems faced by the society should be taken from the community itself and the solution validation too. The Design Innovation Centre(DIC) is also set up with a similar initiative to support those brilliant ideas and projects which have high impact potential. Also, there is a lot we can achieve with the collaboration of DIC and ATLs such as handholding support, process mentoring, operational guidance and

showcase platform. This project aims at the better integration of design education with the school curriculum in the context of ATL & other similar govt. initiatives. Under this, a platform will be created to provide virtual mentoring by the mentors allotted to respective schools. Also with a common digital repository for some of the best projects across the nation, to make guidelines for future projects, accessible to all ATL schools. Some sample experiments will be designed, matching the school's syllabus with ATL tools and equipment, to provide the teachers and students with building blocks on how to do similar projects in the future.

Defining Eri silk with a mark: Eri silk mark

Umme Hani1, Prof. Amarendra Kumar Das2
1&2 Department of Design, IIT Guwahati, India
E-mail: umme.hani@iitg.ernet.in

The textile heritage of India is very rich and dates back to the ancient period. Since then, expertise of our weavers has also been treasured. Textiles have been one of the mainstays in the Indian economy as well as the cultural tradition. The environment and soil have also contributed to the availability of habitat plants for various kinds of silk worms in this country, especially in the state of Assam. An increasing consciousness about eco-friendly and sustainable practices has made us to look towards the alternative fibres. Eri silk is a type of natural fibre, which is gaining importance and has been the desired silk among designers and also animal activists. Eri silk is a gaining popularity not only because of its fine texture but also because it is considered as a non-violent silk. During the process of Eri silk rearing, the silk worm is not being killed and the moth is allowed to fly before the cocoon is taken for further processes. Considering those properties of Eri silk, a logo has been designed that can convey the semiotics behind it.

Urban Spectacles: Urban Festivals, Urban Social Space and the transformations of the Urban Form

Anusmita Das1, Prof. Amarendra Kumar Das2
1&2 Department of Design, IIT Guwahati, India
E-mail: d.anusmita@iitg.ac.in

INTRODUCTION:

In this era of globalisation and mass urbanization, cities in India are transforming, evolving and mutating like an organic entity wherein temporality and informality have become significant urban characteristics. As such, Indian cities can no longer be perceived as a static entity; rather, they are morphing into urban spaces which are more fluid and malleable. This particular 'Kinetic' aspect of cities, lends them a temporal character, often visible through the Urban festivals celebrated in their Urban Fabric. These festivals which appear only for some fleeting time in the urban landscape, however, holds the power to transform the everyday spaces into spaces of social interaction, lending a unique identity to the city and their presence in the everyday landscape weaves itself through the urban fabric dominating the popular visual culture.

Keywords: Urban Spectacle, Urban Festivals, Urban Social Space, Urban Form, Space Syntax

REFERENCES:

1. Ahuja, S., Socio-cultural dimensions in some Indian villages,Ekistics, 47(283), pp. 289–295, 1980.
2. Hanson J. and Hillier B., The Social Logic of Space, Cambridge University Press Cambridge, 1984.
3. Raman S. & Dempsey N., Cultural Diversity and Spatial Structure in the Indian Urban Context, Journal of Urban
4. Design 17(3):425-447, August 2012

Geographical Indication of Handloom Sarees: Indian Scenario

Chirapriya Mondal1 and B. Sougata Karmakar2
1&2 Department of Design, IIT Guwahati, India
E-mail: chirapriya@iitg.ac.in

Geographical Indication (GI) which represents authenticity and uniqueness is intrinsic to its place of origin. GI tags can't be enjoyed by an individual as a personal entitlement but as the member of a community which acts as a registrant of the product.

There is lack of awareness regarding GI products in India. Many a time's GI products are unable to withstand in the competitive market due to duplication of such products, high cost and lack of exploration. Hence, in the current research an attempt has been made to explore the reason behind lack of awareness of GI products, the impact of GIs on various stakeholders especially from the perspective of manufacturers, what modifications can be done to make GI products competitive, and possibilities of innovativeness that can be brought into GI products. Comparison of visual features of GI product of same category (e.g. Sarees) has also been performed to identify the uniqueness of individual GI product and to prevent its duplication with the case example of handloom sarees to achieve the aforesaid objectives of the present review.

Only 303 GIs including 11 foreign products have been registered in India till date. Out ofthis, 149 GI registrations have been accomplished in Handloom and Handicraft sector. This sector includes 57 handloom products (25 registrations are on sarees) across the country. A comparative analysis of visual features has been conducted in present research to identify the uniqueness of GI registered sarees that generates the aesthetic experience. Marketability of such registered products in India and abroad are also touched upon.

The study provides valuable insights through a cross-functional approach to understand the purchase intention of consumers for GI products. Issues of GI has also been discussed as "pseudo branding". There are scopes of innovation in existing handloom sarees but that needs to be studied from the perspective of GI to retain its ethnic attributes. Generic clothing for women is referred as sarees whereas till date only 25 registrations have been made. So there are immense possibilities to explore and bring other sarees under GI. In this context, Government has to play a role to protect the interest of the manufacturers of GI registered sarees and ensure the livelihood of the stakeholders. Rights of the manufacturers need to be protected by bringing more sarees under the purview of GI. Awareness needs to be generated for such provisions. GI registrations would help to weed fake or duplicated ones.

This review would be beneficial to bring awareness among consumers about the importance and unique features of GI registered sarees. The framework proposed to explore the possibilities of innovation in sarees without affecting the key features of GI would be immensely helpful for the manufacturers to keep their product viable in the market.

Progress in Research & Development on Pineapple Harvesting: Special Emphasis on Indian Scenario

Hijam Jiten Singh1, 2, H. Dayananda Singh1 and Sougata Karmakar *2
1 Division of Agricultural Engineering, ICAR-Research Complex for NEH Region Umiam-793103, Meghalaya, India
2Department of Design, Indian Institute of Technology, Guwahati-781039, India
E-mail: karmakar.sougata@gmail.com

Pineapple is the third most important tropical fruit in the world after banana and citrus. It is cultivated commercially in West Bengal, Karnataka, Tamil Nadu, Kerala, Goa, Pondicherry, Andhra Pradesh, Maharashtra and almost all the states of north eastern hilly (NEH) region of India. In NEH region of India, pineapple is the second most important fruit crop of both in terms of area under plantation and production due to temperate to subtropical climatic conditions prevailing in the region. NEH region contributes more than half of the total country's production and six states of the region has been consistently featured in the country's top ten pineapple producing belts and almost all of these are grown organically. Among various steps of cultivation process, pineapple harvesting is one of the most important field operations and it is usually done manually. Manual method of pineapple harvesting is not only time consuming and labour intensive, but also it exposes workers to hazards. As pineapple plants grow low on the ground, manual harvesting requires harvesters to stoop while harvesting and it's a repetitive task that put a lot of strain on the body. However, there is very limited literature available on state-of-art of pineapple harvesting systems. Therefore, the aim of the present research is to conduct an extensive literature review to highlight existing scenario of research & development in pineapple harvesting; and to suggest possible future research directions to come up with better strategies for improvement on mechanization of pineapple harvesting adoptable under Indian condition.

Literature for the present study was collected through a systematic search plan which included electronic search (via. Google Scholar, Scopus and Web of Sciences) and hand-searching (for hard copies of relevant AICRP projects reports). Online search was conducted using combinations of the keywords or phrases: 'mechanical fruit harvesting', 'fruit picking', 'pineapple harvesting', 'pineapple symposium' and 'pineapple cultivation in India' for searching research articles, proceedings, newsletter, reports etc. Combinations of boolean functions (AND, OR and NOT) were also used between words or phrases during online search for further refinement of the output. The researches on manual to robotic pineapple harvesting systems and relevant fruit & vegetable harvesting systems were included. The data search identified 51 important publications and the search was limited to English language published up to 2018. Old literature of more than 20 years was also excluded for the present study.

From the literature, it was found that most of the plantations were not maintained as per the recommended package of practices and suckers arising from the base of the mother plant developed into new plants in subsequent years and thus unlimited ratooning was practiced. Desuckering of excess suckers and slips hindered intercultural operations as well as manual harvesting. Therefore, wooden planks were placed over the plants and the farmers walked over these planks to move into the plantations to harvest manually the matured fruits. Moreover, manual method of pineapple harvesting induced easy injuries to labourers due to spines and the tips of the leaves. Further, manual method causes back-pain as harvesters have to stoop while harvesting as pineapple plants grow low on the ground and it's a repetitive task that put a lot of strain on the body involving the lower limbs such as constant bending over to harvest pineapples. However, safety practice was not often implemented. On the large Central American plantations and major pineapple growing countries like Malaysia, Philippines, Thailand, Costa Rica and Indonesia, the harvest process was more mechanized using heavy machinery. The size of the field and topography of those countries permits use of such heavy machinery. These machines served only the purpose of collecting harvested fruits from the field into a temporary collection point as individual fruits were chopped manually from the plants by a team of field workers. The field plot must be configured for mechanization, with good provision of farm roads and headlands and correct plot dimension for efficient use of machinery systems. However, all these infrastructural and economic

factors hinder the adoption of such advanced machineries by the Indian pineapple cultivators of HEH region due to topological conditions and relatively small land-holdings.

From the study, it was observed that establishing favourable field conditions should be considered for the harvesting system, as tool/machine design alone could not achieve efficient harvest mechanization. So, orchard environment should also be designed to suit the requirements of the harvesting system in order to achieve maximum benefit from mechanical harvesting. Moreover, there is a need for ergonomic studies on pineapple harvesting operation to assess the risks involved in pineapple harvesting in Indian conditions. Though there is scope for large machinery or robotic harvester in other major pineapple growing countries, it is not applicable in Indian scenario and NEH region of India in particular. Therefore, design of either manual and semi-manual fruit harvester or design modification of locally evolved hand tools as per the mechanization gaps would benefit the pineapple farmers in a better way. This study can provide a reference for future research and development on pineapple harvesting with special emphasis on Indian scenario.

Design concepts for terrace forming machine suitable for the hilly areas of North Eastern Region of India

M.Angelus Khoh 1, Prof. Amarendra Kumar Das2
1&2 Department of Design, IIT Guwahati, India
E-mail: angeluskhoh@gmail.com, dasak.iitg@gmail.com

The North Eastern Region of India comprises of both valleys and hilly terrains and the people of the region follows an agrarian economy. Two distinct types of cultivation found in the region are Terrace cultivation and Jhum/slash and burn cultivation. Lack of mechanization of agriculture in the hilly areas is one of the setbacks the farmers from the region faces. The agricultural tools and machineries used in plain areas are not always suitable for use in hilly areas, therefore, terrace cultivation in the hilly terrains demands a lot of physical labour as compared to cultivation in the plain areas. The farmers of the region forms terrace fields using hand tools such as spades, pick-axe, shovel etc. which is physically taxing and economically inefficient. In the present day, even though there are many earth works machines being developed, they are mostly unsuitable for forming terrace fields for the farmers of the hilly region due to a number of factors such as the tough terrains, socio-economic status, safety concerns etc.

Considering all these factors, this paper explores to provide an alternative tool for forming terrace fields without the use of the existing hand held tools which requires a lot of human labour. As a result, two design concepts are proposed which can mechanize terrace forming process in the hilly areas of the region. The proposed designs are to be incorporated with the help of a small capacity engine. The concepts were developed on a CAD platform

Keywords: Terrace Cultivation, Terrace forming, Mechanization of agriculture in hilly areas, Design of Terrace Forming Tool

Work Related Musculoskeletal Disorders in Brass Metal Workers in Assam, India

Mallampalli K Chaitanya
Department of Design, IIT Guwahati, India

Brass metal handicraft is an important and one of the oldest cottage industries in Assam, India. Being labour intensive artisans working in these industries usually suffer from health related ailments. The study reported in this paper investigates the prevalence of musculoskeletal disorders in brass metal workers from the perspective of ergonomics. Nine brass metal artisans were randomly selected and studied using data collected through modified Nordic musculoskeletal disorder questionnaire. The questionnaire consisted of two segments. Firstly, part-A that captured demographic data such as age, height, weight, work experience, duration of work and no of working days and part-B noted with discomfort/pain in different body regions such as neck, shoulder, elbow, wrist/hands, upper back, lower back, hip/thigh, knee, and ankle/feet. The results revealed that at least one worker among the group were suffering from body discomfort. Most commonly reported discomfort is lower back followed by shoulders, neck, upper back and wrists/hands. It is important to highlight that the extent of musculoskeletal disorders was moderately higher and as such demands ergonomic interventions to help relieve the situation. The paper thus proposes solutions that can help reduce musculoskeletal disorders among the artisans and help improve the existing practice.

Self-Explanatory User Interface aided with Visual and Aural Syntax to Improve Cognitive Ability in Human Task

Nandita Bhanja Choudhary
Department of Design, IIT Guwahati, India

User Interface (UI) plays a significant role in man-machine interaction to demonstrate the functionalities of any system or simply to provide inputs to the system. The complexities of the UI are the open issues that make it formidable to explore the interfaces. Supervision makes the task easier by explaining the elements and intention of the UI. The Self Explanatory User Interfaces (SEUI) must trap the complexities of the UI and represent itself with simplicity. The UIs must be adaptable to the level of understanding of the users and provide necessary supervision. It must be able to justify the intent of the design, the purpose of any textual entry, the usability of the buttons, the importance of the labels, the visibility or the blurriness of certain items to the end-users. Literatures in SEUI highlight the intervention of Model Driven Engineering in UI but hardly anyone discussed about the concatenation of visual and aural syntax in UI. The visual aspect aims at explaining a clear and concise diagrammatic representation of the hierarchy of UI and the significance of each user entry. The aural aspect is hard to implement since it is invisible and momentary but highly supervises the naïve users with instructions. Furthermore, these results (visual syntax and aural syntax) can be used for recommender systems that would assist the end-users in their work dynamically.

Challenges while Travelling in a Virtual Environment

Priya Vinod; Keyur Sorathia
Department of Design, IIT Guwahati, India
E-mail: priya176105001@iitg.ernet.in

Recent modern advance in technology has brought Virtual Reality (VR) into the hands of developers and consumers that were once used only in the laboratory. Navigation is one of the main tasks performed to explore and simultaneously interact with a virtual environment (VE). However, enabling users to navigate in a VE is a difficult task from functional and user experience point of view. Navigation consists of both travel and wayfinding. Travel is the control of the user's viewpoint motion in the three-dimensional space and wayfinding is the cognitive process of determining a path. The two main challenges faced by the designers and developers of the locomotion techniques for VR are providing users with natural travel experience in VR worlds that are larger than the tracked physical space and providing users with the appropriate multisensory stimuli in response to their interactions with the virtual world. Many locomotion techniques have been developed to travel in VE. However, each technique works well in different scenarios and is tested and evaluated in different test environments and on different tasks. This paper throws limelight on the different classification of the locomotion techniques, their advantages and disadvantages and their corresponding multisensory stimuli feedback to the user while traveling in a VE.

Investigating Role of Caregivers in Managing Children's Digital Wellbeing

Purvish M.Shah 1, Prof. Pankaj Upadhyay2
1&2 Department of Design, IIT Guwahati, India
E-mail: purvish.shah@iitg.ernet.in

The embeddedness of digital technologies in children's lives has increased rapidly and alongside the established social, physical and mental dimensions, digital media as well is now having significant impact on wellbeing. The concept of Digital Wellbeing is thus introduced to understand the relation between digital media consumption and children's overall wellbeing. The available literature in this domain majorly discusses online safety and negative health implications, with duration of use of digital devices, or screen time, as a factor for measuring digital wellbeing. However, the data on role of Indian caregivers in moderating the children's screen time was scarce, thus giving limited information on various factors contributing to increased exposure. Through seven in-depth interviews and using Fly-on-the-Wall technique with caregivers, of children aged between 3 and 12, various challenges in managing children's screen time were investigated. The insights captured demonstrated the complexity of the issue, with lack of proper strategies and initiatives by caregivers as major factor leading to increased screen time. The study also highlights how digital technologies have created divide in relationship between caregiver and child because of its ubiquity and accessibility, which has had detrimental effects on child's development. The need for involving educational institutions and policy makers to implement system level solutions is also discussed.

Pix cube: Learning Experience for kids(Toy that will improve visual translation skills & color sensitivity in children)

Surya Raveendranath
Department of Design, IIT Guwahati, India

Improving Basic skills in children is a process which happens along with the activities that they are involved in. Considering the lifestyle changes in different generations and the current scenario of children's behaviour and activities, there is a scope of redesigning the existing learning methods and introducing new efficient learning devices and toys which could help in developing their basic skills in the early stages of their life. Pix cube aims to develop a learning toy which helps the child to improve visual translation skills and colour sensitivity.The methods followed to reach the concept includes, literature study, silent observation on kids behaviour, interview with parents, Survey to understand childhood activities of different generations and finally, market study to understand existing products and to bring uniqueness in the final concept, Pixcube which is inspired from pixels. The concept of Pix cube can also be used in various ways in terms of learning as well as other activities which kids prefer to do with. Using this toy will also provide children the freedom to explore the product in so many different ways as per their wish.This will make them spend more time on this learning toy comparing with other learning mediums. The product is been made out of wood which gives a feel of traditional learning toys and method of using it will also increase the eye-hand coordination in children. This simple learning technique will enhance the ability of a kid to explore new things, observing deeply and self learning capacities. In future, this product can be expanded as different levels and structures as per the age groups and the requirement of children.

References

1. Stoll, A. (2007). Montessori: the science behind the genius.
2. Siegler, R. S., DeLoache, J. S., & Eisenberg, N. (2003). How children develop. Macmillan.
3. Day, J. (1994). Creative Visualization Children. Element Books
4. Goldstein, J. H. (Ed.). (1994). Toys, play, and child development. Cambridge University Press.
5. Montessori, M. (1959). The absorbent mind. Lulu. com.

Evaluating Building Aesthetics using Gestalt Analysis

Avanika P. Yammiyavar
School of Architecture, KLE Technological University, Hubballi, Karnataka- 580031

From an Architecture point of view, the main question being addressed in this paper is - when does one cross the visual line between under-design and over-design especially in the frontage of a building's Form? The visual clutter is probably due to improper applications of proportions, ratios and transitions of sub-forms resulting in an over decked up cluttered look. Research done on historical and modern buildings has indicated that the usage of certain specific Design Elements, Ordering Principles, Rules of Composition and specific Proportions, makes a design more appealing. The challenge for an Architect lies in achieving a balance between simplicity and complexity, order and chaos, composition and clutter, symmetry and asymmetry, beauty and beast, over design and under design. This paper proposed an experiment involving the conduct of a questionnaire cum visual evaluation experiment of 16 selected building frontages.

In the experiment thirty-three (33) respondents were asked to rate building elements in the buildings they liked and disliked. These buildings were then subjected to a Grid analysis using Gestalt principles. Analysis of the results indicated that two hypothesis proposed were upheld.

The first hypothesis stated that- more the prevalence and adherence of the design elements in the frontage to Gestalt Principles, higher is the chance of a building's Form being liked. The second hypothesis stated that the degree of Symmetry is significant in the building being liked or disliked.

The inferences in this paper in terms of the upheld hypothesis can act as guidelines for an Architect to decide upon the thin line between – under design and over design of a building Form mainly expressed through its frontage.

KEYWORDS: gestalt, visual perception, facade, frontage, proportion, composition, design, architecture

Rajat Akre

This product is developed to apply Sustainable design in product, making them comply with the principles of social, economic, and ecological sustainability. I observed that the Dust bins in boys' hostel are overflowing with boxes from Amazon, eBay, Walmart and others. So, the idea strikes me to reuse cardboard/corrugated boxes.

Research: Online sales have surged in the past five years, and cardboard use jumped 8% in the same period, according to the American Forest & Paper Association. Yet cardboard recycling has dropped. Last year, 300,000 fewer tons of corrugated containers were recycled in the USA than in the year before, even as domestic consumption increased 3.5%, according to the AF&PA.

Design driven research to understand the parameters that promote good sleep

Shruthi Venkat 1, Ravi Jangir2
1&2 Faculty of Architecture and Design, PES University,Bangalore,India
E-mail: vshruthi2303@gmail.com

Studies show that adults require 7-9 hours of sleep daily. Factors like mood, smell, environment conditions like temperature, noise level, bed type and comfort,etc. And levels of melatonin affect the quality of sleep. Healthy sleeping habits are a balance between behaviour,environment and circadian rhythm. There is also a direct correlation between sleep quality and sleep quantity. A problem in either of the two could lead to bad sleep. Poor sleep over time also causes health risks. One of the other factors proven to affect a person's sleep structure is the position in which they sleep which also influences the gastrointestinal system. The research in progress focuses to co-relate the parameters and understand the perfect combination that promotes good sleep. It examines how sleep affects one's well being and how a good ecosystem could lead to improved sleep and energy. It looks at varied researches conducted over the years and analyze the data to help further understand sleep and the related parameters.

Ergonomic and occupant issues considering elderly female (pillion rider) sitting posture on motorcycle in Indian (rural/semi urban) context

Vaibhav Vijay Lothe
PDPM Indian Institute of Information Technology, Design and Manufacturing Jabalpur, India
E-mail: vshruthi2303@gmail.com

Background- In India most of the elderly female (pillion riders) of aged above 35 prefers sitting sideways upon motorcycles (commuting) in India. In this situation occupant sitting/packaging issues have a major problem, refusing elderly female to get ride on motorcycle.

Objective- The aim of this study is to find different ergonomic and occupant packaging issues including Work Related Musculoskeletal Disorders (WMSDs) mostly for elderly female (pillion rider) in Indian commuting motorcycles.

Methodology – Observation, photography, videography, body part discomfort mapping, analysis, interview, questionnaires were carried out.

Result – Risk factor and discomfort of sitting sideways on existing motorcycle seat were higher (810 mm), demanding quick intervention.

Conclusion- Ergonomic analysis and design intervention were suggested by redesigning/optimizing the existing seat of the motorcycles considering pillion rider as elderly female.

Keywords- occupant packaging, Transport ergonomics, risk factor, injury prediction.

Aquaflash

Akshay Shirish Mohankar
Department of Design, IIT Guwahati, India
Department of Design, IIT Guwahati, India
E-mail: purvish.shah@iitg.ernet.in

Abstract:

Aquaflash is a versatile water bottle which could be used as a light source in an emergency situation or also as a task light, head lamp or a flashlight.

Usually we carry our personal water bottle everywhere we go, it may be on our work desk, in our bag, while we travel or go camping, attached to out bicycle. Many a times it happens when the lights go out, we look for a flashlight. So, what if an alternative light source is at a push of a button away, right there on the desk.

Power cut is a very common and a sudden problem faced by a person in India. An emergency light source becomes a need of the hour in such situations.

While travelling, campers and cyclists often need to carry along different set of items like water bottle, flashlight, headlamp, compass, tents etc. Carrying so many items can be quite cumbersome.

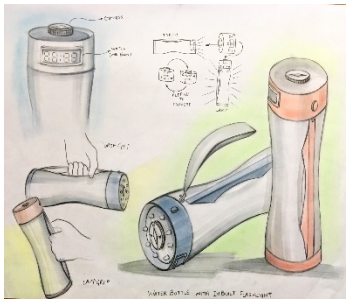
Target User: Campers, Cyclists, Doctors, People living alone, Elderly, Students

User research and Observations: Fly-on-the-wall observation was conducted to learn the surrounding of the target user during a power cut to indicate potential items for an emergency light source Frequent campers and cyclists were asked about the problems they face while carrying multiple gears and the issues about the luminance products they use.

Observations Recorded: A water bottle is the product available within hands reach everywhere we go, it is on our work desk, in our bag, while we travel or go camping, attached to out bicycle.

Proposed Solution:Taking the observations into consideration I chose a ‘water bottle' as an emergency light source. Aquaflash proves to be a great solution for the observed problems by accommodating a compass, lamp and a flashlight in itself.

Ideation and Exploration:



figure(1) Sketch of Aquaflash

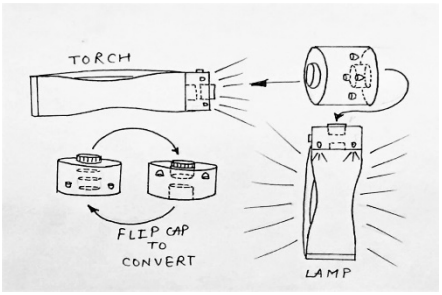
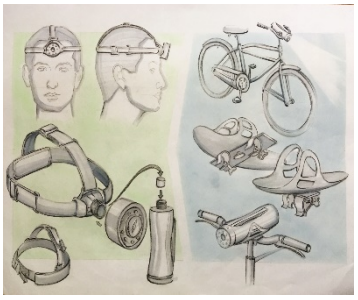


figure (2) Sketch of accessories



figure(3) Sketch of Mechanism

figure(4) CAD model

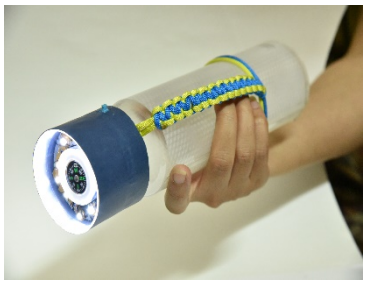


figure (5) Working Prototype

figure(6) Working Prototype (Parts)

Conclusion:
The unique features of Aquaflash make it a multi-utility product not just in an emergency situation but also in day-to-day use.

Virtual ergonomics assessment of a portable bicycle using DHM

Arunachalam M and Sougata Karmakar
Department of Design, Indian Institute of Technology (IIT) Guwahati, Guwahati-781039, Assam, India
Email Id: arunmuthiah8@gmail.com, karmakar.sougata@gmail.com

Most of the portable bicycles available in Indian market are not sound as per ergonomic criteria and not within affordable price. Keeping this fact in mind, an attempt was made to design a portable bicycle for Indian consumers. Following a small user survey and brainstorming, it was conceptualized that the intended design should be such that it would be usable for a frequent commuter and with characteristics like simple in use, easily foldable/dismantle-able, easily portable (less weight), comfortable paddling for a required distance of 2-5 KM, compact and aesthetically appealing. Following development of a 3D concept model desired portable bicycle using CATIA software, various human factor issues (riding comfort in terms of body joint angles, reachability for handle and pedal, vision analysis, clearance/ interference of body parts with bi-cycle component etc.) were evaluated employing digital manikins of 3 different percentile (5th, 50th and 95th) who are representative of smaller, average and larger anthropometric dimension of Indian adult population. Following ergonomic in virtual environment, CAD model of the bi-cycle was finalized with proper adjustable range and features accommodating wide range of Indian riders with varying anthropometry. It is expected physical prototype based on the dimensional specification of finalized CAD model would be compatible for riders from ergonomic point of view.

Seekho: Overcoming Communication Barrier

Arzoo Khare1 , Soumya M2
1,2 Department of Design, IIT Guwahati, India
E-mail: arzoo18@iitg.ac.in1,soumya18@iitg.ac.in2

Abstract

Indian Institute of Technology Guwahati is a national institute which sees an influx of students of linguistically diverse backgrounds from all over India and abroad every year. The most commonly spoken languages are Hindi, Bengali and Assamese. For students who do not know these common languages, every activity turns into a hassle in their day-to-day lives owing to the communication barriers. They face trouble in settling down during the initial days and in developing meaningful relationships with their peers in the long run. Thus, a design intervention was needed to facilitate better and more effective communication thereby easing the students' problems.

HOOK-HANGER

Upasna Sehji
Department of Design, IIT Guwahati, India
E-mail: upasna@iitg.ac.in

Hooks installed behind doors, in bathroom, in powder rooms etc. are used most often to temporarily hang clothes to be reused later, worn the next day, evening party etc. But delicate clothes, jackets cannot be hung on such hooks as this often leads to crumpling, formation of creases and thereby rendering it unwearable the second time. Hangers which are best suited for these situations cannot be found at these locations.

The design aims to solve the problem of hanging delicate clothes on such hooks in places such as behind the doors, bathrooms etc.

Research methodologies:

Primary research: User Survey: Interview, Questionnaire

Random people were interviewed regarding the issues faced by them while using hooks for delicate clothing.

Secondary research:Competitive analysis: Comparison between the existing products was done and it was inferred that no product catered to the problem stated above.

Ideation:

Various Concepts were sketched. Shown below in Figure 1,2 and 3.

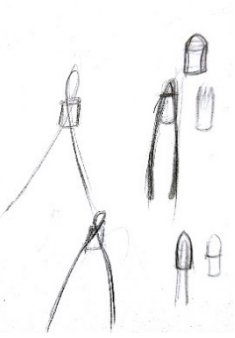


Figure 1

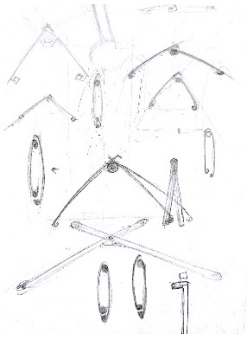


Figure 2

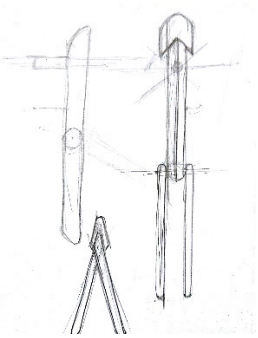


Figure 3

Solution:

The possible solution to this recurring situation in the daily life is hook cum hanger. Where the product functions as hook in the regular use and doubles up as a hanger when required. This solution not only is minimal, consumes less space but is also visually appealing.

Material used:

The choice of material for manufacture would be Stainless Steel or wood.

For Stainless steel's property of being able to be moulded in any shape. Also, its rigidity builds trust, smooth finish gives the product a polished look. And wood for its property of strength and warmth makes it ideal to be used as a lifestyle product. Other possible materials used for manufacturing can be plastic for the lower economy class.

Sustainability aspects (Cradle to Cradle Approach)

Repair: The product is designed that it can be opened to repair and parts can be easily replaced if required.

Easy to recycle: As a single material has been used for manufacturing the product, the process of segregating different materials from the product is eliminated while recycling. The product goes back into the life cycle at the end of its life span.

Other features:

Grip on the ends of the hanger to avoid falling down of the clothes.

Soft edge of the hook to avoid clothes getting damaged.

Possible places it can be used:

Inside a cupboard

Behind door

On walls

A Simple reconfigurable microstrip patch antenna

Radhika Chetri1, B. Dasgupta2

1B.Tech Student, Department of Electronics and Communicational Engineering, Indian Institute of Information Technology, Guwahati,India.

2Assistant Professor, Department of Electronics and CommunicationalEngineering, Indian Institute of Information Technology, Guwahati,India.

E-mail: 1 radhikachetri999@gmail.com, 2 bidisha@iiitg.ac.in

With the advancement of communication technology the demand of the high frequency low profile conformal antennas are increasing day by day. Moreover with the help of advancement of printed technology, the printed antennas can be designed very easily in low cost. Microstrip patch antennas are popular antenna for designing such low profile antennas [1]. Over the last decades, the reconfigurable antennas are playing the important role for increasing the utility of the spectrum. It is an important element for designing cognitive radio antennas, MIMO antennas and satellite antennas. Instead of designing multiple antenna, one single reconfigurable antenna can offers reconfigurability in terms of patterns, polarisation and frequency. By incorporating the active elements like RF-MEMS, PIN diode, optical switches etc with passive antenna geometry such reconfigurable antennas can be designed very easily [2].

The objective of the research is to design, a novel reconfigurable antenna suitable for wireless application. The literature survey reveals the fact that in the past very limited work have been carried out on semi- circular geometry whereas it is a potential candidate for designing low profile patch antenna. So in the present work, the semi-circular antenna geometry has been chosen for designing reconfigurable antenna and it is excited by micro-strip line. Then by introducing some slot structure, operating frequency has been changed. The reported antenna operates at 8.88GHz with a gain of about 6.5dBi whereas with the modification in the patch by introducing a slot in it, the modified antenna operates at 8.14GHz with an acceptable gain of about 2dBi. Moreover, both the antenna provides the Broadside radiation pattern.

The aim is now to add an active element with the proposed antenna structure. By changing the switching status of such elements, the path of the current can be varied which will offer the reconfigurability of the antenna. The simulation analysis has been carried out by using Ansys High Frequency Structural Simulator (HFSS) [3].

Reference

1. Girish Kumar, and K.P.Ray. Broadband microstrip antennas. Artech House,2003.
2. J. Costantine, Y. Tawk, S. E. Barbin and C. G. Christodoulou,“Reconfigurable Antennas: Design and Applications," in Proceedings of the IEEE, vol. 103, no. 3, pp. 424-437, March 2015.
3. Ansoft’s high frequency structure simulator (HFSS) version16.2

Significance of Speech Specific Knowledge for End Point Detection

Ramesh K. Bhukya
Electro Medical and Speech Technology Laboratory,
Department of Electronics and Electrical Engineering,
Indian Institute of Technology Guwahati, Guwahati-781039, India.
Email: {r.bhukya, prasanna}@iitg.ac.in

This work proposes a begin and end point detection using some speech-specific knowledge. The proposed algorithm aims at removing non-overlapping speech as well as non-speech background degradations. The method is vowel-like region detection based and uses vocal tract and source related information to remove background noise. Dominant resonant frequency information is used to remove background speech and foreground speech segmentation is performed to remove the background speech. To detect the consonants at the begin and at the end of the VLRs, glottal activity and dominant aperiodic regions detection are performed. For better localization of the end points. Further, speech duration knowledge is used to remove some spurious VLRs. The detected end points are evaluated by conducting the text-dependent speaker verification experiments.

Power Transformer Winding Fault Detection Using SFRA Technique

Transformers are designed to withstandmechanical shocks during its transportation and largeelectromechanical forces due to Short-circuit and SwitchingInrush currents. However, slackening, dislocations ordeformation of winding may take place due to these forces. Each such defect cumulatively increases the forces on the windingduring a transient and/or decrease the withstand strength of thewinding to these forces, making the winding susceptible tocomplete collapse at the next transient.

In order to avoidcatastrophic faults, estimation of extent of degradation is crucial.Short circuit reactance measurement method is commonly usedfor detecting serious winding deformation, but for highersensitivity to detect minor changes, frequency response analysis isused. In the present work, high frequency response of twotransformer winding models has been studied with ORCAD 9.2.Axial shifting and radial deformation of power Transformer hasbeen done. Results obtained in the simulation have beencompared with the experimental results for detection and extentof deformation of the fault. Simulation and Experimental work has been carried out to locate the winding deformation bycreating artificial deformation at various sections of the winding.Extent of deformation has also been studied by creating numberof deformations at particular sections of the winding. Locationand extent of deformation has been studied by comparingamplitude and natural frequencies.

SFRA method is verysensitive to a lot of changes in internal mechanical structureof the transformer. It is useful in the detection of manydefects and failures caused mainly by the flow of short-circuitscurrents in transformer windings. When transformer operates under normal condition, theelectromagnetic forces generated is small, because the currentand leakage flux density is small. the. During an external fault,the current as well as leakage flux gets increased and thisresults into new and higher electromagnetic forces at thewindings. The modelling of transformer winding by the lumped R-L-C-M model is useful for the calculation of current and voltagesusing network analysing tools like ATP, Pspice etc.

Keywords—power transformer; SFRA; fault diagnosis; windingdeformation; R-L-C-M model

Smart garbage level monitoring system

Rajita Pegu , Anumeta Dutta

The Main aim of this paper is to develop an intelligence bin which can monitor waste through sensors and gives the information in detailed which are connected to internet. Initially all the sensors from different location are connected through Internet in every location sensors will measure and calculate the waste and information will be sent to the server. At Server it will Process the information and sent it to the concern Authorities to take necessary action. By This approach we can get information of bin by using an android app also. The Ultrasonic sensor will monitor the level of garbage and will send the details to the server.

The components required for this IoT based smart garbage level monitoring system are :-

Node MCU esp8266

Ultrasonic sensor

Patch wires

A dustbin

Network Dissensus via Distributed ADMM

Chiarg Kumar1 and Ketan Rajawat2
SPiN Lab, Department of Electrical Engineering, IIT Kanpur, India
E-mail: {chiragar1,ketan2}@iitk.ac.in}

In the scenarios of big data, it is important to have distributed systems[1,2] which reduce the dependence on the centralized systems not only for storage but also the computation load. For networks where each node is observing some kind of phenomenon and aim is to find overall optimal in the distributed manner. In distributed computation scenarios, most of the works focus on the consensus-based approach[3]. According to consensus, nodes in the network will either cooperate in achieving the optimum or agree to a common optimum through coordination.

However this is not the case always as in the case of sensors, a diverse set of sensors form a complete network where every sensor is observing the corresponding process. So, the optimal corresponding to every node or some set of nodes is bound to differ which gives rise to the need of dissensus. Dissensus implies that the optimal points of certain nodes are required to have a disparate relationship. For the sake of clarification, let us consider the example of movie rating example as shown in Figure 1, where users are grouped in accordance with their rating patterns. Each rating group differs from the rest so optimal is also required to be different.

Here we propose the general dissenus framework for the networks and how the antagonistic relationship between the nodes can be incorporated. Dissensus framework is then extended to group dissensus which is the combination of agreement and disagreement at the same time. The nodes in a particular group will have consensual relationship and groups assume dissensus. The implementation of group Dissensus is the combination of centralized as well as distributed optimization along with fully distributed systems. In the last, dissensus framework is used for distributed discriminative dictionary learning which is then applied for various applications such as human activity recognition, seizure detection, and indoor localization.

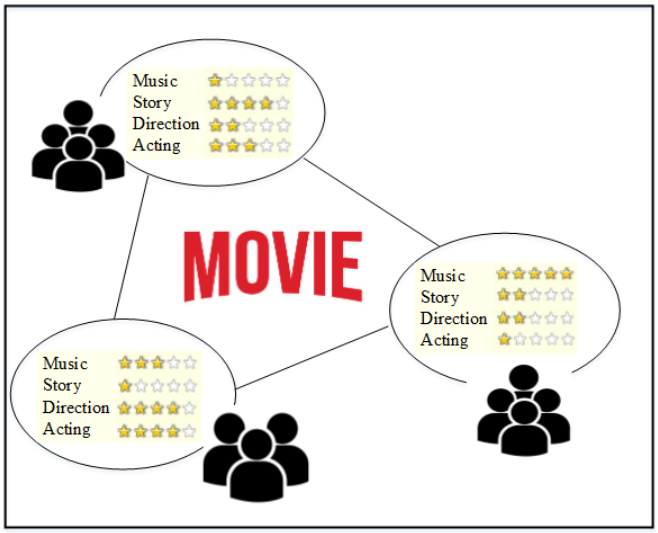


Figure 1: Rating for a movie where group of users consent to similar ratings which are different from the rest of the group.

References:
[1] S. Wang, T. Tuor, T. Salonidis, K. K. Leung, C. Makaya, T. He, and K. Chan, "When Edge Meets Learning: Adaptive Control for Resource-Constrained Distributed Machine Learning," in Proc. of the IEEE INFOCOM, Honolulu, HI, USA, April 2018.
[2] A. Nedic and A. Ozdaglar, "Distributed subgradient methods for multiagent optimization," IEEE Trans. Autom. Control, vol. 54, no. 1, pp. 48–61, 2009.
[3] S. Zhang, C. Tepedelenlioglu, A. Spanias, M. Banavar, and W. Tranter, "Distributed Network Structure Estimation Using Consensus Methods", Morgan & Claypool, 2018.

Implementation of Photo Core Transform and Photo overlap Transform

Gagan kalita1 ,Rakesh Biswas2
1 B.Tech student, Department of Electronics & communication Engineering,
Indian Institute of Information Technology, Guwahati, India
2Assisteant Professor, Department of Electronics & communication Engineering, Indian Institute of Information Technology, Guwahati, Indian
E-mail: gaganstar625@gmail.com,

Recent advancement in the field of picture sensor, communication, VLSI technology have significant impact on devices such as digicam, camcorder etc. In the current scenario, most of the superior multimedia utility require efficient compression rate of images. To match with the improvement in display devices, JPEG XR with high dynamic Range (HDR) and high definition range is designed. In JPEG XR technique, photo core transform (PCT) can exploit the spatial correlation like other transformation (eg. DCT). The main advantages of JPEG XR are low computational complexity as well as storage capacity maintaining high quality image and compression capability. It is a transform based image coding scheme that converts spatial domain data from image to frequency domain.The transform are basically Photo core transform and Photo overlap transform.

The objective of the research is to minimize the losses of an image and how photo core transform and photo overlap transform will improve PSNR, SSIM and EKI of image. It reduce correlation at block

boundaries. The literature survey reveals that different architecture was proposed regarding photo core transform. The efficiency of the proposed architecture was compared by measuring of operating frequency,power consumption and computing time. Now the aim is to improve the quality of an image by applying Photo overlap transform(POT) which may further decrease the artifacts at edges of an image.

Reference

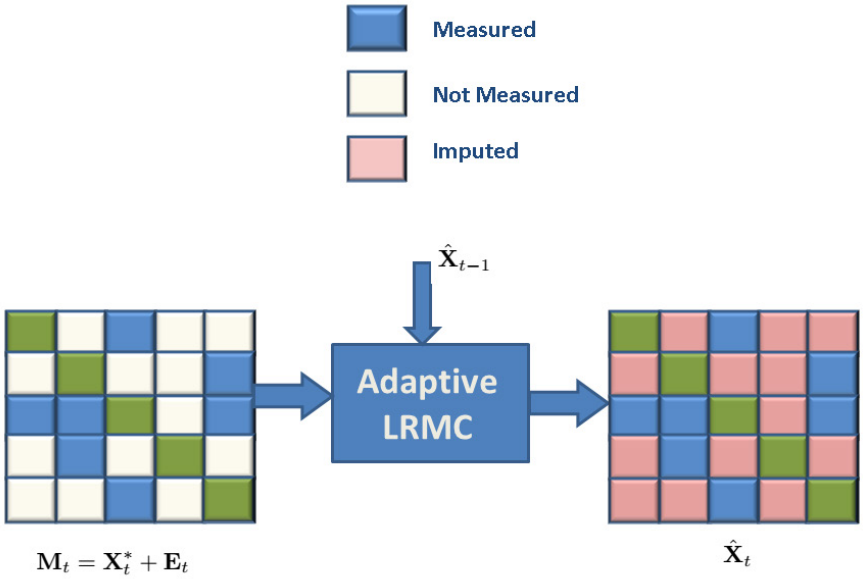
[1] Chien, Ching-Yen, Sheng-Chieh Huang, Chia-Ho Pan, and Liang-Gee Chen. "Full HD JPEG XR Encoder Design for Digital Photography Applications." In VLSI. InTech, 2010.
[2]Zhang, Shuiping, Huabing Zhou, Haihui Wang, and Xia Hua. "Hardware-efficient architecture of photo core transform in JPEG XR for low-cost applications." In Parallel and Distributed Computing (ISPDC), 2016 15th International Symposium on, pp. 344-348. IEEE, 2016.

Dynamic Low Rank Matrix Completion

Ruchi Tripathi1and Ketan Rajawat2

SPiN Lab, Department ofElectricalEngineering,IIT Kanpur,India
E-mail: {ruchi1,ketan2}@iitk.ac.in}

Recovering low-rank matrices from missing and noisy observations is a fundamental task in network monitoring [1], video denoising [2], image processing [3], recommender system [4], and dimensionality reduction [3]. A large number of low-complexity static matrix completion algorithms have already been developed, and applied to various high dimensional problems. However, most of the existing methods do not take into account the temporal correlation between two consecutive measurements. Given a sequence of incomplete and noise-corrupted matrices, the goal is to recover and track the underlying low rank matrices. The system model is motivated from time varying low rank structure which is fundamental to diverse applications such as network latency estimation, video denoising, device to device latency estimation, subspace tracking, video surveillance etc. The key idea is to use the past estimate, which allows improvement in prediction accuracy even when very few measurements (in comparison to existing static frameworks) are available. This property is important since sampling may induce high cost to the system if too many measurements are performed. The advantage of the proposed framework is that the computational complexity grows only linearly with the number of observations [2]. The problem at hand can be categorized as, first when the optimal is static and second when optimal is dynamic/time varying. Both these categories address different applications. We have considered both the problems, and efficiency is showcased via theoretical guarantees and simulation results.



[1] Ruchi Tripathi and Ketan Rajawat. "Dynamic Network Latency Prediction with Adaptive Matrix Completion". In: 2018 International Conference on Signal Processing and Communications (SPCOM) (SPCOM 2018). Indian Institute of Science, Bangalore, India, July 2018.
[2] R. Tripathi, B. Mohan, and K. Rajawat. "Adaptive Low-Rank Matrix Completion". In: IEEE Transactions on Signal Processing 65.14 (2017), pp. 3603–3616. issn: 1053-587X. doi: 10.1109/TSP.2017.2695450.
[3] Brian Lois and Namrata Vaswani. "Online matrix completion and online robust pca". In: Information Theory (ISIT), 2015 IEEE International Symposium on. IEEE. 2015, pp. 1826–1830.
[4] Julien Gaillard and Jean-Michel Renders. "Time-sensitive collaborative filtering through adaptive matrix completion". In: European Conference on Information Retrieval. Springer. 2015, pp. 327–332.

Novel Printed Monopole Antenna for Cognitive Radio Applications

Bhushan Ballav Pathak1, B. Dasgupta2
1B.Tech Student, Department of Electronics and CommunicationalEngineering, Indian Institute of Information Technology, Guwahati,India.
2Assistant Professor, Department of Electronics and CommunicationalEngineering, Indian Institute of Information Technology, Guwahati,India.
E-mail: 1 bhushan.iiitg@gmail.com, 2 gupta_bidisa@yahoo.co.in

The micro-strip patch antenna[1] is a low-profile antenna that widely used in the microwave frequency region because of its numerous advantages such as conformability to planar and non-planar surfaces, simplicity of design, inexpensive manufacturing using modern printed-circuit technology, mechanical robustness etc.

With the increase in demand of wireless communication, the need for antennas operating over a wide range of frequencies has increased and it is an important aspect of antenna research .Another aspect is to design compact, low profile antennas. However, the micro-strip patch antenna provides narrow bandwidth. So the challenging area of antenna research is to design wideband, compact, low cost printed patch antenna. In the past, research has been done in this area mostly using the shapes like rectangular, circular, triangular[2] etc. But at high frequencies, they suffer from high frequency ohmic losses which

reduce the radiation efficiency of patch antennas. So the challenge is to design a novel, compact broadband antenna with good gain.

First, an attempt has been made for designing a novel compact antenna which minimizes the patch area. Next, an attempt was made by incorporating sleeve resonance [3] with the patch resonance to increase the bandwidth and gain. The authors have already reported the proposed antenna structure[4].The reported antenna operates over the C-band with 70% impedance bandwidth (S_{11}< -10 dB). With the extension of the ground plane, the modified antenna operates over both C and X bands. After introducing the sleeve in the structure, bandwidth has increased and gain is slightly improved. Moreover, both the antenna structure provide monopole type radiation pattern throughout the bandwidth.

Further, an increasing demand for radio spectrum has resulted from the emergence of feature-rich and high-data-rate wireless applications. The spectrum is scarce, and the current radio spectrum regulations make its use inefficient. Cognitive radio (CR) is expected to revolutionize the way spectrum is allocated.

The cognitive-radio RF front-end in interweave mode should consist of either one or two antennas. It is preferred to use a dedicated antenna for channel sensing and a separate reconfigurable antennafor communicating in white spaces. The job of the sensing antenna is to detect the white spaces in the channel, and correspondingly the reconfigurable narrowband antenna tunes its operating frequency within these spaces. The reported antenna can be used as the sensing antenna which covers the UWB frequency range. Further, work has been extended by introducing one reconfigurable antenna along with the UWB antenna[Fig.1]. The detailed analysis reveals the fact that the combination of UWB and reconfigurable antenna geometry is suitable for Cognitive Radio applications

Further, coupling between the two antennas should be less than -10 dB for all frequencies. This is important to avoid the induced-RF interference that affects the quality of performance of a cognitive-radio device.

The designing has been done by using Ansys High Frequency Structural Simulator (HFSS)[5].

Fig.1

References:

1. G. A. Deschamps, “Microstrip Microwave Antennas,” Presented at the Third USAF Symposium on Antennas, 1953
2. Kumar,Girish, and K.P.Ray. Broadband microstrip antennas. Artech House,2003
3. Khan, Salman Naeem, and Muhammad Ashfaq Ahmed. "Printed sleeve monopole antenna." Ultra WidebandCommunications:Novel Trends-Antennas and Propagation. InTech,2011.
4. Bhushan Ballav Pathak, Gagan Kalita, Manas Pratim Barooah, Sanapala Chiranjeevi, Bidisha Dasgupta, “A Novel Printed Monopole Antenna for Broadband Applications”, Indian Conference on Antennas and Propagation(InCAP), Hyderabad, 2018
5. Ansoft’s high frequency structure simulator (HFSS) version16.2

A Simple reconfigurable microstrip patch antenna

Radhika Chetri1, B. Dasgupta2
1B.Tech Student, Department of Electronics and CommunicationalEngineering, Indian Institute of Information Technology, Guwahati,India.
2Assistant Professor, Department of Electronics and CommunicationalEngineering, Indian Institute of Information Technology, Guwahati,India.
E-mail: 1 radhikachetri999@gmail.com, 2 bidisha@iiitg.ac.in

With the advancement of communication technology the demand of the high frequency low profile conformal antennas are increasing day by day. Moreover with the help of advancement of printed technology, the printed antennas can be designed very easily in low cost. Microstrip patch antennas are popular antenna for designing such low profile antennas [1]. Over the last decades, the reconfigurable antennas are playing the important role for increasing the utility of the spectrum. It is an important element for designing cognitive radio antennas, MIMO antennas and satellite antennas. Instead of designing multiple antenna, one single reconfigurable antenna can offers reconfigurability in terms of patterns, polarisation and frequency. By incorporating the active elements like RF-MEMS, PIN diode, optical switches etc with passive antenna geometry such reconfigurable antennas can be designed very easily [2].

The objective of the research is to design, a novel reconfigurable antenna suitable for wireless application. The literature survey reveals the fact that in the past very limited work have been carried out on semi- circular geometry whereas it is a potential candidate for designing low profile patch antenna. So in the present work, the semi-circular antenna geometry has been chosen for designing reconfigurable antenna and it is excited by micro-strip line. Then by introducing some slot structure, operating frequency has been changed. The reported antenna operates at 8.88GHz with a gain of about 6.5dBi whereas with the modification in the patch by introducing a slot in it, the modified antenna operates at 8.14GHz with an acceptable gain of about 2dBi. Moreover, both the antenna provides the Broadside radiation pattern.

The aim is now to add an active element with the proposed antenna structure. By changing the switching status of such elements, the path of the current can be varied which will offer the reconfigurability of the antenna. The simulation analysis has been carried out by using Ansys High Frequency Structural Simulator (HFSS) [3].

Reference

[1] Girish Kumar, and K.P.Ray. Broadband microstrip antennas. Artech House,2003.
[2] J. Costantine, Y. Tawk, S. E. Barbin and C. G. Christodoulou,“Reconfigurable Antennas: Design and Applications," in Proceedings of the IEEE, vol. 103, no. 3, pp. 424-437, March 2015.
[3] Ansoft’s high frequency structure simulator (HFSS) version16.2

Youth Unemployment and Transforming to Adulthood in Assam: Study by Districts Based

Youth is the most valuable segment of the population.India has the relative advantages at present over other countries in terms of distribution of youth population. Youth in India constitute one-fifth of total population, the youth population has an important role to play us potential demographics dividend by constituting skilled stock of human capital. Over the last decade few year's a considerable amount of research has focused on the transition to adulthood, a stage of the life cycle where young people face determine life decision, including the completion of education,

finding employment, and establishing their household and family. My study focus only Assam state and it's Districts, I'm here uses some measurement of unemployment, data taken from Census 2011 and NFHS-3 and NFHS-4. In this paper we attempt to determine those factors which cause more young people to experience longer spell of unemployment. I'll describe here some socioeconomic factors.

CLIMATE VULNERABILITY ASSESSMENT FOR THE STATE OF MANIPUR: A DISTRICT LEVEL ANALYSIS

For individuals and communities living in mountainous regions and living in above mentioned multidimensional poverty, the uncertain ecological resilience and their low social resilience render them as highly vulnerable to different hazards including environmental changes. Manipur, situated in the Eastern Himalayan region, with a hill cover of ninety per cent, large population dependency on agriculture, forests and allied activities and individuals living in dynamic nature of poverty, makes the state vulnerable to climate related hazards. As long term mitigation efforts are required to improve the ecological resilience, this study focuses on identifying the socio-economic factors which makes communities vulnerable to unforeseen risks including climate risks and what sort of adaptation planning is required for increasing their social resilience.

Association of Hypertension and Obesity: a cross-sectional study among Sonowal Kachari tribe of Hatimora Village, Assam, North Eastern India.

Ananya Jyoti Gogoi
Department of Anthropology University of Delhi, Delhi 110 007, India.
Email: jgogoi126@gmail.com
Contact Number: 7002646191

Overweight and obesity can be defined as abnormal or excessive fat accumulation that may impair health (World Health Organization, 2018). Obesity has now become one of the major problems in public health with its rapid increase in both developing and developed countries. Cross-sectional study was conducted among the Sonowal Kachari tribe of the Village, from 27th Dec 2018 to 4th Jan 2019 with an aim to determine the prevalence of obesity and hypertension and to determine any association between the two. Out of the total Sonowal Kachari population 240 individuals- 102 male and 138 females of age 19 and above were studied through door to door investigation.MS Excel 2007 spreadsheet was used for data entry and analysis was done using Statistical Package for Social Science (SPSS) version 16.0 software. Out of the 240 studied individuals 51.66 % (124) individuals were found to be hypertensive. Around 31.66% (76) individuals were found to be overweight and 12.92 % (31) individuals were found to be obese. It was observed that central obesity was higher among female compared to the male individuals. A significant association was found between hypertension and high BMI. Significant association was also found between central obesity and hypertension.

Keywords: Hypertension, obesity, adult, sonowal kachari

Green Finance : A Gateway to Green Economy

Brishti Saikia1 and Anjana Sonowal2
1M.Sc Student, 2M.Sc Student
Department of Agricultural Economics
Email : anjana.sonowal04@gmail.com

In today's date, woes of the climate change are heard all around the globe .In a recent wake, researches revealed that growing climatic damage might invade the global economy to a level that will very possibly shake the entire world .To address the environmental challenges and to uphold the economy with sustainability, theUN Conference on Sustainable Development ,2012 decided on greening the financial systems of the nations .Thus, the concept of Green Finance came into existence. The term "Green Finance "refers to a strategic approach to incorporate the financial sector in the transformation process towards low-carbon and resource-efficient economies. It strategically promotes green industry, including environmental pollution prevention projects and renewable energy development projects. There have been some encouraging developments over the past few years, including significant advances in mobilizing and mainstreaming green finance within financial institutions and financialmarkets.Brazil,China,France,Indonesia,India,South-Africa,UK and Germany are the G20 countries adopting green finance in a significant way. The Reserve Bank of India(RBI) has included lending to small renewable energy projects within the targets of its priority sectors lending requirement. Six banks by February 2017 had issued green bonds in India for funding Solar, Wind and Biomass Projects .Scaling-up of green investments will foster economic growth and job creation along with addressing climate issues. Public-private collaborations are highly necessary to stand against the challenges in advancing green finance .The current study thus attempts to explore and reveal how green finance helps in combating climatic challenges and also focuses on its viability in India.

Keywords :Greenfinance, globaleconomy, renewable energy, environment, India

"SOIL HEALTH CARD: AS A TEST FOR SUSTAINABLE AGRICULTURE"

Chittadeep Nath1& Parismita Dutta2
1 B.Sc.Agri (hons.) Student, Assam Agricultural University, Jorhat, Assam
2 B.Sc.Agri (hons.) Student, Assam Agricultural University, Jorhat, Assam
Phone: +91-7576949097 / 7086249445 E-mail id: chittadeepnath.in.18@gmail.com

Soil provides ecosystem services critical for life; it acts as a water filter, a growing medium, provides habitat for billions of organisms, contributing to biodiversity, provides essential nutrients to our forests and crops, and helps regulate the Earth's temperature as well as many of the important greenhouse gases. In a nut shell soil is the basis of agro ecosystems which provide us with feed, fiber, food and fuel. Thus the year 2015 was declared as INTERNATIONAL YEAR OF SOIL (IYS) by the 68th session of the United Nations General Assembly on December 20th, 2013 after recognizing December 5th as World Soil Day. The purpose of the IYS is to raise awareness worldwide about the importance of soil for food security, agriculture as well as in mitigation of climate change, poverty alleviation, and sustainable development. During green revolution soil degradation was a major problem caused by many factors

including excessive tillage, inappropriate crop rotations, excessive fertilizer application, deforestation, mining, etc. To meet the needs of an expanding global population, it is essential for humankind to recognize and understand that improving soil health by adopting sustainable agricultural and land management practices is the best solution for mitigating and reversing current soil degradation trends. That's why the Government of India, as part of its on-going National Mission for Sustainable Agriculture which is a part of global sustainable programme, has launched a nationwide programme of Soil Health Card Scheme (SHCS) on 19th Feb, 2015 with the aim to provide Soil Health Cards (SHCs) to every farmer of each State to address major, secondary and micro nutrient deficiencies in soils on farm basis. SHC is a printed report that a farmer will be handed over for each of his holdings. It will contain the status of his soil with respect to 12 parameters, namely N,P,K (Macro-nutrients) ; S (Secondary- nutrient) ; Zn, Fe, Cu, Mn, Bo (Micro - nutrients) ; and pH, EC, OC (Physical parameters). Based on this, the SHC will also indicate fertilizer recommendations and soil amendment required for the farm. The card will contain an advisory based on the soil nutrient status of a farmer's holding along with recommendations on dosage of different nutrients needed. As per some estimate, about 2.53 crore samples will be collected and tested to generate 14 crore SHCs for farmers. An amount of rupees 568 crore was allocated by the Govt. for the scheme. The SHCs are given to the farmer on the basis of the geo-reference of their farms. As per data collected on 30th June,2018 nos. of SHCs distributed throughout India was 107389421 in cycle I and in cycle II nos. of SHCs is 766787129(63.75% of the total progress, data collected on 5th Feb, 2019). In Assam, among 71 soil testing laboratories (STL) only 10 STL are doing the job of analyzing the collected soil sample under the SHC scheme. As per report of the Economic Survey of Assam, these soil testing laboratories have the capacity of analyzing 9000 soil samples in a year. scheme. The target for Soil Samples to be collected in Cycle – I (2015-16 &2016-17) was 278707 and till now around 1500000 SHCs are distributed in Assam. It provides a qualitative assessment of soil health. Its purpose is to use indicators that assess each soil's ability to support crop production within its capabilities and site limitations. The role of soil health card has been decisive to settle the problem of feeding the growing population of our country. Soil health is day by day getting more importance in the way of increasing agricultural production.

KEY WORDS: soil ecosystem, green revolution, sustainable agriculture, soil degradation, soil health, soil properties, soil of Assam.

"Government strategies for development of Sericulture in India"

Chowcin Borsali Buragohain1 , Sudipta Kumar Das 2
1M.Sc. Scholar.(Sericulture), Dept. of Sericulture, Assam Agricultural University,Jorhat-785013,Assam.
Contact no: +91-7896615215, E-mail id: borsaligohain@gmail.com
2 M.Sc. Scholar.(Sericulture), Dept. of Sericulture, Assam Agricultural University,Jorhat-785013,Assam.
Contact no: +91-8876862942, E-mail id: sudiptadas707@gmail.com

Since 1947, the Indian economy has been premised on the concept of planning. Five-Year Plans (FYPs) are developed, executed, and monitored by the Planning Commission. The Planning Commission was constituted in 1950 under the chairmanship of the then Prime Minister Pandit Jawahar Lal Nehru. Central Silk Board (CSB) was constituted in the year 1949 (Gangwar and Gupta, 2010). Under the plans, certain projects and schemes were implemented and helped the growth of sericulture. The progress made by India after independence in the field of sericulture has been due to horizontal expansion as well as enhancement of productivity per unit area vertically. The phenomenal vertical growth has been made possible due to evolution of high yielding superior mulberry varieties and silkworm breeds. Before Five Year Planning, total raw silk production of India was only 894 MT but now, the production has reached 30,348 MT (Anon., 2017). In Vanya sector also production is increasing day by day. With the proper planning and fund released through five year plans development

of sericulture in India has been achieved in pre-cocoon sector and post-cocoon sector. Newly developed reeling and spinning machines can able to satisfy the quality of silk. Export earning is also increasing. Though, India is leading the 2nd position in silk production yet there is scope to increase the production and compete with China (Anon., 2017).

REFERENCE : Anonymous (2017). Annual Report (2016-17). Central Silk Board, Ministry of Textiles, Govt. of India. Gangwar, S. K. and Gupta, V. P. (2010). Indian silk Industry- Progress through Plans. In: Tasar CulturePrinciples and Practices (edited by Gangwar, S. K. and Gupta, V. P.), pp: 9-36

PARTCIPATION OF WOMEN IN ANIMAL HUSBENDARY ACTIVITIES

Daizi Durba Saharia*, Hemangee Das and Kundal Hazarika
Assam Agricultural University, Jorhat-13
E-mail of the corresponding author: daizidurbasaharia@gmail.com

Women's involvement in livestock management is a long standing tradition and livestock rearing has been as integral part of homestead farming system. Animal husbandry occupation is an important source of income among rural household. Most of the important task in animal husbandry activities is performed by farm women besides fulfilling their responsibilities as homemakers. A study was conducted in Jorhat district of Assam with an objective to analyse the participation of women in animal husbandry activities. For the study two villages were randomly selected from one developmental block (Koliapani). For the study 78 numbers of household were selected. The primary data were collected through personal interview method for present study. From the study, it was revealed that 90 per cent women of different educational qualification (from under-metric to graduate) were involved in different livestock enterprises. It was observed that the participation of women was found to be higher in dairy followed by poultry, piggery and goattary. Involvement of women was found in only feeding, milking and shed cleaning activities in livestock sector. Low level of women involvement was noticed in housing management, health issue and marketing in livestock sector. But full involvement of women's were observed in different activities i.e. housing management, feeding, cleaning, health issues and marketing in respect to poultry sector. More participation in animal husbandry activities were observed under the age group between 25 to 50 years. The present study also revealed that 72 per cent women famers involvement having educational qualification of under-metric followed by higher secondary and graduate at 21 per cent and 7 per cent respectively. Also higher level of involvement was observed in traditional practices than commercial farming. Hence, the level of women involvement in commercial farming can be increased through providing different training regarding scientific management of livestock and poultry.

KEYWORDS: Participation, Husbandry, Women, Poultry

Women entrepreneurship: a tool for gender equality and rise in women empowerment in india

Partha Pratim Baruah* and Gagana. M.D.**

*Msc Student and **Msc Student Department of Agricultural Economics & Farm Management Assam Agricultural University, Jorhat, Assam-785013

Corresponding author:gaganamd12@gmail.com

Women entrepreneurship is the process where women organise all the factors of production, undertake risks, and provide employment to others. Empowerment of women should be increased both

economically and politically as it is a necessity for the very development of a society, since it enhances both the quality and the quantity of human resources available for development. Women's economic empowerment generates tremendous dividends for the society-like 1) If women participate in economic activity, own and control productive assets, it leads to development by helping to overcome poverty, reducing inequality and improving children's nutrition, health and school attendance. 2) If women and men stood on identical footing in terms of participation in economy through paid works and entrepreneurship, the world could see as much as 28 trillion dollars in global growth by 2025.Many of the barriers to women's empowerment and equality lie ingrained in cultural norms as the society is more biased in favour of male child in respect of education, nutrition and other opportunities. Recent studies also show that women face more barriers in the work place than do men like occupational segregation, unfair hiring practices, and gender pay gap which globally stands at dismal 23%. To overcome these inequalities, there should be the presence of the women's equality in power sharing and active participation in decision making in political process at all levels should be ensured for the achievement of the goals of empowerment. At present, for improvement of women empowerment the basic instrument is the women entrepreneurship development. In India, empowering women through entrepreneurship has become an integral part of our development efforts because of 3 important reasons. i.e., 1) Women development. 2) Economic growth and 3) Social stability.

Keywords: Women empowerment, Gender equality, Women entrepreneurship, Economic growth

SUSTAINABLE LIVELIHOOD GENERATION THROUGH PRODUCTION AND MARKETING OF OYSTER MUSHROOM (*Pleurotus ostreatus*) IN JORHAT DISTRICT OF ASSAM

Hemangee Das*, Daizi Durba Saharia and Kundal Hazarika

Assam Agricultural University, Jorhat-13, Assam

E-mail of the corresponding author: hemangee95@gmail.com

Indian economy is mainly fuelled by its agriculture sector. Mushroom cultivation may be identified as a budding source of income in this sector as it can be cultivated by landless farmers on waste material and is a source for proteineous food. During last decades the world mushroom production has increased at a growth rate of about 10% per cent. Pleurotus ostreatus, also known as oyster mushroom, is commercially important edible mushroom due its excellent flavour and taste. Assam produced about 100 metric tones of oyster mushroom in the year 2016. In Assam mushroom is mostly marketed as fresh mushroom packed in polythene bags. Under the present study 60 mushroom bags were purposively selected out of which 6 bags were selected randomly in order to record the average yield of mushroom per bag. Each bag yielded a total of about 2.2-2.4 kg of mushroom. The total amount of mushroom produced from 60 bags was 143.60 kg. It was noted that the yield of mushroom declined gradually after each harvest. The price of oyster mushroom in the retail market ranges from Rs. 200/- to Rs. 1000/- per kg. Marketing of mushrooms in Assam is not yet organised and hence 46.17 per cent of the produce is sold directly to the consumers and 31.33 per cent is sold through the retailers. Due to the poor marketing strategy farmers fail to make the expected profit from mushroom production. Therefore, these problems are needed to be solved before trying to increase the production of mushroom. Proper government intervention and knowledge dissemination by the institutions like State Agricultural Department, Assam Agricultural University etc. will surely encourage the farmers to consider mushroom as one of the key components in their farming system, which will surely help them in improving their livelihood in future.

KEYWORDS: Mushroom, marketing, livelihood generation.

ECONOMIC PERFORMANCE OF PRIMARY AGRICULTURAL COOPERATIVE SOCIETIES (PACS) OF NAGAON DISTRICT OF ASSAM

Jharna Choudhury, MBA (Agri Business Management) scholar

Assam Agricultural University, Jorhat-13, Assam

India is mainly an agrarian society with 78 per cent of its population (census 2011) depends on agri and allied sectors and still reside in the villages for their livelihood. To alleviate poverty and encourage self-employment, the development of cooperative society is must. Today with a network of 6 lacs cooperatives and approximate base of 24 crores membership, the Indian cooperative movement has proved to be an effective economic instrument for ensuring growth with equity and inclusiveness. Cooperative sector today covers 99 per cent of our villages and 71 per cent of rural household. The flow of rural credit through cooperatives presently stands at 17 per cent.

Primary Agricultural Cooperative Societies are the best vehicle for rural credit disbursement. The basic objective of primary cooperatives is to increase earning capacity. National Cooperative Development Corporation (NCDC), a Statutory Corporation was established on 14.03.1963 under an Act of Parliament (NCDC of 1962) for economic development through cooperative societies. NCDC is a non-equity based promotional organization created exclusively for planning, promoting and financing programmes for production, processing, marketing, storage, export and import of agricultural produce, foodstuff and certain notified commodities through cooperative principles.

Cooperative movement of Assam has entered into a new phase of organizational and functional development ever since the implementation of Assam Cooperative Societies Act, 1949. Main aim of the cooperative was to get the poor and indebted farmers out of poverty and out from the clutches of money lenders. At present, the Nagaon district has 43 numbers of Primary Agricultural Cooperative Societies along with a Cooperative Apex Bank Ltd. and a State Level Cooperative Society (The Assam Cooperative Jute Mills Ltd.).

The poster will represent the study conducted in two cooperative societies located at Kuthori and Pubthoria areas of Nagaon district of Assam during two months project completed under NATIONAL COOPERATIVE DEVELOPMENT CORPORATION (NCDC, REGIONAL BRANCH), GUWAHATI. The main objective of the project is to study the aims, objectives and functions carried out by them for the growth of their members. All the analyses are mainly based on the primary data collected during the study. The two selected societies respectively Duarbagori Cooperative Society and Bholaguri Satra Samabai Samiti are under Kaliabor sub-division of Nagaon District.

Duarbagori Cooperative Society Ltd. organized and registered in the year of 1973. The society was organised with the area of Duarbagori Mouza and some part of Chatial Mouza as its area of operation having 37 nos. of revenue villages under Kaliabor sub-division in the district of Nagaon, Assam. Total population of the society is 29,544 comprising of 5173 nos. of households.

The Bholaguri Satra Samabai Samiti is occupying 48 revenue villages with 4600 individual members and 1 membership by the government. It was established at Pubthoria under Kaliabor sub-division in the district of Nagaon on 20th Aug, 1920. The society was conferred best cooperative award in the year 2002 by NCDC. The main object of the society is to promote agriculture and to assist weaker section of the society.

Community supported agriculture: a step towards strengthening producer-consumer relationship

Julfiqur Rahman* and Dipanjan Kashyap1

*M.Sc. (MBA-ABM) scholar and 1Assistant Professor Assam Agricultural University, Jorhat

Email of corresponding author: julfiq05@gmail.com

The negative impacts of global level economic restructuring on social welfare and environment are in an increasing trend which has prompted a number of activists and social persons to look for certain alternatives right from the grass root level. Serving this context, Community Supported agriculture (CSA) is a newly introduced concept in India, where consumers are in direct contact with the producers or farmers to obtain their food. CSA is used as a strategy to improve local agricultural economy, enhance food security and educate the farmers regarding farming and the environment. The CSA is a unique concept regarding the process of buying and selling. The goal is to cover the true costs of production and give a fair amount of return to the producers as well as satisfying the objectives of consumers by setting various standards. After being introduced in Japan and Europe and gaining momentum in U.S., CSA is spreading to some parts of India including the North-Eastern region. The study mainly focuses on the spread and extent of CSA in the nation, in general and in Assam, in particular. Moreover, the study tries to find out the benefits of the CSA firms while distinguishing it from the non CSA firms. KEYWORDS: CSA, Local economy, Food security, Producer-consumer relationship.

SCOPE OF REARING VANARAJA IN ASSAM

Kundal Hazarika*, Hemangee Das and Daizi Durba Saharia

Assam Agricultural University, Jorhat-13, Assam

E-mail of the corresponding author: kundalhazarika246@gmail.com

The poultry sector of India has seen a rapid growth of around 8 per cent in the last few years and chicken dominates the poultry production in India. In North-Eastern region, commercial poultry production is still at an infant stage compared to the rest of the country. Backyard poultry production is the most popular system of poultry rearing as it does not require large investment. Vanaraja is a dual purpose chicken breed has become popular among the rural people as one of the income generating activity. For the study 50 Vanaraja chicks at a male female ratio of 1: 10 were compared with 50 indigenous chicks. The body weight of the chicks was recorded periodically and a comparative study was done. The physical qualities of egg like egg weight, size and yolk weight were also recorded as per standard method. The mean body weight gains at 24 weeks of age in case of Vanaraja male and female was recorded as 1990±0.15gm and 1490±0.47gm respectively, whereas the corresponding weight of indigenous male and female was 900±0.22gm and 848±0.19gm respectively. The egg weight of Vanaraja was recorded as 50±0.35gm and 35±0.24gm in case of indigenous chicken. Egg production was significantly ($p \leq 0.01$) higher in Vanraja than indigenous chicken in the present study. The present study also revealed that from rearing of Vanaraja birds farmers got an average profit of Rs. 150.00 per bird per month in comparison to indigenous chicken. From the study it can be concluded that a subsidiary occupation of Vanaraja rearing of even 20-30 birds can give a handsome benefit at a minimum input. Vanaraja has the potential to perform well under traditional system of rearing where natural vegetation would be the excellent source of food with low or no expenditure on its maintenance.

KEYWORDS: Vanaraja, Indigenous chicken, livelihood generation

Identifying the neurocognitive strengths of children with cerebral palsy to enhance their mental health and quality of life.

Authors: Dr. Manidipa Baruah1 , Pallavi Sarmah2 .

(Department of Psychology, Gauhati University, Assam)

Cerebral palsy (CP) is the most common motor disorder in children, affecting approximately five children per 2,000 live births. The condition affects predominately motor functions, such as the ability to walk and perform daily tasks; therefore, children are typically assessed by measures of gross motor function and gait (Stanley, Blair, & Alberman, 2000). The condition has far reaching consequences to the individual, family, and the community in the spheres of socio-economic, emotional and quality of life to large number of the affected population is indeed serious. The study aims at identification of neurocognitive strengths and utilization of these strengths in training children with cerebral palsy. The sample consisted of 66 children who are diagnosed with Cerebral Palsy, grouped into Hemiplegic, Diplegic and Quadriplegic. Demographic information and medical records were collected for each participant. The tests administered were; Colour Cancellation for visual scanning and sustained attention, N back task for verbal working memory. Tactile Form Perception for Somatoform perception and Expressive Speech. Scoring was done using appropriate statistical analysis. Results of the study reveal significant difference in the neurocognitive strengths among the sample. All the CP children showed higher skills in visual scanning and sustained attention as compared to verbal working memory. Expressive Speech and Tactile form perception is comparatively manageable. Conclusion: Neurocognitive strengths identified can help these children to cope better in their life skills. The weakness in these children can be frustrating and sometimes impossible to be trained. Thus, the identified neurocognitive strengths of the children would be a boon to the educators and parents. The curriculum may include training each child's neurocognitive strengths rather than weaknesses to cope better with their own skills, which in turn will make them happy, enhance their mental health and quality of life. Key words: cerebral Palsy, neurocognitive, quality of life, skills, strengths, children.

Is Soil Health Card able to increase farm income?

Parthana Gogoi* and Nivedita Deka**

*M.Sc.(Agri) student** Professor

Department of Agricultural Economics

Faculty of Agriculture Assam Agricultural University, Jorhat-13

prathanagogoi@gmail.com,

With the new prominence on sustainable agriculture the interest in soil health is reawakening. High quality soils contain water and nutrients optimum for plant growth and higher yield. Poor quality soils are generally vulnerable to weather variations throughout the growing season and which do not support

optimum plant growth. Imbalanced and inappropriate use of chemical fertilizer affects soil fertility, crop yield and thus the income of the farmers. Soil testing plays a very important role in diagnosing the

physical, chemical and biological properties of the soils and provides unswerving information about the exact amount of fertilizer dose required. So soil health card scheme was initiated by the government of India in February 2015 and by July 2015 more than 34 lakhs cards were distributed. In Assam 18,83,457 no of cards were distributed out of which 1,02,127 card were distributed in Nagaon where present study was conducted. The present paper attempts to analyse the change in resource use pattern and its impact on farmers' income and to explore the problems and prospects associated with the use of SHC. The study was conducted in Nagaon district of Assam with 60 respondents. The primary data was collected by personal interview method during 2018-2019. The data regarding the utilisation pattern of the recommended dose of fertilizer as per SHC revealed that majority more than 79.65% farmers didn't apply the fertilizers as per requirement. The observation also shows that none of the farmer uses any micronutrient like zinc, sulphur boron including biofertilizer as suggested by SHC. It was observed that there was no significant change seen in the resource used pattern by the farmers and no significant change was observed in the income of the farmers. There were many problems observed regarding the adoption of the SHC by the farmers of the districts some of which may be that no technical advice after distribution of SHC was given to the farmers which were faced by majority of the respondents. The respondents were unaware of the process of soil testing by grid system and find it hard to believe the fertilizer dose as mentioned in the soil health card. The study concluded that the SHC scheme could not bring any positive change in the Nagaon district of Assam in the initial years of its distribution, which solicit for mass awareness campaign using the concept of the judicious use of fertilizer as per dose recommended on the soil health card. The farmers also should be given advisory services along with technical supervision on the use of soil health cards and make Agriculture more sustainable and productive.

Key words: Resource use, farm income, soil health cards, Nagaon, Assam

Seed Industry of India An overview and analysis

Prithviraj Pegu1 (corresponding author) & Sharmila Dutta Deka2

1 M.Sc. Scholar, Seed Technology, Dept. of PBG, Assam Agricultural University, Jorhat, Assam

2 Principal Scientist, National Seed Project (Crops), Assam Agricultural University, Jorhat, Assam
Phone: +91-8638120437 E-mail id: prithvirajpegu007@gmail.com

Indian Seed industry is the 5th largest in the world and it continues to grow on a considerable pace to gain a good name in the world seed map. Various factors are responsible for this growth viz. 1. Adoption of high value hybrid seed is growing fast. 2. With the IPR in place through PPV&FR Act more private bred open pollinated varieties in rice, wheat and soybean is available to the farmers. 3. The Seed Replacement Rate improves with the raising farming income and profitability. 4. New Biotech traits boost the Seed Market Value. Different types Public, Private and other seed firms like National Seed Corporation, Mahyco, Ankur seeds, Namdhari Seeds etc. and sub-systems owned by those seed firms constitute the structure of the giant Indian Seed Industry. It mainly consists of the field crop seeds and vegetable seeds, which are also exported to other countries and thus contribute a lot to India's economy. Growth of the seed industry of a country is dependent on Seed Replacement Rate (SRR). The SRR for almost all the crops in India have improved in the recent times. From 2002-2010, the SRR of key cereal crops have more than doubled, with that of Rice experiencing a 111% jump, Wheat increasing by 154% and Maize 238%. The current marketing trends and government policies of seed marketing are shaping its future towards glory. Moreover, A flawless supply chain and its proper management is going to help India's seed industry to achieve its goals. Marketing-mix like Product, Pricing, Distribution and

promotion are the pillars of seed marketing in India. The Strength, Weakness, Opportunity and threats (SWOT) to the overall Indian Seed Industry are also mentioned and analyzed properly. Also, Development of Seed industry in Assam as well as the rest of the North-eastern region is at a very nascent stage and lot of things are to be done for its growth. Various marketing strategies like good inventory management system, excellent post-sales service etc. and most importantly increased investment in R&D are followed in Indian Seed Industry. The role of seed sector has been decisive in securing food security in India and thus, Indian seed industry continues to explore further and conquer newer heights.

Keywords: Seed industry, marketing-mix, flawless supply chain, SWOT, food security

CARBON CREDIT: A REMEDY FOR CLIMATE CHANGE AND A LUCRATIVE MARKET IN INDIA

Saradi Sondhya Baruah* and Dibya Jyoti Kalita** *Msc. Student and ** Msc. Student Department of Agricultural Economics & Farm Management Assam Agricultural University, Jorhat ,Assam-785013
Corresponding author:dibyajyotikalitajrt@gmail.com

Global warming; the word itself reflects a grievous danger that the whole world with 7.6 billion people has been facing due to various activities leading to increase in the temperature of the world resulting in various devastating consequences like extreme weather events, melting of ice, rise in the normal sea level, sea level and ocean acidification etc. The reason behind this phenomena is the emission of Green House Gases like carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, perfluorocarbons through the natural as well as anthropogenic activities. When we look into the global scenario then it can be seen that the contribution of the developed countries towards the above mentioned phenomena is more as compared to the developing or underdeveloped countries. According to a report published by United States Environmental Protection Agency, China contributes about 30 percent to the total carbon di oxide emission in the world, which was the highest and the contribution of US, Europe and India are 15, 9, 7 percent respectively during 2014. Sector wise Global Green House Gas emission is highest in case of electricity and heat production sector(25 percent), followed by Agriculture Forestry Land use sector (source: IPCC 2014). To mitigate this problem an international agreement was adopted named “Kyoto Protocol” in Japan during 11 December, 1997 which came into force from 16 February, 2005 and it described the emission of six green house gases. Through this the concept of “Carbon Credit” came into being, which can be defined as the tradable certificate representing the right to emit one tonne of carbon di oxide or the mass of another green house gas with a carbon di oxide equivalent to one tonne of carbon dioxide. Kyoto Protocol introduced three mechanisms to reduce the emission of green house gases namely ‘Joint Implementation’, ‘Clean Development Mechanism’ and ‘International Emission Trading’. India signed this Kyoto Protocol during 2002 and being a developing country, it has the potential to come up as leading country in carbon trading.

Keywords: Global warming, Green house gases, Kyoto protocol, Carbon credit, opportunities in India.

A Simple reconfigurable microstrip patch antenna

Radhika Chetri1, B. Dasgupta2

1B.Tech Student, Department of Electronics and Communicational Engineering, Indian Institute of Information Technology, Guwahati, India.

2Assistant Professor, Department of Electronics and Communicational Engineering, Indian Institute of Information Technology, Guwahati, India.

E-mail: 1 radhikachetri999@gmail.com, 2 bidisha@iiitg.ac.in

With the advancement of communication technology the demand of the high frequency low profile conformal antennas are increasing day by day. Moreover with the help of advancement of printed technology, the printed antennas can be designed very easily in low cost. Microstrip patch antennas are popular antenna for designing such low profile antennas [1]. Over the last decades, the reconfigurable antennas are playing the important role for increasing the utility of the spectrum. It is an important element for designing cognitive radio antennas, MIMO antennas and satellite antennas. Instead of designing multiple antenna, one single reconfigurable antenna can offers reconfigurability in terms of patterns, polarisation and frequency. By incorporating the active elements like RF-MEMS, PIN diode, optical switches etc with passive antenna geometry such reconfigurable antennas can be designed very easily [2].

The objective of the research is to design, a novel reconfigurable antenna suitable for wireless application. The literature survey reveals the fact that in the past very limited work have been carried out on semi- circular geometry whereas it is a potential candidate for designing low profile patch antenna. So in the present work, the semi-circular antenna geometry has been chosen for designing reconfigurable antenna and it is excited by micro-strip line. Then by introducing some slot structure, operating frequency has been changed. The reported antenna operates at 8.88GHz with a gain of about 6.5dBi whereas with the modification in the patch by introducing a slot in it, the modified antenna operates at 8.14GHz with an acceptable gain of about 2dBi. Moreover, both the antenna provides the Broadside radiation pattern. The aim is now to add an active element with the proposed antenna structure. By changing the switching status of such elements, the path of the current can be varied which will offer the reconfigurability of the antenna. The simulation analysis has been carried out by using Ansys High Frequency Structural Simulator (HFSS) [3].

Reference

[1] Girish Kumar, and K.P.Ray. Broadband microstrip antennas. Artech House,2003.
[2] J. Costantine, Y. Tawk, S. E. Barbin and C. G. Christodoulou, “Reconfigurable Antennas: Design and Applications," in Proceedings of the IEEE, vol. 103, no. 3, pp. 424-437, March 2015.
[3] Ansoft’s high frequency structure simulator (HFSS) version16.2

Shackled to the Golden Arches: Fast Food Culture and the Urban Youth

Aishwarya Bhuta

MA Development Studies – I year

Indian Institute of Technology Guwahati

While globalization accelerated the export of fast food culture and values from USA to the rest of the world, capitalism and localisation helped it thrive. This empirical study is an attempt to capture the emergence and evolution of fast food chains in India, and how fast food gradually became a way of life for the youth in Mumbai. Visiting a quick service restaurant now symbolises a novel method of recreation, i.e. experiencing western ways of life. It homogenises the middle class vis-à-vis the elite and lower classes, thereby demarcating its aspirations, preferences, desires, buying behaviour, ideologies, and class associations from the rest. By comparing the consumption patterns and other attributes of youngsters in a suburban vis-à-vis a posh area of Mumbai, the paper discusses the perceptions of youngsters with regard to fast food. It also explores the role of media and advertising in establishing fast food as culture, and the resulting identity and status-seeking behaviour of middle class youngsters. Finally, the study contextualises the poetics and politics of food and its significance in an urban middle class society.

Keywords: fast food, globalisation, middle class, advertising, food politics, McDonaldisation

Impact of landuse on land surface temperature in Rajarhat area

Land use and it's change are the burning issues of Contemporary Geography. Due to rapid urbanization, land use change occurs at fast rate. A huge amount of agricultural land has been transferred into urban utilities. Rajarhat is located to the north of East Calcutta Wetland and north east of Salt Lake City. Many urban and suburban areas experience elevated temperatures compared to their outlying rural surroundings; this difference in temperature is what constitutes an URBAN HEAT ISLAND. Atmospheric urban heat islands are often weak during the late morning and throughout the day and become more pronounced after sunset due to the slow release of heat from urban infrastructure. Factors creating URBAN HEAT ISLANDS are as follows:-

Reduced vegetation in urban regions reduces the natural cooling effect from shade and evapotranspiration.

Properties of urban materials contribute to absorption of solar energy, causing surfaces, and the air above them, to be warmer in urban areas than those in rural surroundings.

IMPACT OF SURFACE URBAN HEAT ISLAND:

Heat stress and heat wave related illness.

Discomfort in day as well as night time in summer seasson.

Thermal water pollution as well as groundwater and thus the degradation of water quality.

MITIGATION STRATEGIES:

Vegetation cover should be increased in urban area.

Roof top gardening is a good solution to minimize the future surface UHI growth.

Building density should be moderate by widening the width -height ratio in urban area.

Rooftop solar panel utilization should be compulsory in urban area.

REFERENCES

Oke,T.R. 1997. Urban climates and Global Environmental Change

Voogt J.002.UHI Global Environmental Change.

Women and School Children Empowerment through Organic Kitchen Waste Management

Jharna Choudhury* and Dipanjan Kashyap1

*MBA (Agri Business Management) scholar

1Assistant Professor, MBA (Agri Business Management)

Assam Agricultural University, Jorhat-13, Assam

Email: jchoudhury671@gmail.com

'Kitchen waste' is defined as left over organic matter from household. Tons of kitchen wastes are produced daily in highly populated areas. For mixed municipal waste system it is difficult to process kitchen waste by standard means such as incineration due to high moisture content. Kitchen waste is highly nutrient rich and organic matter can be transformed into environmentally friendly manures for chemicals free organic food production.

Objectives

Develop an integrated and environmental-friendly organic waste management system that ensures the adequate collection and treatment with sustainable methods

Create awareness and impart training among housewives to generate income with household organic waste management

Build up young generation as change agents of the sustainable environment

Overview

This project brings an idea to recycle the organic waste produced in a household by composting method to produce organic manure and reuse of those organic manures to produce organic vegetables. The aim is to develop an organic vegetable farm by using organic waste compost. The organic manures will be produced from composting organic kitchen waste of household. Household kitchen waste will be collected from nearby areas.

After establishing the business, the project will create awareness and generate training programme for the housewives of the area to recycle the organic kitchen waste to compost or vermicompost. The produced compost or vermicompost will be bought back from trained women by paying reasonable price, which will assure them the market. The trained women can also use self-made organic manure in their homestead gardens which can develop their mind to become women entrepreneurs which solely intends to organic waste management.

The project also aims to develop future agripreneurs by attracting school students to agripreneurship. It intends to train and educate students for establishing and maintaining organic school gardens with the help of ecological organic waste management. It can be successfully implemented by involving the

students half an hour everyday either before start of the school or after the end of day's class. Organic school gardens established by participation of students can bring in nutritional security by inculcating the habit of eating local green vegetables as they have delight of eating own grown food. Produce of organic school garden can be tied up to school meal programme. Again, garden waste can be recycled to compost which can be used as organic manure for maintaining the school garden. Organic school garden will emphasize in sowing seeds of agripreneurship in the minds of young children and also build nutritional stewardship in the juvenile minds.

In general, the project brings:

Contribution to the overall sustainability of the area

Improvement of overall organic waste management of the area

Increased recycling levels and reduction of organic waste in landfills

Use of quality compost will improve soil fertility as well as help in production of nutrition-rich organic vegetables

Women empowerment with the help of sustainable organic waste management

Developing agripreneurship among the school students by promoting organic school gardens and ecological organic waste management

STARTUP INDIA: awareness among the youth; a study carried among the students of various educational fields in Jorhat.

Dr. Pranab Baruah

Mukut Chakraborty
Pratikshya Borpujari
Ananya Saikia
Asmita Tamuli

Department of Statistics, Jagannath Barooah College, Jorhat.

Email ID-mukutchk110@gmail.com

STARTUP INDIA is an initiative popularized by present PM of India Mr. Narendra Modi to attract the youth for being a potential entrepreneur to tackle the problem of unemployment in the country. As a part of these programme different states of India has formulated different policies and Assam is also not an exception of this. The govt. of Assam has also framed some policies for successful implementation of this programme, these include: GST reimbursement, Stamp duty reimbursement, Digital up gradation subsidy, Lease rental reimbursement., Power subsidy, 100 % reimbursement of patent filling cost, Incentives for hiring women, transgender and differently abled, Marketing and promotion assistance, Preferential market access, Self-Certification and compliance. Since the main objective of this policy is to attract the youth in order to tackle the unemployment problem by creation of entrepreneurs, an attempt is made by us by the use of various statistical tools, to find the level and determinants on awareness about STARTUP INDIA among the students of various educational fields like Science and Technology, Agriculture, Commerce, Humanities and so on,as immediately after obtaining their Graduation degrees many of them would search for employment.

Keywords: STARUP INDIA, youth, unemployment, entrepreneur.

Development of 2-D Solution For Axially Graded Piezoelectric Beam Under Static Loading

Viwek Kumar1,Dr. Poonam Kumari2
Department of Mechanical Engineering, IIT Guwahati,India

E-mail: viwek176103111@iitg.ac.in, kpmech@iitg.ac.in

An analytical two-dimensional (2D) piezoelectricity solution for arbitrarily supported axially functionally graded (FG) beam under static loading is developed. Linear gradation of the material property along the axis of the beam is considered. Using the strain displacement and constitutive relations, governing partial differential equations (PDEs) is obtained by employing Ressiner mixed variational principle. Then PDEs are reduced to two set of ordinary differential equations (ODEs) by using recently developed extended Kantorovich method. The set of 4n ODEs along the z-direction has constant coefficients. But, the set of 4n nonhomogeneous ODEs along x-direction has variable coefficients which is solved using modified power series method. Efficacy and accuracy of the present methodology are verified thoroughly with existing literature and 2D finite element solution. Effect of axial gradation, boundary conditions and configuration lay-ups are investigated. It is found that axial gradation influence vary with boundary conditions. These benchmark results can be used for assessing 1D beam theories and further present formulation can be extended to develop solutions for 2D micro or Nanobeams.

Keywords: Axially functionally graded, Two-Dimensional piezoelectricity, Arbitrary supported, Extended Kantorovich method.

HYBRID VEHICLES

Hybrid vehicles are similar to conventional vehicles which are driven by ony a internal combustion engine which are powered by petrol or diesel or any type of fuel. Hybrid Vehicle uses an additional feature of having an electric motor along with internal combustion engine. It combines useful features from both Internal Combustion engine and pure electric vehicle. For example, an automobile which is driven purely by a electric power needs a very big electric storage devices in order to get mileage similar to a conventional hybrid vehicle. And in a diesel/petrol engine car fuel is unnecessarily wasted during ideal conditions like waiting in traffic or going at very low speed, which can be overcome in hybrid vehicle by using a automatically/manually controlled electric motor as per driver's wish which can be switched on /off along with switching alternatively combustion engine.In this way Hybrid vehicles is helpful in reducing pollution in cities without compromising in much space requirement as in vehicle driven by pure electricity.

Design Approach to Selection of Wing Airfoil for MAV

Anand Verma, Dr. Vinayak Kulkarni

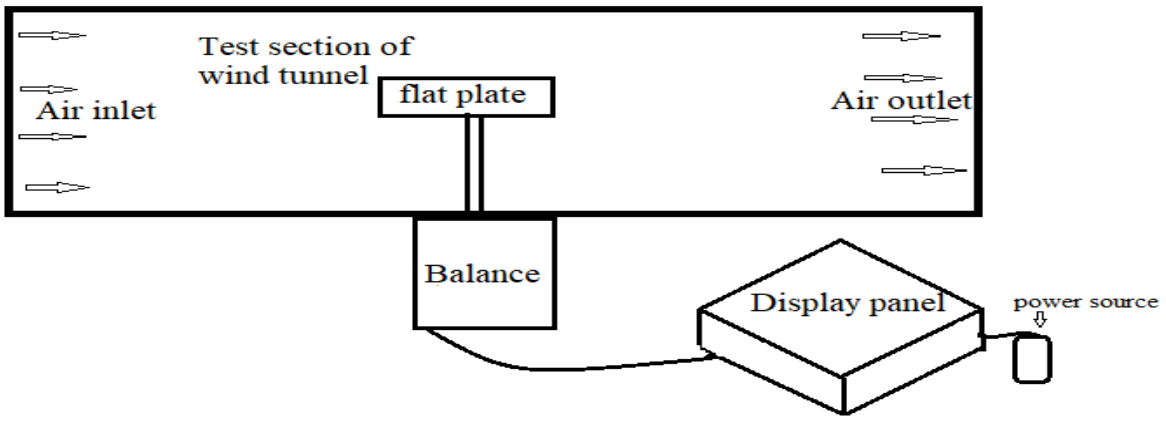
Department of Mechanical Engineering, IIT Guwahati, India

Micro Air Vehicles (MAVs) is developing as the recent trend of research, which is a class of Unmanned Air Vehicle (UAV) having wingspan size of less than 500 mm and weight less than 500 g. MAVs have various applications such as by army for border security, inspection of bridge construction, during search and rescue operations and many more. The current research work emphasizes the aerodynamic problems

that must be addressed in order to achieve an efficient MAV design. Reynolds number and aspect ratio (AR) seems to be the parameters that require more concern for a proper design having reasonable performance. Prior to the actual experiments on MAVs to get an estimate of the aerodynamic coefficients and flow phenomenon, flow over model is investigated.

The research is intensively concentrated on low-Reynolds-number aerodynamics, as LAR wings are crucial for the development of MAV. The flow around LAR wings is characterized by complex three-dimensional flow phenomena involving generation of wing-tip vortices, flow separation and reattachment phenomena. In this regard, experimental investigation has been planned in wind tunnel facility to have a proper estimate of the coefficient of drag and lift over various LAR configurations namely flat plate, NACA0012, S5051 aerofoil. The basic layout of complete experimental set-up has been presented below fig.1

Fig.1-Block-diagram of whole experimental setup



Experiments have been conducted to estimate the force and moment coefficients at low Reynolds no. of the order 105 using six component strain gauge balance. However the velocity has been measured through the reading of single channel manometer and angle of inclination of the model through digital split level. During experimentation arrangements have been also made for smoke wire flow visualization to investigate the three-dimensional flow aerodynamics of rectangular LAR wings for an aspect ratio of 1 and 2.

Effect of Low Profile Vortex Generators on MAV flight

Bastav Borah1 , Dr. Vinayak Kulkarni2 and Dr. Ujjwal K. Saha3

Research Scholar, Department of Mechanical Engineering, IIT Guwahati, India

Assoc. Professor, Department of Mechanical Engineering, IIT Guwahati, India

Professor, Department of Mechanical Engineering, IIT Guwahati, India

E-mail: bastav.borah@iitg.ac.in

Vortex Generator (VG) are invariantly used as flow control devices. The vortices generated through these devices help in maintaining the attached fluid flow over the object of interest. These devices are generally seen attached with parts of aircraft wings, automobile spoilers, wind turbine rotor blades etc. These systems or subsystems, over which fluid flows, encounter flow separation due to adverse pressure gradient. As a result of such flow separation, low pressure wake gets formed in the downstream and it leads to enhancement in form drag. Careful implementation of VGs can considerably negate such flow separation by mixing the slow moving fluid layers closer to the surface with the comparatively faster moving or high energy outer layers. Such VGs come in various types or shapes, such as doublets,

wishbones, counter-rotating rectangular vanes, counter rotating delta vanes etc. (Fig. 1) [1]. Low profile VGs have a maximum device height of around 10% - 50% of the boundary layer thickness [2]. Doublet and wishbone types of VG fall under the category of low profile VGs. The doublet VGs have height of only 10% - 20% of the boundary layer thickness. Drag reduction of up to 38% was observed using wishbone VG devices for a low Reynolds number flow [3]. These VGs can be thought to be integrated with Micro Air Vehicles (MAV) since reduction of induced drag is particularly very important aspect of studies for a fixed MAV. As per the classification, MAVs are low powered unmanned autonomous flying vehicles, having a linear dimension of around 15cm, gross take-off weight of approximately 100g with a payload of 20g. Fixed wing MAV flights are also in the low Reynolds number regime (<105) [4] (low Reynolds number range). In their flights, even a minor reduction in drag forces can bring a considerable improvement in MAV durability and range. Although VGs improve lift force by reducing or delaying flow separation, they also induce a minor drag force owing to their form factor. A thorough investigation of the effects of implementing these low profile VGs in a fixed wing MAV needs to be carried out to understand the benefits it can offer. Multi staging of VGs with time bound actuations can be studied to understand their influence on flight dynamics of a fixed wing MAV. Initially, numerical simulations are planned on S5010 airfoil section wing with different VG profiles. These simulated results will be analysed along with the wind tunnel experiments.

a. Counter rotating b. Co-rotating c. Wishbone

Figure 1: Different types of Vortex Generator

References:

1. Lin, J. C., Howard, F. G., and Bushnell, D. M., 1990, “Investigation of Several Passive and Active Methods for Turbulent Flow Separation Control,” AIAA 21st Fluid Dynamics, Plasma Dynamics and Lasers Conference, Seattle, WA, June 18-20, 1990.
2. Lin, J. C., 2002, “Review of research on low-profile vortex generators to control boundary-layer separation,” Progress in Aerospace Sciences 38, pp. 389-420.
3. Lin, J. C., Selby, G. V., and Howard, F. G., 1991, “Exploratory Study of Vortex-Generating Devices for Turbulent Flow Separation Control,” 29th Aerospace Sciences Meeting, Reno, Nevada, Jan 7-10.
4. Mueller, T. J., 1999, “Aerodynamic measurement of low Reynolds number for fixed wing Micro-Air Vehicle,” VKI, Belgium, September 13-17, 1999.

Understanding flow dynamics, viability and metastatic potency of cervical cancer (HeLa) cells through constricted microchannel

Binita Natha, Asif Raza, Vishal Sethia, Amaresh Dalala, Siddhartha Sankar Ghosh and Gautam Biswas

Department of Mechanical Engineering, and Department of Bioscience and Bioengineering, Indian Institute of Technology, Guwahati - 781039, India

To understand the burgeoning challenges of metastasis, a microchannel of 35 μm diameter, constricted to 7 μm for a distance of 200 μm in a total length of 3 mm, was designed and fabricated using a mask aligner made of polydimethylsiloxane (PDMS) to mimic in vivo capillaries. A thin glass cover-slide was mounted on top to monitor the motion of single or aggregated malignant HeLa cells (size 17–30 μm) microscopically through the constricted microchannel at a constant flow rate of 30 μl/h. Quantitative deconvolution of high-speed videographs of a single cell of 30 μm revealed cellular deformation while passing through constriction, having elongation index, average transit velocity and entry time of 2.67, 18 mm/s and 5.1 ms, respectively. Morphological analysis of live and apoptotic cells by dual staining with Acridine Orange/Ethidium Bromide demonstrated retention of a significant viable cell population after exit through the constriction and a viability index of 50% was quantified by dye exclusion assay. The cumulative data for microfluidic parameters, morphology and relevant metastatic MMP2 gene expression efficiency measured by real-time polymerase chain reaction revealed retention of virulence potency that could possibly cause metastasis, would be beneficial in developing futuristic MEMS device for cancer theranostics.

Fabrication of a wearable device and Health Assessment of a human knee joint – An Innovative Approach

D.Verma, P. Kumari, S.Kanagaraj

Department of Mechanical Engineering, IIT Guwahati, India.

E-mail: verma176103116@iitg.ac.in, kpmech@iitg.ac.in, kanagaraj@iitg.ac.in

Purpose – Now a day's various people are suffering from knee health problems. There are various kind of activities people do in their daily life including walking, running, jumping, playing etc. It is also observed the common knee injuries in athletes and non-athletes like fractures, dislocations, sprains and ligament tears. Osteoarthritis and its progressive stage is a very common disease in people. It leads to the total knee replacement which includes a higher monetary for common people. The aim of this study is to distinguish the human knee joint health assessment by using the Acoustic Emissions (AE).

Approach –In the human biological system, the knee joint is very important because it functions as a weight bearer as well as torque transmitting member in the body. Knee health assessment is related to the proper functioning and positioning of bones like femur, tibia, fibula, and patella along with ACL, PCL, MCL and meniscus. Also the strength of a knee joint varies by male to female and person to person. Piezoelectric acoustic sensors are highly efficient to convert the mechanical input into electrical signals and vice-versa. Here the mechanical input may be the direct load application, in terms of strains, mechanical vibrations and sound waves also. PVDF and its polymers are widely used to fabricate these sensors using electrospinning methods. In a human gait cycle, these AE signals can be recorded and noise can be captured which is produced by the healthy and an unhealthy knee. In particular, we propose a piezoelectric based acoustic sensor in a wearable device which can monitor the knee health conditions in different people. Inertial measurement unit (IMU) based system is suggested along with the wearable device during human gait cycle. Furthermore micro electromechanical systems (MEMS), electret an air microphones are also suggested to capture the noise from knee joint during flexion-extension, walking and running postures.

Findings – After thorough literature survey it is found that the fabrication of a wearable device and health assessment of a human knee joint will be a very useful and innovative creation.

Keywords: - Acoustic Emissions, ligament, meniscus, electrospinning, human gait cycle, Inertial measurement unit

FREE VIBRATION ANALYSIS OF FUNCTIONALLY GRADED BEAM USING EXTENDED KANTOROVICH METHOD

Ehtesham Hussain1, Agyapal Singh2and Poonam Kumari1

1Department ofMechanicalEngineering,IIT Guwahati,India

Email: ehtes174103076@iitg.ac.in

Functionally Graded Materials (FGMs) are advanced class of heterogeneous material in which there is gradual change in composition and structure of the material over volume that results in its property changes. Main advantage of FGMs is that it can withstand high temperature gradient without change in its structural integrity. So it is very important to know the exact behaviour of FGMs under various boundary conditions and loading. Among various solution approaches analytical approach is preferred because of its simplicity and more accurate results. Therefore, this work presents accurate and precise dynamic behaviour of functionally graded beam subjected to arbitrary boundary condition under transverse loading using Extended Kantorovich method (EM).

By applying the EKM method, first order ordinary differential equation (ODEs) and algebraic equations along the in-plane and thickness directions are obtained. The system of the equations along the thickness direction are having constant coefficients but the set of equations along the in-plane direction have variable coefficients. In thickness direction, exact closed-form solutions are obtained and along in-plane direction the system of ordinary differential equation with variable coefficients is solved by employing the modified power series.

THERMAL MODELING AND SIMULATION OF MULTI TUBE LATENT HEAT THERMAL ENERGY STORAGE SYSTEM

In this study, a numerical investigation of heat and mass transfer characteristics of a high temperature phase change material (PCM) is presented. The phase change material used is Sodium Nitrate with a melting point of 306 °C. For a fixed PCM mass, investigations are carried out on a multi-tube heat exchanger system for examining the effects of tube size and number of tubes on overall heat transfer rate. The performance of latent heat storage system during the charging and discharging processes are discussed. Further, the results are elaborated for three multi-tube systems to optimize the number of tubes to be used with the constant heat transfer surface area. The natural convection pattern during charging is observed with the help of temperature contours and streamlines. With the increase in the number of tubes from 13 to 25, the heat distribution throughout the storage system is very effective which lead to reduction in charging and discharging times by 20% and 48% respectively.

Design and Modeling of a Three-Fingered Gripper for Therapeutic Purposes in Institute Hospital

Jyotindra Narayan1,Gaurav Jaiswal1andSantosha K. Dwivedy1

1Department of MechanicalEngineering,IIT Guwahati,India

E-mail:n.jyotindra@gmail.com, gaurav_jaiswal@iitg.ac.in, dwivedy@iitg.ernet.in

This paper present a design and modeling of three-fingered gripper for the automation of manual operations, performed by physiotherapists. As the physiotherapist used to perform repetitive task throughout the whole day for visualisation of inflamed tendons, joints and ligaments; a robotic gripper can reduce manual working hours of physiotherapists and relax them. The design is modelled in SolidWorks- CAD software with certain specifications, framed with available ultrasonic therapy unit of institute hospital. The designed three fingered gripper can hold the massaging knob throughout the physiotherapy operations. When the finger starts grasping the knob, the first phalanx comes in contact with the object. Thereafter, the Arduino setup is installed for the roll movement of the gripper about the base. Thereafter, the specialised motions for analysing the behaviour of muscles and ligaments are burned to Arduino interface by giving different mathematical formulations as input file. The computational process is carried out in MATLAB software. The motion responses being considered are progressive spiral, concentric circles and Lorenz model of fractals. The gripper is attached with a robotic arm for better visualization of constraint free movements during the physiotherapy operations.

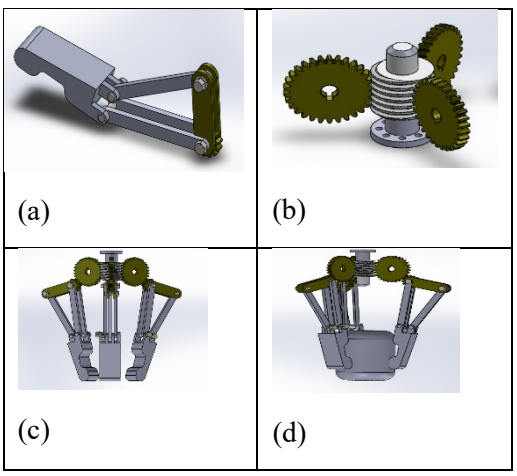
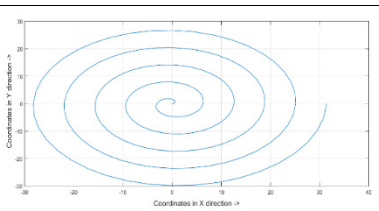
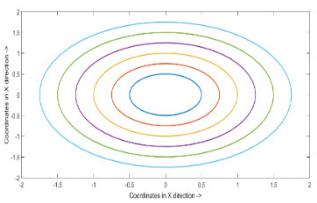
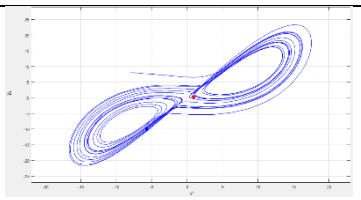


Figure 1. CAD model of (a) one finger (b) worm gear set (c) gripper system (d) 3-fingered gripper with knob.

Mathematical Formulations	Desired Motion Responses
Progressive spiral motion: For, $0 < t < 10\pi$ $\beta(t) = c \times t$; c is constant. $x(t) = c \times t \cos(t)$, $y(t) = c \times t \sin(t)$; such that $x^2+y^2 = c^2 [\{\tan(y/x)\}-1]2$; where, the $\beta(t)$ and t denotes the radius angle of spiral, respectively	 (a)
Concentric circles motion: For, $2mm < r < 22mm$ $x= a + [\cos(\theta) \times r]$; $y= b + [\sin(\theta) \times r]$;	 (b)

where, a and b are the centre points and r is the radius of circles.	
Lorenz fractal motion: $\frac{dy_1}{dx} = -\sigma \times y_1 + \sigma \times y_2$ $\frac{dy_2}{dx} = -y_1 + r \times y_1 - y_2$ where,σ, r and b are the positive constants.	 (c)

Electric field mediated separation of water–ethanol mixtures in carbon-nanotubes integrated in nanoporous graphene membranes

Manash Pratim Borthakur, Dipankar Bandyopadhyay and Gautam Biswas

Department of Mechanical Engineering, and Department of Chemical Engineering, IIT Guwahati

We investigate the influence of an applied electric field on the separation of a water–ethanol solution inside a carbon nanotube (CNT) using a series of molecular dynamics simulations. The electric field is applied at an angle θ with respect to the axis of the CNT. The study uncovers that with the application of a 'small-angle' electric field (e.g. smaller θ), the water molecules exhibit preferential occupancy inside the CNT, whereas the application of the same electric field at a 'wide-angle' mode (e.g. higher θ) fills the CNT with ethanol molecules in place of water. Remarkably, the direction of the electric field plays a pivotal role because the field exerts a contrasting influence on the behaviours of the water and ethanol molecules. The water dipoles are favourably aligned at small values of θ creating an ordered water structure inside the CNT. Increasing θ disrupts the water dipole orientation and leads to the preferential occupancy of the CNT by ethanol molecules. An in-depth analysis on the simulated systems unveil that, at lower values of θ, multiple layers of water molecules are physically adsorbed near the CNT walls, which is found to diminish as θ is increased. In comparison, at higher magnitudes of θ, the ethanol molecules are preferentially adsorbed inside the CNT. The average interaction energy per ethanol (water) molecule is found to increase (reduce) when θ is monotonically increased, which can be ascribed to the increase (decrease) in the intermolecular hydrogen bonding capacity of the ethanol (water) molecules at larger values of θ. Consequently, inside the CNT, the average occupancy of water molecules decreases and ethanol molecules increases, as θ is monotonically increased, leading to the separation of the ethanol–water mixture. The proposed methodology can convert an equimolar mixture of ethanol–water into a concentrated one when the electric field is applied orthogonal to the axis of the CNT. The separation efficiency is found to improve with an increase in the intensity of the externally applied electric field.

Fabrication of Piezoelectric PVDF nanofiber

M.Kumar1, P.Kumari

1, 2 Department of Mechanical Engineering, IIT Guwahati, India

E-mail: mukes176103016@iitg.ac.in, kpmech@iitg.ac.in

Purpose - The continuous growing of the commercial use of electrospun nanofiber membrane have been attracted attention to the scientific community, as well as industry and is considered to be a key scientific and commercial venture with global economic benefits. Electrospun nanofibers have been used in various area such as tissue engineering, wound dressing, filtration, drug delivery system, desalination, protective clothing fabrication, optical electronics, personal care, sound absorption, and biosensors.

Methodology/approach - Electrospinning has been widely used technique since the late 20th century. Significant development have been reported in the instrument design, material used, and nanomaterial's produced. The various operating parameters which affect the morphology of electrospun nanofiber, made by electrospinning technique. This work will provide an overview of the process (applied voltage, flow rate, distance between the needle and collector, and shape of spinneret), solution (molecular weight, polymer concentration, viscosity, surface tension, and conductivity), and ambient (humidity, temperature, and type of atmosphere) parameters that affect the nanofibers fabrication and their vital application.

Findings - With the widening knowledge of nanomaterial manufacturing techniques, research community across the world are primarily focusing on the preparation of nanomaterials for potential application. (Li and Xia, 2004) reported that electrospinning has gathered significant interest among various techniques due to its ability to fabricate nanostructures with novel properties such as small diameter, long length, diversified composition, high surface area to volume ratio, inter/intra fibrous porosity, and flexibility in surface functionalities.Two different nanomaterials are blended together to form nanocomposite which lead an abrupt change in material properties of electrospun nanofiber. Value - Apart from the composite materials piezoelectric materials also playing a vital role in the production industries now a days because they are naturally act as an energy harvester. These materials act under the action of force application and they produces significant voltage and vice- versa. So ultimately piezoelectric materials can produce the form of electrical energy and mechanical energy both. Piezoelectric materials are very useful to the fabrication of piezoelectric electrospun nanofiber composite with the help of electrospinning. Most common piezoelectric materials such as polyvinylidene fluoride (PVDF) polymer and lead zirconate titanate (PZT) ceramic are used in fabrication of nanofiber.

Keywords Polyvinylidene fluoride (PVDF); Parameter effect; Electrospinnning

Gecko adhesion – Explaining the strong attachment and easy detachment at nanoscale spatula level

S. Gouravaraju and S. S. Gautam

Department of Mechanical Engineering,IIT Guwahati,India

E-mail:saipraneeth@iitg.ac.in, ssg@iitg.ac.in

Geckos can generate strong attachment forces and at the same time detach swiftly from any surface by employing the hierarchical fibrillar structures on their toe pads. The underside of each digit on the gecko toes has expanded digital scales called scansors, which have rows of lamellae that are populated by thousands of micro-fibrils called setae (see Fig. 1). Each seta is about 30−100 μm long and 5 μm in diameter. At their ends these setae further branch into hundreds of nanoscale spatula-like structures (Fig. 2), which adhere to substrates through van der Waals interactions. The present work investigates the normal and tangential peeling behaviour of a gecko spatula computationally using a coupled adhesion-friction model. A nonlinear finite element formulation is used to solve the equations of motion. The objective is to explain the strong attachment and easy detachment behaviour of the spatulae as well as to understand the principles behind their optimum design. For this, the gecko spatula is modelled as a thin two-dimensional strip which is rotated by an angle and then pulled along at an angle by applied displacement as shown in Fig.3. It is found that the maximum pull-off forces decrease with increasing peeling angle as shown in Fig. 4. Using our computational model, we show that the ``frictional adhesion'' behaviour is also present at the spatula level, which was until now has only been observed from seta to toe levels. The model also shows that, there is an optimum range of spatula pad thickness for which, irrespective of the peeling angle, the spatula detaches at a constant angle known as critical detachment angle. It is shown that, the spatula readily detaches from the substrate by changing its shaft angle and then peeling vertically like a tape. Additionally, it is found that friction increases the attachment forces, while the detachment forces are unaffected. Since the present computational model is not limited by the geometrical, kinematical, and material restrictions of the theoretical models, it can be employed to study and analyse the adhesion behaviour of many similar biological adhesive systems. It is observed that as the friction coefficient increases, the pull-off force increases. It is found that increasing the spatula stiffness or decreasing the adhesion strength reduces the pull-off forces and the spatula stresses. On the other hand, decreasing the size, stiffness or increasing the adhesion range increases the stresses and pull-off forces.

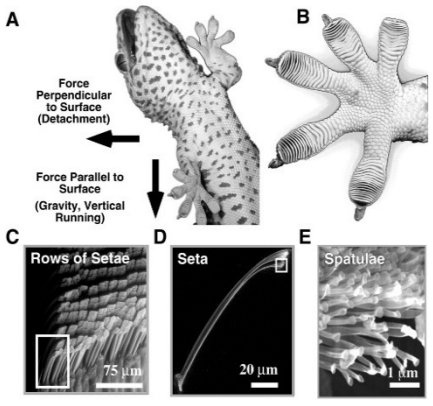


Figure 1. Structure of gecko adhesive system

(Adapted with permission from Autumn et al. 2002)

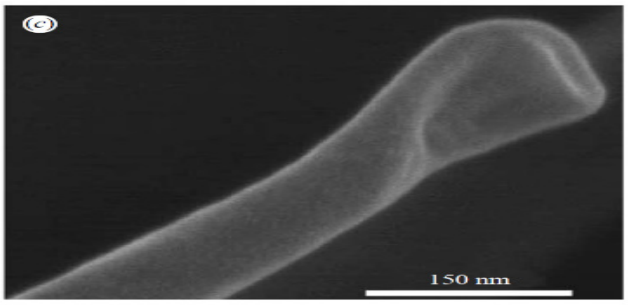


Figure 2. Scanning electron microscopy image of the spatula of a Tokay Gecko (Adapted with permission from Rizzo et al. 2006)

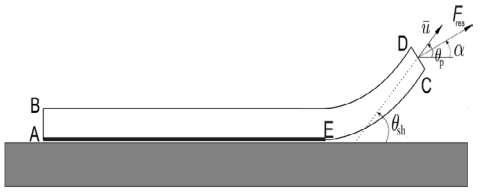


Figure 3. Spatula modelled as a strip peeling by applied displacement

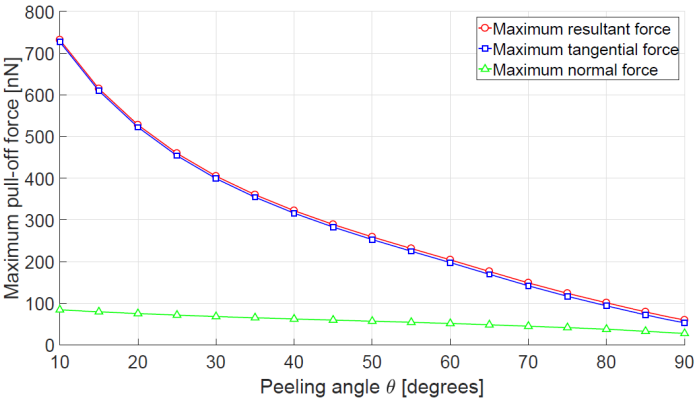


Figure 4. Variation of the maximum pull-off force with peeling angle

Manufacturing Solutions for the Preparation of Siddha Medicines(Traditional Medicines Originated from Tamil Nadu)

A. Saurav Kumar[1], B. Chayanika Bordoloi[2]

[1] Department of Mechanical Engineering, IIT Guwahati, India
[2] Department of Mechanical Engineering, IIT Guwahati, India

[1] E-mail: kumar174103133@iitg.ac.in
[2] E-mail: chaya@iitg.ac.in

Introduction:

Siddha medicines are traditionally originated medicines from Tamil Nadu. Siddha medicines possess wide spectrum of insight from physical processes to different herbal & mineral usefulness in our body. Siddha system is one of the oldest systems of medicine in India. Traditional Indian medicines are generally prepared in very small quantities with very stringent manufacturing conditions. Major manufacturing stages can be divided as calcinations, sublimation, distillation, dissolution, fusion, separation, coagulation and fermentation. By understanding scientific reasons behind every stage of a manufacturing process and utilizing appropriate modern manufacturing techniques, required skilled manpower and manufacturing time can be significantly reduced. This project aims to replace traditional Pudam process and traditional mud devices including kuzhi thaila karuvi, valuka yandra, mezhugu thial karuvi and kuppi puda karuvi by simple modern devices.

Current status:

In the siddha manufacturing units, calcinations (Pudam), sublimation (pathangam) and distillation(vaalai) are being carried out using traditional clay devices even today. Pudam is time consuming, laborious process and most critical manufacturing stage in most of the medicines. Agal is made up of two identical clay bowls filled with the desired material, one over the other and sealed withlayers of mudded cloth. It is dried in the sunlight then placed in an earthen pit. The whole mass is fired inside pit for specified duration for the anaerobic condition. Based on requirement, various number of cow dungs are being used.

A Robust and Versatile tool for Topology Optimization of 3D Linear Elastic Continuum Structures

S. K. Ratnakar1

1Department of Mechanical Engineering, IIT Guwahati, India

E-mail: r.shashi@iitg.ac.in

Structural topology optimization is a very important step of design engineering. It is concerned with determining optimal material distribution in the given domain so that it can optimally fulfill its function. Nowadays structural testing and analysis have become a basic requirement across a wide range of industries owing to the limitation on material resources, environmental impacts of manufacturing and, technological competition which requires lightweight, low-cost and high- performance structures. Topology optimization has a wide range of applications across various fields of engineering such as, the weight minimization of structures, compliant mechanism design, aircraft wing design and, bone modelling simulation, to name a few. Its applicability to such wide range of problems motivated the researchers to design a computing tool for topology optimization of mechanical components. In the literature there are a few open source tools available which can be used to generate the optimum topology for a given component or structure, but each tool has a limitation of its own. Some of them can be applied only for 2D structures. A common demerit of most of this tools is that their application is limited to the structures with very simple and regular geometry. In the presented work, a robust and versatile topology optimization tool based on SIMP (Solid Isotropic Material with Penalization) method has been presented which is capable of generating optimum topology for the structures with complex domain geometries. A few popular examples from the literature are solved using this tool, and their final topologies are presented.

ABSTRACT

The bone defects caused by disease and trauma has called upon the need for bone grafting to repair them. In developed countries, bone and joint inflammatory and degenerative problems account for almost 50% of all the chronic diseases in people over 50 years of age. People with age higher than 50 years are twice as likely to be affected by bone diseases by 2020. In the United States alone, there have been over one million surgical procedures which involves large bone defects totaling over 5 billion dollars annually. Traditionally, these defects were treated by implanting a healthy bone from the patient's own body or from a donor's body. However, there are lot of risks associated with it such as invasive nature of the surgery, donor site morbidity, long recovery times, etc. There is also need to match the blood group and biocompatibility if the bone is from a donor. Thus, the research in bone grafting has been boosted and is of primary importance due to the various limitations associated with autografts, allografts. In bone tissue engineering, a scaffold maybe prepared along with growth factors and/or cells to guide bone regeneration or it may be prepared alone. These synthetic bones can be pre-formed and implanted into the body or the bones can be made cure in-situ under physiological conditions to fill up the defects of the bone. Thesynthetic polymers used as a scaffolding material include PCL because of its ease of processing and excellent biocompatibility, however, there are certain drawbacks such as their hydrophobic surface and its slow degradation rate. These disadvantages can be avoided by adding natural or polymeric fillers into the PCL matrix. The copolymer thus formed aims at producing a thermo-sensitive hydrogel that is able cure and harden under temperature stimulus.

OPTIMIZATION OF PROCESS PARAMETRS FOR MACHINING D3 GRADE TOOL STEEL

Sukanta Das1,Mohammad Zishan Ahmad2

Department of Manufacturing Engineering, NIFFT Hatia Ranchi, Jharkhand

E-mail:sukan176103114@iitg.ac in

This study presents an experimental investigation of wire-cut EDM for improving the process performance by machining D3 grade tool steel. D3 grade tool steel is high carbon-high chromium steel developed for applications requiring high resistance to wear or to abrasion and for resistance to heavy pressure rather than to sudden shock. Because of these qualities and its non-deforming properties, D3 is heavily used for die work on long production runs. The objective of this research work is to develop mathematical models correlating the 2D surface roughness parameters and the operating process parameters (pulse on-time, pulse off-time, peak current) using central composite design. Response Surface Methodology (RSM) is used to develop a mathematical model to determine the effect of the process parameters. The impacts of the input process parameters on surface roughness were assessed by the Analysis of variance (ANOVA).

Keywords: Wire EDM, D3 grade Tool steel, Response Surface Methodology (RSM), ANNOVA

Sankalp passive knee prosthesis having medial-lateral rotation, anterior-posterior adjustablity and variying link length option.

Vaibhav Jaiswal, Subramani Kanagaraj,

Department of Mechanical Engineering, Indian Institute of Technology, North Guwahati 781039

As per 2011 census of India, there are 5.4 million locomotor disabled persons. It is estimated that around 5-15% of these amputees acquire a prosthetic medical device, and up to 80% of amputees are not able to bear the cost of prosthesis. Any form of amputation is a serious health problem on the individuals, families and society. It also drives many patients towards various psychiatric disorders because of the inability to support themselves and their family. A polycentric knee joint is expected to provide the basic anatomical functions of able-bodied person to the amputees to bring back their active normal life. In India, users perform daily activity of cross-knee sitting, which itself a challenge to provide in prosthesis. In order to accommodate the same, trans-femoral rotator is being used in advanced prosthesis, which allows lower leg prosthetic device to rotate in the internal-externaldirection for the provision of cross-legged sitting. Till date, the provision for knee rotation is not provided in many of the commercially available affordable polycentric knee joint. In addition, it has the fixed alignement line and there is no provision for adjusting the same along anterior-posteror direction depending on the patient's requirement. Additonally, a passive model of polycentric knee joint with variation of link length is required to satisfy the different level of amputees. Thus, there is a need to design and develop an inexpensive knee joint prosthesis with variation of link length; rotator mechanism, which can provide the medial-lateral rotation along with the locking provision, and provide an option for adjusting the trochanter knee ankle (TKA) alignment along anterior-posterior direction. An attempt is made to incorporate a transfemoral rotator assembly with locking mechanism and the provision for the TKA alignment adjuster in the previously designed IITG polycentric knee joint to enhance its functionality. By incorportating these features, the previously designed IITG knee will provide a kinematically stable gait pattern, internal-external knee rotation with locking provision, and TKA adjustment along anterior-posterior direction in order to increase its versatile nature. The knee joint pyramid adopter is positioned over the top part of the knee joint, which could be adjusted in the range of TKA ± 5 mm in the anterior-

posterior direction. In order to provide 360o rotation in the lower leg along medial-lateral direction under unlocked condition, the inner cylinder arrangement is housed within the top part of the knee joint and it is connected with socket via a suitable adapter. The knee joint assembly with all additional features was tested in ANSYS as per the loading requirement provided by the ISO 10328. The maximum stress, deflection and strain developed in the knee joint were found to be within the acceptable limits. A prototype model of the knee joint assembly along with transfemoral rotator mechanism is being manufactured using Acrylonitrile butadiene styrene (ABS)/Nylon-66. The TKA alignment adjusting unit and locking mechanism are fabricated from the stainless steel and it is a part of pyramid adapter of the knee joint. Additionally, the effect of variation of link length at intial stance phase, mid stance, push-off phase and minimum toe clearance was in progress. Once the assembly is fabricated, an attempt will be made for patient trial at GNRC, GMC, NEIGRIHMS to get rehabilitation feedback in order to further improve the different features of knee joint assembly.

Isogeometric Analysis - A means to accurate and efficient contact simulations

V.Agrawal and S. S. Gautam

Department of MechanicalEngineering,IIT Guwahati,India

E-mail:v.agrawal@iitg.ac.in, ssg@iitg.ac.in

Numerical simulation of the contact problems is considered to be one of the most challenging task as they include the material, geometrical, as well as boundary non-linearities in general, which need to be analysed simultaneously. A considerable amount of research efforts have been devoted to studying these problems - both analytically and computationally. The primary challenges that reside with the numerical simulation of contact problems are due to the approximate discretization of the geometry. It has been observed that most widely used finite element based simulation of the contact problems yields the faceted or inaccurate geometrical representation of the contact surface as shown in Fig. 1, which leads to the spurious oscillation of the contact solution. This issue becomes prominent especially for the case of large deformation or large sliding contact cases.

As a remedy to the FE discretization, Hughes et al. (2005) introduced the isogeometric analysis (IGA) technique that utilizes the NURBS functions as a basis for the representation of the geometry exactly and approximation of unknown solution fields. Due to the intrinsic properties of NURBS functions, viz. (a) ability to represent the complex shape of geometry exactly even with a coarse discretization, see Figs. 3 and 4, (b) higher-order inter-element continuity, and (c) non-negativeness over Lagrangian polynomials, IGA inherently provides the unique normal vector across the contact element boundary as shown in Fig. 2. In the past few years, a considerable amount of research efforts have been devoted for the treatment of large deformation frictionless/frictional problems within the framework of IGA using the different contact formulations. However, its application to contact is computationally expensive since a very fine mesh is required.

Moreover, the higher-order NURBS basis functions used for the approximation of contact solution field are also uniformly employed for the description of the domain away from the contact surface. These difficulties mainly stem from the rigid tensor product nature of the NURBS structures. To address this issue, the present work makes use of varying-order NURBS discretization for the isogeometric contact analysis. Compared to standard NURBS discretization based approach, our method provides accurate results at a considerably less computational cost even with a coarse mesh. This is illustrated for a classical Hertz contact problem, as shown in Fig. 5. The corresponding contact pressure distributions along the contact interface for the standard and proposed approach are illustrated in Fig. 6, which shows that our method matches accurately with the exact solution

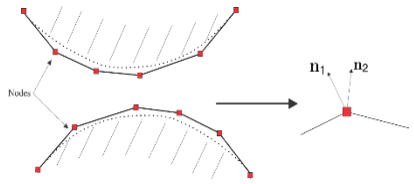


Fig. 1: FE based non-smooth discretization

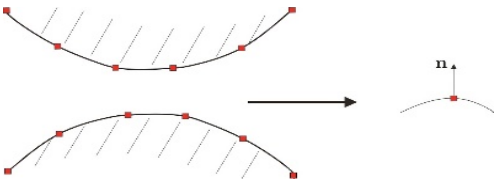
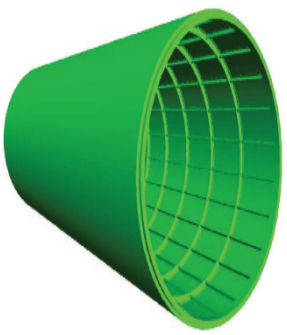
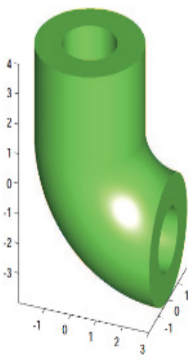


Fig. 2: NURBS based smooth discretization.



Actual frame and geometrically exact modelling of aluminium testbed cylinder (Adapted with permission from Cottrell et al. 2009).



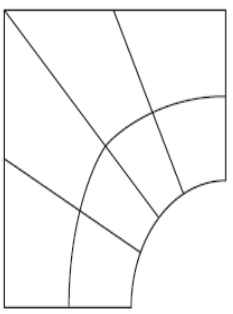


Fig. 4: NURBS discretized exact representation of a pipe with an elbow bend and plate with a hole geometries (Adapted with permission from Cottrell et al. 2009)

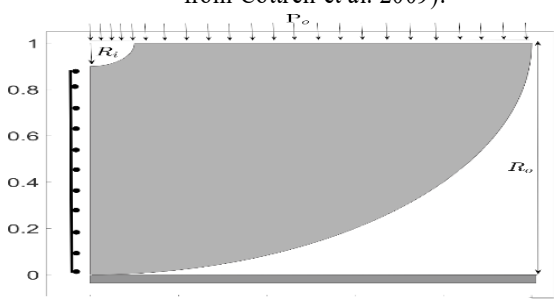


Fig 5: Setup of the Hertz contact problem.

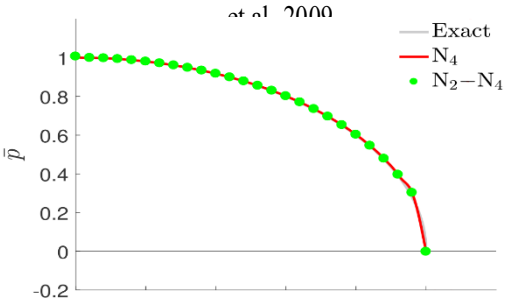


Fig 6: Variation of the contact pressure distribution.

Properties of NiO-Ni-Ti-TiO2 nanocomposites: The effect of mechanochemical reduction process

Aneeta Manjari Padhan and Perumal Alagarsamy

Department of Physics, Indian Institute of Technology Guwahati, Guwahati,India

E-mail:aneeta@iitg.ac.inand perumal@iitg.ac.in

The partial reduction process of transition metal (TM) based oxides is of substantial importance in recent times because of their fascinating physics as well as their potential technological developments [1,2]. In particular, the distinctly marked properties of NiO nanostructures synthesized by the partial mechanochemical reduction process serve as a suitable alternative for a myriad of several exciting research activities including the fields of catalysis, sensors, fuel-cell electrodes, magnetic memories etc [3,4]. Therefore, we are hereby presenting the structural and magnetic properties of NiO-Ni-Ti-TiO2 nanocomposites prepared through mechanically activated NiO-Ti (x wt.%) reduction process by high-energy ball milling technique under dry milling conditions in argon atmosphere. As-mixed bulk NiO-Ti powder exhibits face-centered cubic structure with room temperature antiferromagnetism (see figure). The addition of Ti up to 5% forms solid solution of NiO-Ti with considerable reduction in antiferromagnetic moment. With increasing Ti above 5%, a gradual reduction of NiO occurs, which induces ferromagnetism with the increase in magnetization from 1 emu/g to 13.7 emu/g for the addition of Ti from 5 to 35 %, respectively. Interestingly, these nanocomposite powders, despite having very fine Ni, show ferromagnetism due to enhanced magnetic anisotropy. Thermomagnetization data confirm the presence of mixed magnetic phases and the magnetic phase transition temperatures depending on the ratio between NiO and Ni phases in the nanocomposite. The observed results are discussed on the basis of Ti substituted reduction reaction process in NiO by forming the NiO-Ni-Ti-TiO2 nanocomposite, which is suitable for the applications in catalysis and ore reduction processes.

Keywords: Transition metal oxides, Mechanical activation, Nanocomposite, Effective magnetic anisotropy.

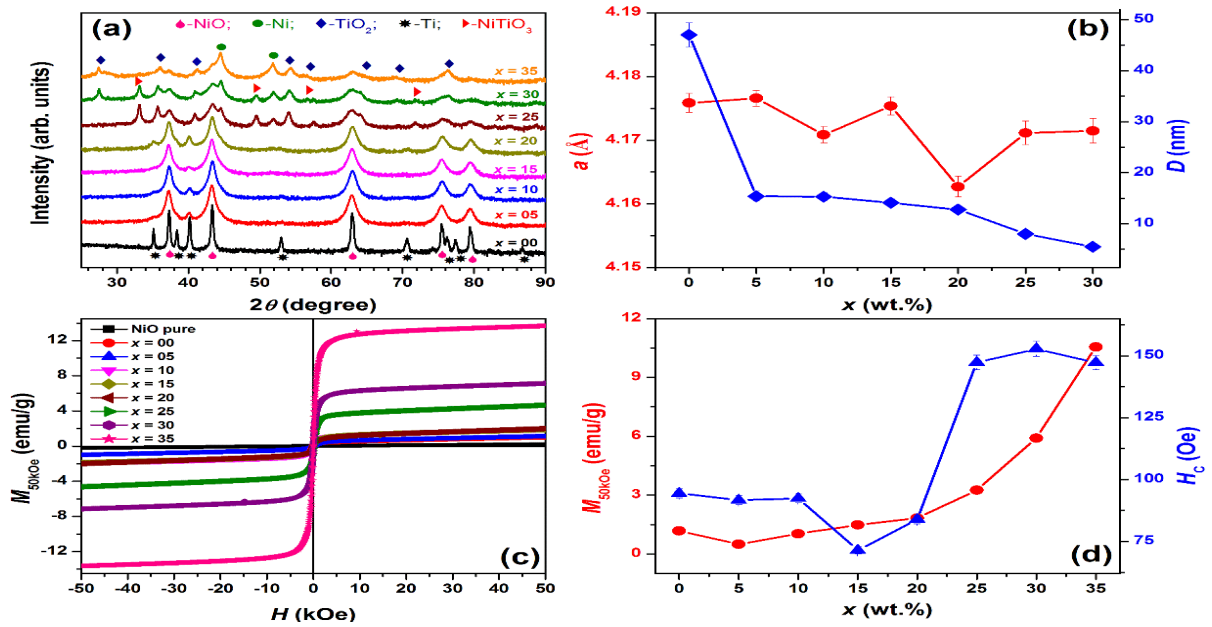


Figure: (a) Room temperature XRD patterns, (b) variations of a&D, (c) M-H loops and (d) variations of M50kOe&HC of 30 hrs milled NiO-Ti (x wt.%) powders

References:

[1] J. Nogués et al, J. Nanosci. Nanotechnol. 8(6) (2008) 6.

[2] A.M.Padhan et al, J. Phys. D: Appl. Phys. 50 (2017) 21LT01-21LT10.

[3] B. Kucharczyk et al, Chem. Eng. J. 309 (2017) 288–297.

[4] B. Janković et al, Thermochim. Acta 456 (2007) 48–55.

Deposition and Characterization of Calcium Phosphate and Strontium substituted Calcium Phosphate for biomedical applications

R. Kamdak[1],A.Das[1]andD. Pamu[1]

[1]Department of Physics, IIT Guwahati,India

E-mail:apurba12@iitg.ac.in

Calcium phosphate minerals are the main inorganic component of the bones and teeth. Calcium phosphates are among the most widely used bio-ceramics with excellent bio-resorption and compatibility specific to enhance bone repair. Calcium phosphates are the largest group of artificial bone graft substitutes. This is mainly due to their close resemblance to the mineral components of bone. Numerous forms, compositions, and application methods are available. One such form is the Strontium substituted Calcium Phosphate(Sr-CaP). This work focusses on the deposition and characterization of Calcium Phosphate(CaP) and Strontium substituted Calcium Phosphate(Sr-CaP) which is intended to be used for different biomedical applications. The CaP and Sr-CaP layers are deposited over Ti substrates which will help in better osteo bonding of the Ti based implants to the host tissues.

Evidence for Field Induced Phase Transitions and Enhanced Long-range Ordering in Fe doped MnCo2O4

B. Yadav, S. Ghosh, M. Sehrawat, S. Singh, P. Pramanik, S.K. Jena, D.C. Joshi and S. Thota*

Department of Physics, Indian Institute of Technology Guwahati, Guwahati-781039, Assam (India),

*Corresponding Author Email:subhasht@iitg.ac.in

Transition metal oxides which crystallizes in cubic ‘Spinel’ form (AB2O4 where A represents Tetrahedral sites (T()) and B symbolizes Octahedral (O[]) sites) are considered as important class of materials because of their outstanding catalytical behaviour and novel magnetic properties [1,2]. Due to the competing magnetic interactions among nearest neighbour cations (JBB>JAB) these oxide exhibits strong magnetic frustration at low temperature [3]. In addition to their intriguing magnetic properties, spinel-oxidesalso exhibits excellent electrochemical properties useful for the energy storage applications such as Li-ion batteries and oxygen evolution reactions (OER) due to the multiple valence state of cations under nano and micro-dimensions [4]. In the present work, we report the magnetic properties of Fe doped MnCo2O4 polycrystalline bulk compounds prepared by the standard solid state reaction method. The room temperature powder x-ray diffraction confirmsthat all the compositions exhibit inverse spinel structure with space group Fd-3m (227) with the cationic distribution Mn1-xFexCo2O4= (Co2+)A[Co3+Mn1-x3+Fex3+]BO4. The temperature and field dependence of magnetization measurements (M(T,H)) performed under both zero-field-cooled (ZFC) and field-cooled (FC) conditions reveals enhanced ferrimagnetic properties as compared to the pristine compound MnCo2O4. The long-range ordering increases from 184 K to 234 K with increasing the Fe substitution from 0 to 20 atomic % at Octahedral B-sites of spinel lattice. High-field (10 kOe), MZFC(T) provides evidence for

two-low-temperature field induced transitions at T1 = 13.7 K and T2 = 84 K. The origin of such anomalous magnetic properties in Fe doped MnCo2O4 will be discussed in detail.

References:

[1] T. Nakamura, M. Misono, Y. Yoneda, J. Catal. 83, 151 (1983)

[2] S. Thota, A. Kumar, J. Kumar, Mater. Sci. and Eng: B, 164, 30 (2009)

[3] F. Guillou, S. Thota, W. Preellier, J. Kumar and V. Hardy, Physics Review B, 83, 094423, (2011)

[4] S. Singh, P. Pramanik, S. Sangaraju, A. Mallick, L. Giebeler, S. Thota, J. Appl. Phys. 121 (19), 194304 (2017)

Magnetic and electrical studies of lithium-chromium-ferrite synthesized by citrate gel combusition method

Mahananda Brahma and S. Ravi*

Department of Physics, IIT Guwahati, India

E-mail*:sravi@iitg.ernet.in

Nanocrystalline Li0.5Cr1.25Fe1.25O4 sample with average grain size~65nm was synthesized via citrate gel combustion method. Rietveld refinement of XRD pattern [fig.1(a)] show that the sample crystallizes in cubic α-phase (space group P4132) with lattice parameter, a = 8.2869(4) Å. Magnetization versus field (M-H) measurement at room temperature shows a soft ferromagnetic behaviour. Temperature variation of magnetization (M-T) measurement under ZFC condition shows a ferrimagnetic to paramagnetic transition at Curie temperature, Tc~473K and magnetic compensation at 355K [fig.1(b]. However, under FC condition, magnetic compensation point shifts to 339K. The magnetic compensation can be attributed to competition between the two sub-lattice magnetizations as explained by Neels' molecular field theory. In α-phase with inverse spinel structure, Li+ and Fe3+ ion occupy octahedral site in 1:3 ratio whereas remaining Fe3+ ions occupy tetrahedral site. The substitution of Cr3+(3μB) in place of Fe3+ (5μB) preferentially occupy the octahedral site and thus reduces its magnetic moment. The octahedral sub-lattice moment is thus compensated by tetrahedral sub-lattice magnetic moment at the compensation point which is not observed for the Cr-free lithium ferrite. Variations of real part of Impedance (Z') with frequency show the negative temperature coefficients of resistance (NTCR) behaviour. The complex part (Z'') shows the contribution of grain and grain boundaries in the relaxation dynamics [fig.1(c&d)]. The change of slope is observed near Tc (473K) in linear fit of Arrhenius type (ln ω(Z''max) vs. 1000/T plot) of thermally activated relaxation indicating possible coupling of magnetic and electric ordering [fig.1(e)]. The activation energies of grains and grain boundaries are found to be 0.21±0.02eV and 0.35±0.02eV respectively which are close to activation energies of singly ionised oxygen vacancies.

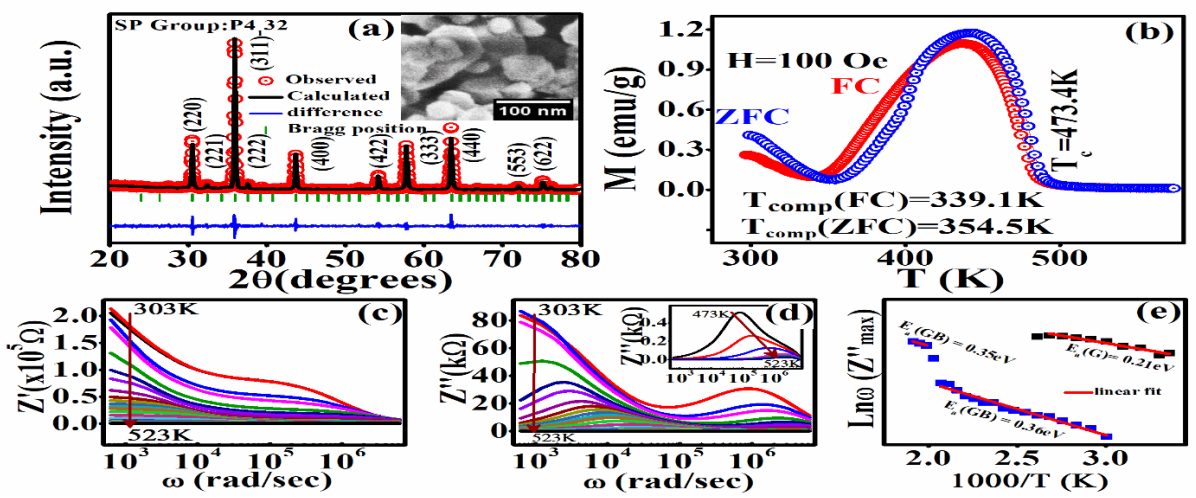


Fig.1 (a) Rietveld Refinement ofXRD pattern(b) M-T measurement (ZFC & FC) (c Real part of impedance (Z') (resistance) vs. angular frequency (ω) (d) Imaginary part of impedance (Z'') vs. angular frequency (ω) (e) Ln ω(Z''max) vs. 1000/T plot.

Synthesis of metallic nanoparticles on different substrates to study their effects in thin film solar cells for light trapping applications.

Manvendra Singh Gangwar1, Pratima Agarwal1,2*

1 Department of Physics, Indian Institute of Technology, Guwahati, Assam 781039, India

2 Centre for Energy, Indian Institute of Technology, Guwahati, Assam 781039, India

Corresponding author's email: pratima@iitg.ac.in

Light trapping is critical particularly in thin film solar cells in order to increase light absorption and hence overall cell efficiency. Plasmonic metal nanoparticles are of great interest for light trapping in thin film solar cells. Metal nanoparticles support surface Plasmon modes, which are used to couple light into the optical modes of semiconductor. The surface plasmons can enhance the spectral response of thin film cells over the entire solar spectrum. Silver nanoparticles can be used as light scattering elements on top and as a plasmonic back reflector structure at rear side of cell for enhancing solar cell energy conversion efficiency. The objective of our work is to gain more insight into the optical and structural properties of silver nanoparticles films and their effect on the performance of solar cells. First we have done a systematic investigation to identify suitable fabrication condition in which circular, uniformly spaced nanoparticles are obtainable. We successfully fabricated self-assembled nanoparticles by solid state dewetting (SSD) of thin silver film of variable thickness, deposited using RF magnetron sputtering on various substrates. We deposited silver thin films on glass and polished crystalline silicon (c-Si) substrates, of thickness 12, 22, and 34 nm followed by a post annealing process at 400oC for 1 hour. Silver thin films with thickness of 12 nm have nanoparticles with average diameter of 50 nm with a roughly circular shape. We found that with increasing thickness of silver thin films the size of nanoparticles increases and the shape becomes more irregular.

Keywords: Thin film solar cells, plasmonics, metal nanoparticles, light trapping, back reflector.

Abstract

Mrinal Kanti Giri

Department of Physics, Indian Institute of Technology Guwahati, Guwahati, India

In this paper we have analytically studied the quantum phase transition of a super fluid phase to the Mott insulator phase for a multicomponent Bose-Einstein Condensate (BEC) system in an optical lattice. Starting with the two component Bose-Hubbard model,we developed mean-field theory to study the quantum phase transition. (a) First we have studied the phase transition for the case of the simple Bose-Hubbard model, where we get the two phases which are the Mott Insulator (MI) and the Super fluid (SF) states. (b) Second we studied the two species Bose-Hubbard model where we found there exits four states in addition of the two previous states which are the MS(Mott-insulator Super fluid) and the SM(Super fluid Mott-insulator) depending upon the characteristics of the interaction between two species. The meaning of SM is that when first species is in super fluid phase and second species is in Mott insulator phase and vice verse for the region MS. We found that the inter species interactions indeed can change the position of the phase boundary for the Mott-insulator. (c) Next we take the single species Bose-Hubbard model with three-body interaction. We find the extension of the Mott-insulating areas and the existence of a fixed point in phase space. Finally we trying to understand the effect of three-body inter species term on the phase diagram of the two-component BEC

Magnetic Properties of Nickel-Cobalt Ferrite nanoparticles synthesized by coprecipitation method

Ritupan BorahandS. Ravi*

Department of Physics ,IIT Guwahati,India

*E-mail:sravi@iitg.ac.in

Single phase Ni0.5Co0.5Fe2O4 sample was synthesized by coprecipitation method. Room temperature X-ray diffraction (XRD) pattern [fig.1(a)] along with Rietveld analysis confirm that the prepared sample is in cubic crystal structure with space group $Fd\bar{3}m$. The lattice parameters are found to be a=b=c=8.3652 Å. Field Emission Scanning Electron Microscopy [fig.1(b)] reveals randomly agglomerated particles of spherical shape with average size of 15nm. In order to investigate magnetization (M) as a function of temperature (T), magnetization data was recorded under zero field cooling (ZFC) and field cooling (FC) over a wide range of temperature from 25 K to 850 K [fig.1(c&d)] at a magnetic field of Hdc=200 Oe.Anomaly has been observed around T=150 K [fig.1(c)], which may be due to a possible spin glass system formed by magnetically ordered core and disordered surface spin. M-H loops recorded at 150 K and 300 K are shown in [fig.1 (e)]. The observed large value of coercivity at 150K may be due to the strong anisotropy associated with the pinned surface spin layer upon magnetic core. The energy band gap estimated by Tauc plot is found to be 2.27 eV.

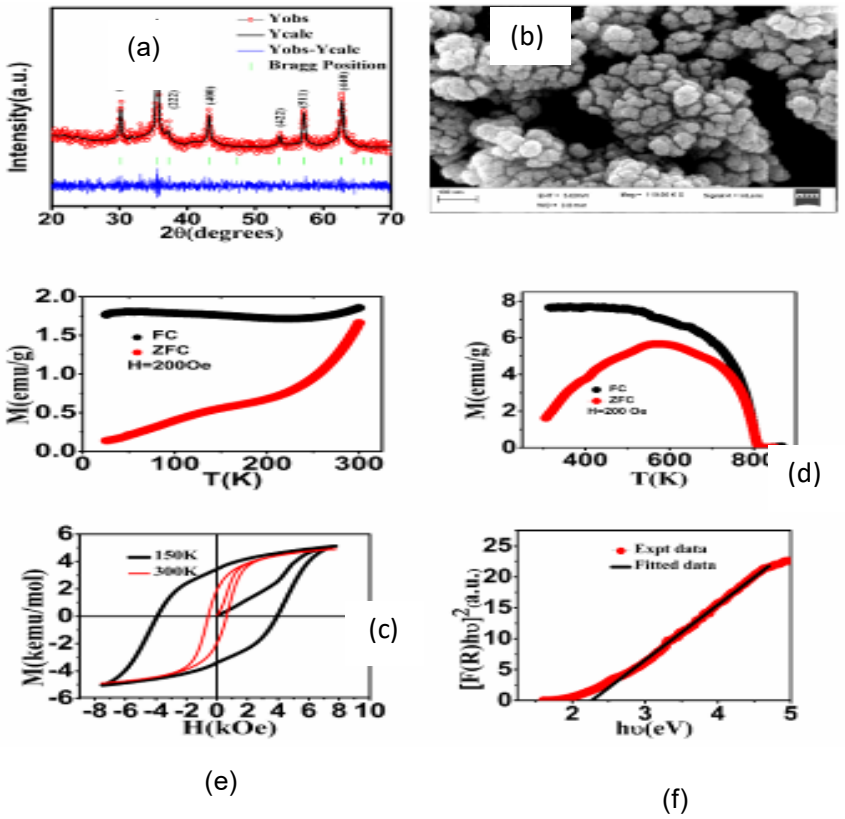


Fig.1: (a) Rietveld Refinement of XRD pattern (b) FESEM micrographs (c) M-T measurement (ZFC&FC) below 300 K (d) M-T measurement (ZFC&FC) above 300 K (e) M-H recorded at 150 K & 300 K (f) Tauc plot.

Altered Antiferromagnetic State and Exchange Bias of Bulk Co3O4 Granular Matrix Dispersed in Nonmagnetic CeO2

S. Singh1, P. Pramanik2, D. C. Joshi2 and S. Thota2*

1Department of Physics, Integral University, Lucknow-226021, Uttar Pradesh, India

2Department of Physics, Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India

Email: subhasht@iitg.ac.in

Transition metal based oxide spinels attracted enormous scientific interest in material science for their remarkable physical and electrochemical applications [1,2]. Specially, Cobalt (II,III) oxide (Co3O4) has attracted immense research interest due to its high energy storage capacity in lithium-ion batteries, gas-sensing ability, high corrosion stability, excellent catalytic behavior along with its novel antiferromagnetic properties [3]. In the present work we report the crystal structure and magnetic properties of bulk Co3O4 particles dispersed in nonmagnetic ceria (CeO2) by means of x-ray diffraction and temperature dependence of magnetization measurements M(T). For the synthesis we employed standard solid-state-reaction technique using standard Co3O4 and CeO2 powders. These powders were mixed in an agate mortar and pelletized using a hydraulic press (50 kN/m2) followed by high temperature sintering at two different temperatures 1200ºC and 1350ºC in air. The room temperature x-ray diffraction data shows presence of Co3O4 cubic spinel phase (space group Fd3m) with lattice parameter ao ~ 8.05±0.02 Å within the CeO2 matrix which has cubic crystal structure with space group Fm-3m, (225) and lattice parameter ao ~ 5.41 ± 0.02 Å. The low-field M(T) curves measured under standard zero-field-cooled (ZFC) and field-cooled (FC) conditions exhibit two main transitions at 30.12 K and 47.32 K. The peak noticed in MZFC(T) and MFC(T) across 30 K is pertaining to the antiferromagnetic Néel temperature TN of Co3O4. However, the peak noticed at 47.3 K is due to the additional antiferromagnetic component occurring due to strong Co-Co exchange interaction inside the CeO2 matrix. Interestingly, the low temperature (5-50K) magnetization versus field (M-H) hysteresis loop shows loop asymmetry and exchange bias (HEB ~ 100 Oe) which gradually decreases and vanishes as the temperature approaches TN.A detailed analysis of such interesting magnetic behavior of Co3O4-CeO2 will be presented.

References:

[1] G. McDonald, Thin Solid Films, 72, 83 (1980).

[2] T. Arakawa, in: L.G. Tejuca, J.L.G. Fierro (Eds.), Properties and Applications of Perovskite-Type Oxides, Marcel Dekker Inc., New York, NY, 1993, p. 361.

[3] T. Nakamura, M. Misono, Y. Yoneda, J. Catal. 83, 151 (1983).

Morphology Tuned Ga2O3 nanostructures: Ultrafast removal of Eosin B

Brahami Das1*, Biswajit Das1, Nirmalya S. Das2, Subrata Sarkar1 and Kalyan K. Chattopadhyay1,3,#

1Department of Physics, Jadavpur University, Kolkata 700032, India
2Department of Physics, Techno India - Batanagar, Kolkata 700141, India

3School of Materials Science & Nanotechnology, Jadavpur University, Kolkata 700 032, India

*E-mail:brahami.das@gmail.com, #Email: kkc.juphy@gmail.com

In recent years, various fabrication methods of photocatalytic materials have been developed for photo degradation of organic and inorganic pollutants from consumable water. Particularly, inorganic semiconductor nanomaterials have been considered as most promising agents for photocatalytic applications due to their remarkable physical and chemical properties with large effective surface area, and a variety of morphologies, such as nanorods, cubes, spheres and flowers, synthesized by cost effective chemical route.

This work is directed towards the development of group III metal oxide nanostructures of Ga2O3 which have been recognized as an important material for several applications including catalysts, gas sensors, solar cells, photodetectors etc. Typically, the Ga2O3 nanostructures were obtained by calcination of gallium oxide hydroxide (GaOOH) synthesized via a chemical bath method. Then, as-prepared GaOOH nanostructures were calcined at 500° C for 3 hours for obtaining α-Ga2O3 nanostructures. This system was characterized by traditional tools like XRD, FESEM, HRTEM, EDX, UV-Vis to investigate the phase information, morphological features, composition and the information about band gap of the same. Also, the photocatalytic performance of Ga2O3 nanostructures and corresponding hydroxides were studied by time evolved UV-Vis absorption spectrum of degradation of Eosin B solution as shown in Fig. 1(a). Under UV irradiation for 14 min, the Ga2O3 nanostructures exhibited a high photodegradation efficiency of (98.1%) which is a remarkable enhancement over the identical performance of GaOOH (Fig. 1(b)). This work proposes a simple cost effective eco-friendly route for synthesis of Ga based oxide photocatalysts for wastewater treatment.

Keywords: Gallium oxide; Photocatalytic performance; nanostructures; Eosin B

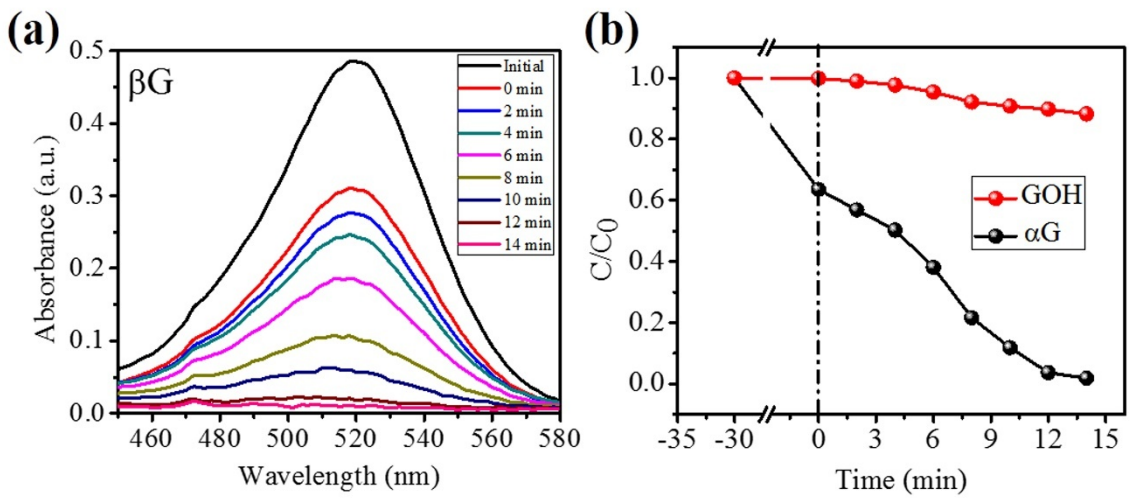


Fig.1: (a) Time evolved UV-Vis spectra; (b) Efficiency of Eosin B degradation by Ga2O3 nanostructuresss

Graphene based composites as an efficient material for separation of harmful gases

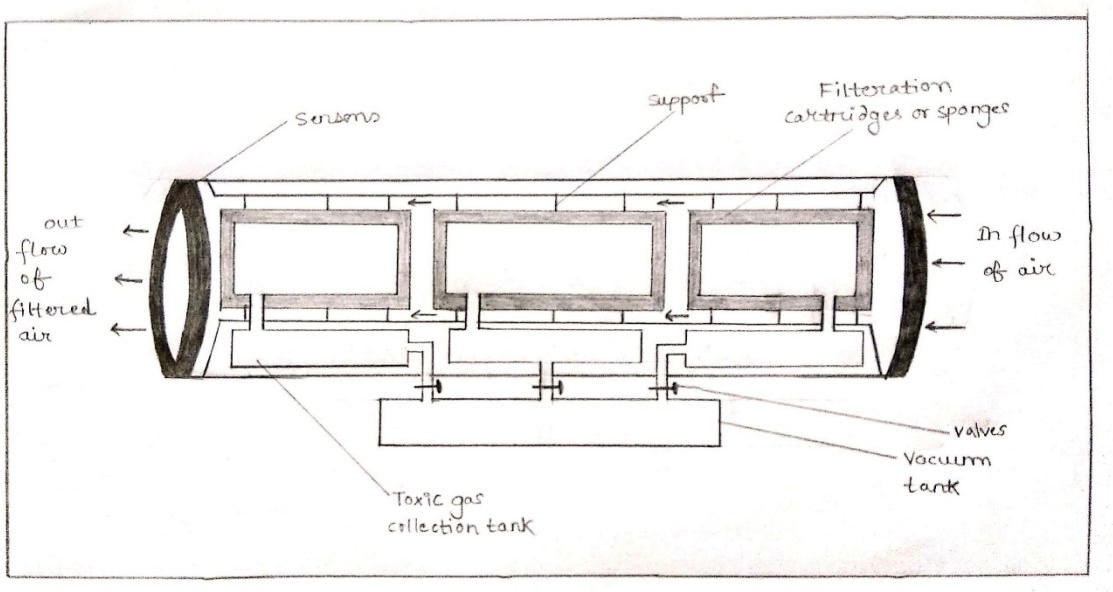
A.Hrishikesh Tamuli, B. Sanjeeb Chouhan andC. Abhra Chakrabarty

Department ofPhysics, B.Borooah College, Ulubari, Guwahati, Assam.

E-mail: sanjuch863@gmail.com

The atmospheric degradation in the environment due to various harmful gases released from industries, crop-fields and medical wastes etc. should be dealt with proper concern for monitoring of the environment. The detection of harmful gases and the separation from anthropogenic sources is therefore needed to be done before release of those gases to the atmosphere. The development of gas detectors is quite necessary for the detection of industrial toxic releases such as SO2 (sulphur dioxide), CO (carbon monoxide), CO2 (carbon dioxide),NH3 (ammonia), CH4 (methane), which would advance to their separation from the environment by means of efficient gas separators. Conventionally, nanomaterials, due to their large effective surface area for molecular adsorption, such as carbon nanotubes (CNTs), metal-oxide nanoparticles (NPs), and graphene are widely used as gas sensors for long range detection of gases. Among them, graphene has been considered as a promising material because of its electronic properties strongly affected by the adsorption of foreign molecules. Graphene is also capable of forming a tuneable filter or even a perfect barrier when dealing with liquids and gases. It has been observed that a chemically synthesized form of graphene called 'graphene oxide' could effectively separate organic solvents from non-purified intact polluted gas mixture to an exceptional level. Though, graphene has shown high sensitivity compared to other available materials in this purpose, as reported by many researchers, towards low gas concentrations, the poor sensor selectivity limits its use in many practical applications. Hence, composite structures can be formed by blending other materials with graphene or its derivatives, which are selectively adhered to particular gas molecules, e.g. metal-oxide NPs, polymers, to improve gas sensitivity.

Here we would like to propose a design of all-in-apparatus that can separate industrial harmful releases and coal mining industrial exhausts using a cumulative graphene material cartridges filtration assembly. The system can trap the gases, from a mixture flue gas, in each graphene-composite cartridges/sponge and store the gases in separate chambers. An assembly to trap the vehicle exhaust gases before releasing to the atmosphere has also been proposed in our work. We conclude that the practical application of such apparatus to industries and different sectors might be helpful in solving devastating environmental problems in the future.



Prototype of Vehicle Exhaust Filtration Assembly

Recent progress in Superconductor Theory, Materials and Devices

Superconductivity is a phenomenon in the solid-state physics that occurs under a certain critical temperature (Tc) in some materials. A superconducting material is characterized by its infinitely high electrical conductivity and the absence of any magnetic field in the interior. From many areas of research, this so-called superconductivity has become indispensable. This paper takes a simple approach to explain the theory behind Superconductivity and its applications.

Gravitational Waves

A. Nayana Swargiary1, B. Neetashri Borah2, and C. Pralay Chakraborty3

1 Department of Physics, Bodoland University, Assam, India

2 Department of Physics, Jorhat Institute of Science and Technology, Dibrugarh University, Assam ,India

Email: nayanaswargiary@gmail.com

This article deals with the first detection of gravitational waves by the advanced Laser Interferometer Gravitational Wave Observatory(LIGO) detectors on 14th September, 2015, where the signal was generated by two stellar black holes. Gravitational waves are ripples in the fabric of space time. The gravitational waves are a direct consequence of Einstein's General Theory of Relativity which travel at the speed of light generated by the accelerating masses. These waves are incredibly difficult to detect. But a device named LIGO or Laser Interferometer Gravitational wave Observatory detected this wave for the first time on 14th September, 2015. There are two laser interferometer currently in operation: The LIGO Livingston Observatory in Livingston, Louisiana and the LIGO Hanford Observatory in Richland, Washington. In our present work we will discuss how gravitational waves are produced in the cosmos and about the operational work of LIGO detector.

Electric Field and Thermionic Emissions aided Multi-Stage Air Rectification

A.Abhilash Gayan1,B.Pragalbh Kashyap1 , C. Abhilash Kaushik[1] , D. Dipanjit Kalita1

1Department of Physics, B. Borooah College, Ulubari, Guwahati

E-mail:pragalv22@gmail.com , agayan401@gmail.com

We have devised a mechanism to filter out a huge range of pollutants from the air as well as destroy the hazardous microorganisms present in it. The entire set up is an organised system of different filtration components each of which targets different types of pollutants. The positive ions present in the air causing adverse effects on human health are directed towards a metal surface by generating an electric field. They are then made to interact with the electrons generated from a thin surface of a metal of low work function, by thermionic emission. Bacteria and viruses present in the air are subjected to UV radiation. The air is then further passed through an activated carbon filter for ensuring a total purification.

Morphology Tuning of BiOCl nano-crystals by Citric Acid variation: Application in visible light assisted dye degradation

R. Sarkar1#, D. Das2, A. Mitra1, S. Sarkar1, K. K. Chattopadhyay1,2*

1Department of Physics, Jadavpur University, Kolkata, India
2School of Materials Science and Nanotechnology, Jadavpur University, Kolkata, India

E-mail: ratnasarkar60@gmail.com

Bismuth oxyhalides (BiOX, X= Cl, Br, I) are well known highly efficient photocatalysts for the degradation of toxic organic pollutants. They exhibit different types of crystal structures along with unique electrical and optical properties. These materials can efficiently degrade different types of textile dyes and pharmaceutical products. Among the different oxyhalides, BiOCl is a p-type indirect band gap semiconductor with band gaps lying in the range of 3.2 ~ 3.5 eV.
In the present work, a simple and efficient synthetic strategy has been followed to prepare nano-disk like BiOCl samples with prominent growth along the {00l} planes. The precursors {Bi(NO3)3, 5H2O} and HCl in appropriate molar ratio along with the capping agents citric acid and PVP are subjected to hydrothermal condition for 3 hours at 160 ˚C. Variation in the molar ratio of the citric acid during the synthesis procedure resulted in subsequent variation in the morphology of the as-prepared samples from nanodisks [1] to nanosheets. The samples were characterized in details by several techniques to have a proper insight into the phase formations, chemical bonding, morphology and electronic band gaps. The X-Ray diffraction (XRD) analysis revealed the preferential growth in the {001} direction whereas the Fourier Transform Infrared (FTIR) analysis and Raman spectra analysis confirmed the presence of all the respective chemical bonds. The morphology of the samples was revealed from the Field Emission Scanning Electron Microscope (FESEM) and Transmission Electron Microscope (TEM) images. The band gaps of the as-synthesized samples varied from 3.2 to 3.5 eV with change in the morphology from disk to sheet as obtained from diffuse reflectance spectra (DRS) analysis. The samples were further exploited for effective degradation of toxic Rhodamine B (RhB) dye under visible-light irradiation. The variation in citric acid resulted in changes in the morphology which in turn led to the variation in the photocatalytic dye degradation efficiency of the as-prepared BiOCl samples.

Keywords: Bismuth oxyhalides, citric acid, photocatalysis.

References:

1. X. Zhang, X.B. Wang, L.W. Wang, W.K. Wang, L.L. Long, W.W. Li & H.Q. Yu. ACS Appl. Mater. Interfaces 2014, 6, 7766−7772.

Characterizations of BZT ceramics with sintering aid prepared by novel technique

Renu Rani1* , Vishal Khatri2 and Chandra Prakash3

1Department of Physics, Magadh University, Bodhgaya-

2 Department of Physics, Nalanda College of Engineering, Chandi

3Scientist G, SSPL, New Delhi-110054

*renudhy@gmail.com

Lead free ceramics are strongly needed to replace the lead based ceramics with increasing environmental concerns. Barium titanate ceramics are most promisingly ceramic materials due to its excellent electrical properties. But high sintering temperature of barium titanate restricts the application of BaTiO3 ceramics. So in the present paper, the lead-free BaZr0.10Ti0.90O3 have been prepared by solid state reaction route. For present work, BZT was synthesized by conventional solid state method and sintered in conventional and microwave furnaces. By adding a mixture of Li2CO3 as a sintering aid the sample can be sintered at 1150◦C in conventional furnace with soaking time 4hrs and at 950◦C in microwave furnace with soaking time 20 mins. Sintered samples were then subjected to XRD analysis. X-ray diffraction revealed the formation of single phase material. The dielectric, properties were recorded for both the samples. It is observed that microwave sintered samples could obtain comparable properties to the conventionally sintered one in lesser soaking time at lower sintering temperature
Keywords : XRD, Ferroelectric, Ceramics, Barium Titanate

Comparative Study of Optical & Electrical Properties of PS-MSM and nano- CdS- PS- MSM Heterostructure

S. Sarmah1, M.Das1and D.Sarkar1

1Department ofPhysics, Gauhati University, Guwahati,India

E-mail:samarjitsarmah59@gmail.com

In the present work we report fabrication of Porous Silicon (PS) and nano- CdS- PS metal semiconductor metal (MSM) photodetector grown on p-type Silicon wafer of (100) orientation. PS and nano CdS- PS surfaces observed via FESEM shows uniform porous layer with randomly distributed pores and hierarchical dendrite like CdS nanostructures grown on PS substrate respectively. Optical properties reflectance and absorbance spectra of the prepared PS, CdS and related hetero-structures are observed via UV-Visible Cary 300 scan spectrophotometer and Photoluminescence (PL) spectra using model Jasco FP-8300 respectively. Photoluminescence measurement for the samples shows luminesence bands at ~533 and 590 nm for an excitation wavelength of 275 nm which are characteristics peaks for bare PS and nano-CdS along with some defect related peaks which subsequently have a direct effect on its electrical and photo-sensing abilities. PS-MSM and nano- CdS- PS- MSM devices are fabricated by thermal evaporation of high purity (99.99%) aluminium (Al) under a vacuum of 10-5 torr, using interdigited shadow masks (7mm × 8 mm) on the PS and CdS- PS substrates respectively. The photo detection properties of the devices were recorded for UV-Visible spectrum range 250- 500 nm using computer interfaced Keithly 2400 source meter. It is observed that nano- CdS-PS heterostructure exhibits enhanced maximum Rλ and EQE (Ƞ%) values of ~0.6 AW-1 and ~180% respectively at 400 nm compared to ~0.3 AW-1 and ~85% for bare PS at -2 V biasing. Along with this additional enhanced Rλ and EQE peaks at ~440 nm are seen, these particular peaks coincide with the absorbance band edge

of the nanostructured CdS. Both devices also shows good switching behaviour which insists us to use them as good photodetectors.

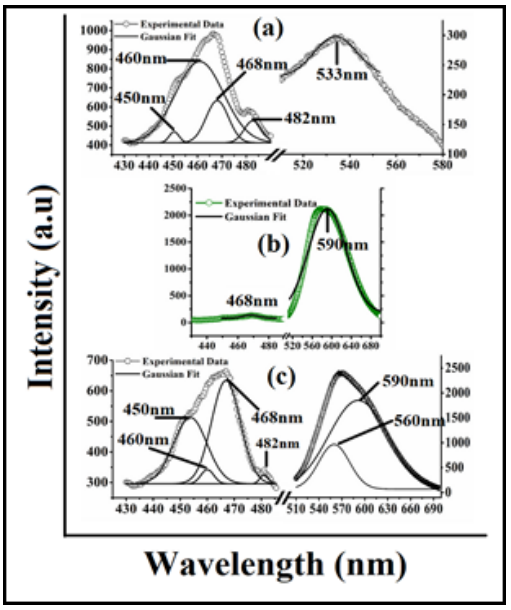


Fig. 1 (a) PL spectra of CdS, (b) PS and (c) CdS- PS

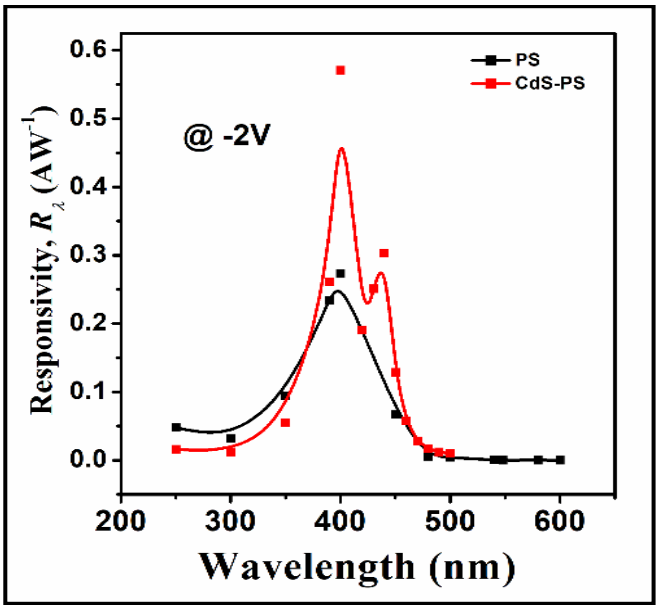


Fig. 2 Responsivity compare of the devices.

Synthesis, Structural and Magnetic Properties of Ni1-xMgxO Nanostructures

S. K. Jena1, S. Mohapatra2, S. Singh1, P. Pramanik1, D.C. Joshi3 and S. Thota1*

1Department of Physics, Indian Institute of Technology Guwahati, Guwahati-781039, Assam (India)

2Department of Physics and Astronomy, National Institute of Technology Rourkela, 769008, Odisha, (India)

3Ångstrom Laboratory, Department of Solid State Physics, Uppsala University, Lägerhyddsvägen 1, 75237, Uppsala (Sweden)

*Corresponding Author Email:subhasht@iitg.ac.in

Wide band-gap semiconducting oxides play a key role in the development of transparent electronic devices. Recent advancement in this field based on transition metal oxides such as nickel oxide (NiO), zinc oxide (ZnO) and TiO2has provided fertile new ground for creating devices like varistors, spin-valves, transparent TFTs, solar cells, gas sensors, and light emitting diodes. In the present contribution we report the magnetic behaviour of various compositions (x) of Ni1-xMgxO bulk and Nanostructures. For the synthesis of the bulk crystals we using standard solid-state reaction method by mixing the stoichiometric amounts of precursors MgO and NiO. However, for the synthesis of the nanostructures we employed sol-gel technique with the precursors acetates of Ni and Mg. Crystal structure analysis carried out using the X-ray diffraction technique reveals f.c.c. type crystal structure with lattice parameters ‘ao’ increases continuously from 4.1598 Å to 4.1815 Å as the Mg composition (x) increases from 0.3 to 0.9. Low-temperature magnetization measurements reveal the superparamagnetic characteristics of Mg doped NiO nanoparticles with very low magnitude of magnetization. However, the bulk samples display antiferromagnetic properties with altered Néel temperatures with increasing the Mg composition. The role of surface and finite size effects on the magnetic behaviour of Ni1-xMgxO will be discussed.

Tuning of electrical properties of BaSnO3 via vanadium doping

Suvra Pal[1*], Nirmalya S. Das[2], Subhadipta Mukhopadhyay[1]and Kalyan K. Chattopadhyay[1,3,#]

1Department of Physics, Jadavpur University, Kolkata 700032, India
2Department of Physics, Techno India - Batanagar, Kolkata 700141, India

3School of Materials Science & Nanotechnology, Jadavpur University, Kolkata 700032, India

*E-mail: suvrapal02831@gmail.com, #Email: kkc.juphy@gmail.com

In recent years, BaSnO3 belonging to the perovskite oxide family has gained much attention due to its optical transparency and electrical conductivity. Due to its simple and flexible structure for ionic substitution, carrier doping, formation of oxygen vacancies and also having remarkable dielectric and semiconducting properties, it has become suitable for wide range of applications like humidity sensors, gas sensors, ceramic capacitors etc. Dielectric permittivity is one of the most interesting physical properties of semiconductors, as it gives us information on the charge transport mechanism of semiconductors. The dielectric permittivity depends on the synthesis method, processing temperature, composition and grain dimension of the material.

The effect of Ba or Sn site doping by transition metal (Co, Cr)/rare earth metal (La) has been studied and changes in dielectric permittivity and frequency dependent conductivity of the corresponding modified systems has been reported [1-3]. However, the effect of Sn substitution in BaSnO3 by V has not been studied as yet.

BaSn1-xVxO3nanocrystalswere prepared via standard solid state reaction method. The materials were characterized by XRD, FESEM, EDX, UV-Vis spectroscopy to investigate phase, morphological information, composition and band gap. The electrical properties of the samples have been investigated using Complex Impedance Spectroscopy (CIS) technique. We have thoroughly studied the grain, grain-boundary effect and were able to find out how nanostructural changes upon doping resulted modification of the electrical properties of BaSn1-xVxO3. It was clearly observed that the vanadium doping can enhance the room temperature resistivity of the sample up to a certain level. Once the foreign element incorporation affects the crystal structure appreciably, the electrical properties of the system show a reverse variation.

Keywords: Dielectric permittivity, grain, grain-boundary effect, electrical properties

Reference:

[1] Ashok Kumar, R.N.P. Choudhary, B.P. Singh, Awalendra K. Thakur, Ceramics International 32 (2006) 73–83

[2] O. Prakash, D. Kumar, J. Mater. Sci.: Mater. Electron. 12 (2000) 165–172.

[3] O. Prakash, D. Kumar, K.K. Shrivastava, R.K. Dwivedi, J. Mater. Sci. 36 (24) (2001) 5805

Electromagnetic pollution and Electromagnetic shielding

First author- Tanmay Dev, Co-authors- Mrinmoy Jyoti Barman, Manash Pratim Baruah

B.Sc 1st semester, Dept of Physics, B.BOROOAH COLLEGE, Guwahati-7

E-mail-tanmaydev177@gmail.com, Phone-8402048994

Every electric or electronic device generates electromagnetic Field. There is no place in the Universe without electromagnetic fields. If this field is too strong it is good candidate for EMI. The quick development of electronic devices has increasingly pulled in concerns around the world. Electromagnetic interference (EMI) is a disruption that disturbs, blocks or otherwise destroys the operational performance of an electronic circuit due to either electromagnetic induction or electromagnetic (EM) radiation emitted from an external source. Some of the sources of EMI are- Radio & TV Stations, industrial machinery, medical diagnosis and treatment equipment, electronic equipments, electrical tools, police and other radio networks, mobile phone networks, radar etc. The presence of radio frequency EM in surroundings is progressively increasing due to rapid conspicuous use of mobile phones and other devices. Emitted electromagnetic (EM) radiations not just interfere with the working of complex electronic devices yet in addition influence the human wellbeing. EMI particularly at radio-frequency is one of the concerns which can be problematic even up to GHz range. In this scenario the top priority is to protect sensitive electronics from the ill effects of these interruptions. The best solution is to design electronic circuits either immune to EMI or shielded from external EM radiations. Because of the outrageous reliance on the day by day electrical equipment's today, individuals cannot live without electromagnetic field. Shielding of the electromagnetic radiation is the most basic, coordinate, and accessible approach to secure the EMI for diminishing the encompassing amount of electromagnetic radiation, which has been considered in numerous literary works. To protect electronic devices from EM interference, extensive research has been carried out and various materials and techniques have been developed by researchers. Shielding is used on a range of devices in many marketplaces, consist of communications and telecommunications; computers and data processing; aviation and aero-space; military/defence, stealth technology; medical and health; automotive; office equipment; electronics; instrumentation and control systems; home electronics, audio and video; appliances; radio, TV, cable and recording.

Keywords: EMI SHIELDING, ELECTRONIC EQUIPMENTS, EM INTERFERENCE

References:

1. 1.Sachdev, V.K., et al., Electrical and EMI shielding characterisation of multi-walled carbon nanotube/polystyrene composites. Journal of Applied Polymer Science, 2014. 131(24).

2. Griffiths, D.J., Introduction to electrodynamics. 1962: Prentice Hall

3. Sachdev, V.K., et al., Electrical and EMI shielding characterisation of multi-walled carbon nanotube/polystyrene composites. Journal of Applied Polymer Science, 2014. 131(24).

4. Theoretical analysis of reflection and refraction of electromagnetic waves on an Anisotropic, Inhomogeneous and Linear medium; Andri S. Husain, Roniyus MS, Sri W. Suciyati

5. 5.Saini, P. and V. Choudhary, Structural details, electrical properties, and electromagnetic interference shielding response of processable copolymers of aniline. Journal of materials science, 2013. 48(2): p. 797-804.

Inversion of 3-D Magnetotelluric Data Using the Developed 3DINV Algorithm: Synthetic Study

Vishal Khatri1, P. K. Gupta2 and Kamal2

1Nalanda College of Engineering, Nalanda, India

2Indain Institute of Technology, Roorkee, India

The magnetotelluric (MT) method is a very useful technique for studying the geo-electrical structure of earth. For resolving the subsurface structure this method requires an efficient modeling and inversion algorithm. In this paper the results of 3DINV algorithm for forward and inverse modeling of three dimensional (3-D) MT are presented. Comparison of forward modeling results is done with published results and inversion of synthetic data obtained from COMMEMI model is presented.
3DINV solves the forward problem is solved using the finite difference method (FDM) after discretizing the model domain. We have used the staggered grid (Yee 1966) for discretizing the domain by defining E along cell edges and H is defined on the face centers. solved using iterative method bi-conjugate gradient stabilized (BI-CGSTAB). To improve the convergence rate of iterative solver DILU preconditioner is also used. Moreover, to improve convergence at low frequencies static divergence correction (Smith 1996a, 1996b) is also applied.
For inversion the objective to find the 'smoothest' model subjected to a reasonable fit to the data is achieved by minimizing a functional. This optimization problem is nonlinear because model response is a nonlinear function of model parameters. In the present algorithm the optimization problem is solved using Gauss-Newton with conjugate gradient method (GN-CG), which is based on quasi linearization of the problem.

REFRENCES

Smith J T (1996a) Conservative modeling of 3-D electromagnetic fields: part I. Properties and error analysis. Geophysics 61:1308–18

Smith J T (1996b) Conservative modeling of 3-D electromagnetic fields: part II. Biconjugate gradient solution and an accelerator. Geophysics61:1319–24

Yee K S (1966) Numerical solution of initial boundary value problems involving Maxwell's equation in isotropic media. IEEE Trans. Anten. Prop.14:302–07

Zhdanov, M., Varentsov, I. M., Weaver, J., Golubev, N., and Krylov, V. (1997) Methods for modelling electromagnetic fields results from commemi-the international project on the comparison of modelling methods for electromagnetic induction. Journal of Applied Geophysics 37:133-271.

Production of microbial biomass feedstock via co-cultivation of microalgae-bacteria consortium coupled with effective wastewater treatment: A sustainable approach

A sustainable process was demonstrated towards production of biomass feedstock coupled with wastewater treatment. Sustainability was endeavoured to be achieved via symbiotic growth of microalgae and bacteria coupled with utilization of wastewater as cheap source of nutrient and water. The best microalgae-bacteria consortium comprised of two microalgae Chlorella sorokiniana strain DBWC2 &Chlorella sp. strain DBWC7 and two bacteria Klebsiella pneumoniae strain ORWB1 &Acinetobacter calcoaceticus strain ORWB3. When the consortium was characterized on artificial wastewater and raw dairy wastewater, a significant improvement in the microalgal growth, total biomass titer, chemical oxygen demand (COD), and nitrate removal efficiency was observed as compared to microalgae alone. Total biomass titer, nitrate removal, COD removal efficiency was found to be 2.84 g L−1, 93.59%, 82.27% and 2.87 g L−1, 84.69%, 90.49% in artificial wastewater and raw dairy wastewater respectively. The selected microalgae-bacteria consortium may be a potential platform towards sustainable production of microbial biomass using wastewater.

Comparative analysis of fabricated humidity Sensors based on different nanomaterials.

Brijesh Meena1, Dr. Harsh Chaturvedi*1

1Center for Energy, IIT Guwahati.

A comparative study on humidity sensing was investigated between CuO, SiO2 and CaCO3 polymer composite thin films with Polymethylmethacrylate (PMMA) polymer. Characterizations such as SEM Imagining for the surface morphology and particle size measurement, and FTIR Spectroscopy for the binding between polymer and nanoparticles were conducted on the composites. Interdigitated electrodes were screen printed on a flexible PET substrate. A thin layer of CuO based, SiO2 based and CaCO3 based paste was then printed on these electrodes for the fabrication of the devices separately. Effect of humidity on the resistance, impedance, and capacitance was studied for all the devices. To increase the reusability of the system, and faster response time a flexible heater is proposed to be integrated with the fabricated humidity sensor

Sun is a champion among all other renewable energy sources as it is never going to end, free of cost, no environmental hazard. Photovoltaic technology utilise the energy of sun and convert it into electricity. Dye sensitized solar cell (DSSC) developed by O' Regan and Gratzel have attract lot of interest and have been regarded as a potential renewable energy sources among the third generation solar cell technologies. Traditionally, DSSC utilize a Mesoporous nanocrystalline TiO2 film covered with ruthenium-bipyridyl-based dyes as the photo electrode material, triodide/iodide as the redox electrolyte and Ptatinum thin film counter electrode. Each component has its own importance but among them the performance of DSSC depends mostly on photo anode materials, since they influence both photovoltage and photocurrent of the solar cell. DSSC is considered as a promising technology, owing to its low production cost, simple fabrication process, relatively high efficiency, variety of colours, light weight, eco-friendly and its raw materials availability.

Effect of post annealing on structural, optical and electrical properties of thermally evaporated WO3 films

Juhi Kumari1 and Pratima Agarwal1, 2*

1Centre for Energy, Indian Institute of Technology Guwahati, Assam-781039, India

2Department of Physics, Indian Institute of Technology Guwahati, Assam-781039 India

*Corresponding author, e-mail: pratima@iitg.ac.in

Tungsten trioxide (WO3) is n-type semiconductor having wide band gap in the range of 2.6 – 3.1 eV. As compared to TiO2, it is highly stable and has ability to persist harsh and corrosive environments such as exposure to strong acids. WO3 also has higher carrier mobility than TiO2. These properties have made WO3 a suitable candidate for its application as an electron transport layer (ETL) in organic solar cells. Here, WO3 films were deposited on corning glass substrate by thermal evaporation technique. The as deposited WO3 films were annealed at 300 °C, 400 °C and 500 °C in air. Post annealing effect on structural, optical and electrical properties were investigated using X-ray diffraction (XRD), Raman spectroscopy, UV-Vis-NIR spectroscopy and I-V measurements. As deposited films exhibited amorphous nature. However, a dramatic change in crystalline structure was observed when samples were annealed at 400 °C and 500 °C. In XRD pattern, sharp diffraction peaks were observed at 2θ = 23.17° and 24.36° which indicate presence of monoclinic phase having (020) and (200) planes respectively. Transition from amorphous to crystalline structure was also observed in Raman spectra with increase in annealing temperature. UV-Vis-NIR transmission spectra show increase in transmission in visible and IR range as annealing temperature was increased. This might be because of increase in oxidation state of tungsten. Estimated band gap of as deposited film was found to be 3.36 eV that decreased to 2.88 eV for samples annealed at 400 °C. Moreover, the post annealing had also enhanced the conductivity of WO3 thin films by 3-4 order compared to as deposited films.

Effect of post annealing on structural, optical and electrical properties of thermally evaporated WO3 films

Juhi Kumari1, and Pratima Agarwal1, 2*

1Centre for Energy, Indian Institute of Technology Guwahati, Assam-781039, India

2Department of Physics, Indian Institute of Technology Guwahati, Assam-781039 India

*Corresponding author, e-mail: pratima@iitg.ac.in

Microalgae are considered as potential and sustainable feedstock for the production of biofuels, fine chemicals, nutraceuticals and cosmetics because of their higher lipid and carbohydrate contents, fast growth and rapid CO2 sequestration ability. However, large volumes of feedstock are required in order to extract and process biochemicals from microalgal biomass due to the small biomass to liquid ratio. This causes substantial challenges in attaining a sustainable energy balance in microalgae based products process operations. Additionally, the small size of microalgal cells along with their negatively charged cell surface and cell density similar to the growth medium produces challenges in microalgae harvesting. So, the high cost associated with microalgae harvesting is a major bottleneck for commercialization of algae based industrial products. Hence, microalgae harvesting is recognized as an area that needs to be explored and developed. In the present experiment, waste eggshell was used as the low cost bio-flocculant for harvesting microalgae. A maximum harvesting efficiency of ~95% was obtained. Thus, waste eggshell facilitated bio-flocculation proved to be an efficient harvesting method as it does not interfere with the cell integrity and the lipid content of the biomass.

A study on bio composite wind turbineblade using the local bamboo

M.Bora1, P. Kumari2, N.Sahoo1, 2, V.Kulkarni1, 2

1 Centre for Energy,IIT Guwahati,India.

2 Department of MechanicalEngineering,IIT Guwahati,India.

E-mail: mridusmi@iitg.ac.in,kpmech@iitg.ac.in,shock@iitg.ac.in

Purpose – With the increasing fossil fuels, the emission of huge amount of carbon dioxide is a major problem which contributes to global warming. In order to reduce the dependency of fossil fuels, renewable energy production, in particular wind energy generation must be drastically increased. It is observed from the literature that, most of the wind turbine blades are being manufactured using polymeric composites with carbon fibers, glass fibers, and matrix etc. The problem arises with the future disposal of this fiber reinforced blades which possess environmental as well as monetary issue. To tackle with this problem, bio-resins for use with fiber composite as well as green materials are being used. In the hilly areas of Assam, where electricity is a major concern for the people and in such areas large mass of steel and rcc structures to carry cables are inconvenient to be constructed on hill-top. The forests of Assam are highly stocked with bamboo of various species.
Approach – A through literature review is conducted. Research articles related to use of timber, bamboo and other bio-composite materials are studied and reported. The effect of mechanical properties of various bio-composites are also investigated on wind turbine blades. A comparative chart is made considering various blade profiles, their advantages and disadvantages. Details about Fatigue life cycle analysis, fracture analysis and structural analysis are summarised. Gaps in the literature are identified and finally plan for future is proposed.
Findings - In this poster presentation, a literature review on the study of a bio-composite based wind turbine blades is presented. Various factors which will enhance the capacity of small scale wind turbine using the local bamboos of Assam are also studied.

Keywords – bamboo blades, composites, small wind turbines, wind energy, modelling.

Study of Electrical Behaviour of Reduced Graphene Oxide and Silicon Hetero-junction

Niharika Gogoi1 and Pratima Agarwal1,2 *

1Centre for Energy, IIT Guwahati, Assam, India

2Department of Physics, IIT Guwahati, India

*email: pratima@iitg.ac.in

Graphene is a promising 2D material for emerging electronic devices. Due to ease of preparation, there is growing applications of graphene based chemical compounds such as Graphene Oxide (GO) and reduced Graphene Oxide (rGO). GO and rGO are widely used for solar cell and battery applications. In this paper, we present a study of electrical behaviour of rGO-Si heterojunction in transverse geometry. GO is prepared by Modified Hummers Method and annealed at different high temperatures to obtain rGO_T (T denotes the annealing temperature). The prepared rGO_T is integrated with n type Silicon to fabricate a device in the arrangement Al/n-Si/rGO_T/Al. We have studied the role of annealing temperature in current voltage characteristics of the fabricated device under dark and illuminated

conditions. The fabricated diode shows different photoconductivity under different bias voltage. Our investigations show possible application of the arrangement for photo-detector.

Wind farm modelling for Horizontal Axis Wind Turbine

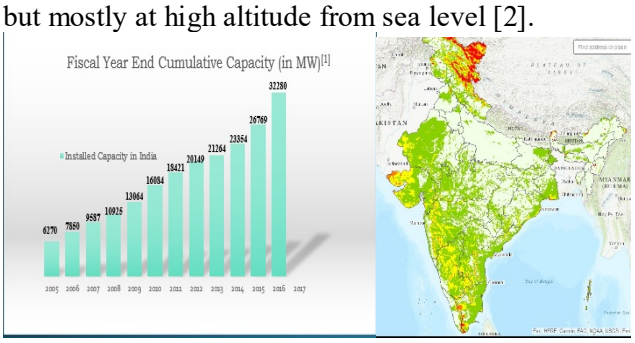
1Ojing Siram, 2Prof. Niranjan Sahoo

1Centre for Energy, IIT Guwahati,India

2Mechanical Engineering Department, IIT Guwahati,India

E-mail:osiram14@iitg.ernet.in

To fulfil the growing energy demand with sustainable source and ensuring the preview of environmental friendly generation, Wind Energy plays a vital role in providing the same with eco-friendly perspective. In present era of high tech, booming industrialization, population growth and global collaborations there is drastic increase in energy demand. Wind energy being the source of highest renewable energy in India [1] [3] has the ability to provide efficiently because of vast ability of wind flow mostly in southern coastal region [2]. North eastern part of India also show good potential for wind energy development but mostly at high altitude from sea level [2].



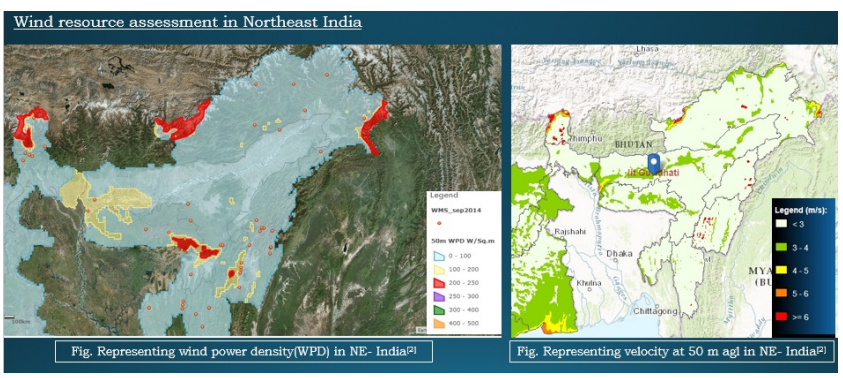


Fig. Representing wind power density(WPD) in NE- India[2]

Fig. Representing velocity at 50 m agl in NE- India[2]

For large scale energy demand, designing and forecasting proper layout of wind farm is of great interest by many researchers and because of the stochastic behaviour of wind flow, annual flow variation, atmospheric boundary layer effects, seasonal climatic change and most importantly the effect of wake flow downstream of wind turbine in subsequent arrays of turbine makes the wind farm modeller a difficult task. So, in our present research study a Computational and experimental investigation work will be carried out in Wind Tunnel to understand the wake flow down steam of HAWT (Horizontal axis wind turbine) and subsequently designing of efficient wind farm for various flow conditions.

http://www. mnre. Gov.in
http://niwe.res.in/index_map.php
http://www.renewindians.com/2013/02/indian-renewable-installed-capacity-has-reached-27.7GW.html

MAPbI3 perovskite solar cells using ITO as an inter layer

Pilik Basumatary1, Pratima Agarwal1,2 *

1Centre for Energy, Indian Institute of Technology Guwahati, Guwahati 781039, India

2Department of Physics, Indian Institute of Technology Guwahati, Guwahati 781039, India

*E-mail: pratima@iitg.ac.in

Perovskite solar cell having device structure as glass/ITO/Pedot:PSS/ MAPbI3/PCBM/ITO/Ag were fabricated at 100ºC. We have used two step method for deposition of MAPbI3 (CH3NH3PbI3)absorber layer, which includes thermal evaporation (TE) of PbI2 (lead iodide) and dip coating (DC) in MAI (methyl ammonium iodide), which results in large grain size film up to 1µm. The stability of perovskite absorber layer prepared using this two-step method is better compared to that prepared using spin coating techniques. The use of ITO (Indium tin oxide) above electron transport layer (ETL) inhibits fast diffusion of silver electrode material into the perovskite absorber layer. The ITO layer significantly improves the device stability compared to the device without ITO. Following the optimization, the device showed maximum power-conversion efficiency of 8%, with open circuit voltage Voc = 0.885V, short circuit current density Jsc = 21mA/cm2 and fill factor, FF = 0.48. The devices are fabricated and characterized in the relative humidity of ~ 50%.

Keywords: MAPbI3 perovskite, thin film, thermal evaporation.

Optimization of enzymatic hydrolysis of alkali-treated finger millet straw by recombinant β-1,4-endoxylanase

Sumitha Banu J.1*, Abhijeet Thakur2, Vijay S. Moholkar1,2 and Arun Goyal1, 3

1Centre for Energy, 2Department of Chemical Engineering, 3Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati-781039, India

*Corresponding author. Tel: +91 8011033882, E. mail: sumitha@iitg.ac.in

To make the bioethanol production process efficient, besides the cellulose saccharification, the efficient enzymatic hydrolysis of hemicellulosic portion of the lignocellulosic biomass also needs to be focussed. In this study, optimization of hemicellulose saccharification of alkali pretreated finger millet straw using β-1,4-endoxylanase (CtXyn11A) from Clostridium thermocellum was carried out at 55°C, pH 7.5 and 150 rpm. The pretreated finger millet straw contained 20% hemicellulose (200 mg/g pretreated biomass). The optimized biomass loading, enzyme loading and hydrolysis time were 6% (w/v), 558 U/g biomass and 56 h, respectively for hemicellulose saccharification that yielded the total reducing sugar (TRS) yield 39 mg/g pretreated biomass (2.4 g/L). Further conversion of xylo-oligosaccharides into xylose by β-xylosidase and ethanol fermentation will be carried out.

Keywords: Finger millet straw, Saccharification, β-1,4-Endoxylanase and TRS yield.

Performance analysis of electro-chromic WO3 material with different electrolytes using screen printing

Debika Devi Thongam, Brijesh Meena, Harsh Chaturvedi

Indian Institute of Technology Guwahati, Guwahati, Assam

As electrochromic smart materials are one of the mostly sought material in industries for widespread use in windows, glass buildings etc., it has been an important field to study its efficiency and other properties like cost, voltage dependence etc. WO3 /PVAc composite electrochromic ink is prepared by simple and facile chemical method to analyse the performance of electrochromism. The ink is printed on an ITO glass slide accomplished by simple screen printing technique. The physical and chemical properties of PVAc polymer, WO3 and WO3 /PVAc ink are characterised by using XRD, SEM, Raman, FTIR and UV-Vis spectroscopies. The ink coated ITO glass slide shows a considerable amount of colour change when varying applied voltage. Their electrochromic properties and effect of varied applied voltage are being analysed in different electrolytes. The effect of diverse types of electrolytes like HCl, NH3Cl, KI, KOH, NaOH towards electrochromic colour intensity change and their response to varied applied voltage range are also studied thoroughly in this work.

PERFORMANCE STUDY OF CAST-STEEL BASED MEDIUM TEMPERATURE THERMAL ENERGY STORAGE SYSTEM: EXPERIMENT

Thermal energy storage has become one of the versatile and indispensable component in the field of concentrated solar power generation. In the present work, the performance of a thermal energy storage module made of cast steelis evaluated using air as the heat transfer fluid (HTF). A cast steel module of length 740 mm and diameter 267 mm is fabricated with 19 cylindrical channels of diameter 12.7 mm for HTF flow. The module charging and discharging performance data are reported for an operating temperature range of 393.15 K to 473.15 K and the effect of HTF flow velocities on module performance is analysed. The estimated maximum storage capacity of the cast steel module is 13.76 MJ. The charging and discharging temperature profile across the module is measured to analyse the heat transfer phenomenon and it is observed that conduction varies predominantly in the axial direction, whereas, there is minimal variation in the radial direction. From the experimental results, it is comprehended that both charging and discharging rates are enhanced by increasing the HTF velocity from 2.5 m/s to 4.5 m/s. For a velocity of 4.5 m/s, the average module temperatures achieved at steady state condition for charging and discharging are 468 K and 398 K respectively.

Rapid Microwave Assisted Synthesis Technique for sub - 10 nm Chalcopyrite (CuFeS2) Quantum Dots and its application in Visible Light Photodetector.

Brajesh Kumar1, Abhimanyu Chattopadhyay2, Satya Veer Singh, Dr Bhola Nath Pal#

School of Materials Science and Technology, Indian Institute of Technology, Banaras Hindu University, Varanasi, UP 221005, India

The use of toxic heavy metals in energy conversion devices like solar cell and dependency of the whole industry on few materials leads to search of new materials, which are earth abundant, nontoxic, and nature friendly materials. In this regard, we are presenting an energy efficient and short time synthesis process for nature friendly, nontoxic, earth abundant, magnetic semiconducting, and heavy metal free chalcogenide compound named as Chalcopyrite CuFeS2 (CFS). Chalcopyrite (CFS) is an

antiferromagnetic, direct band gap semiconducting material with a band gap of 0.53 eV and Neel temperature 853K. In this research work, we have synthesized ligand free CFS quantum dots (QDs) with band gap of 2.74 eV via microwave assisted synthesis technique with synthesis time 5 minutes. We are using a p-n lateral heterojunction type of device structure to fabricate photodetector. In which ZnO thin film is prepared by sol-gel technique used as n-type semiconductor and CFSQDs as p-type semiconductor. The structural, surface morphology, optical and electrical properties of CFS are characterized by various techniques such as X-ray Diffraction (XRD), Transmission Electron Microscopy (TEM), UV-Vis spectroscopy, and semiconductor parameter analyzer. We fabricate nontoxic solution processed high efficient photodetector and device architectures are Glass/ZnO/Ag/QDs and Glass/ZnO/MoO3Ag/QDs in which Ag and MoO3Ag act as electrodes. These devices exhibit good photo-response performance under light illuminations. The gain factor is the ratio of light current to dark current; the devices Glass/ZnO/MoO3Ag/QDs and Glass/ZnO/Ag/QDs shows the gain factor of 12.24 and 8.7 respectively under white light illumination.
Keywords: Quantum Dots, Microwave Assisted Synthesis Technique, Photodetector, p-n junction.

References

1.K.Aup-Ngoen, T.Thongtem, S.Thongtem, A.Phuruangrat. Cyclicmicrowave-assistedsynthesisofCuFeS2 nanoparticles using biomoleculesassourcesof sulphur andcomplexingagent. Materials Letters101 (2013) 9–12.

2.Y. A. Wang, N. Bao, A. Gupta. Shape-controlled synthesis of semiconducting CuFeS2 nanocrystals.Solid State Sciences 12 (2010) 387–390.

3.K. Chen, C. J. Chiang, D. Ray. Hydrothermal synthesis of chalcopyrite using an environmental friendly chelating agent. Materials Letters 95 (2013) 172–174.

4.B. Bhattacharyya, A. Pandey. CuFeS2 Quantum Dots and Highly Luminescent CuFeS2 Based Core/ Shell Structures: Synthesis, Tunability, and Photophysics.J. Am. Chem. Soc. 2016, 138, 10207−10213.

5.Z. Zhang, B. Xu, L. Zhang, S. Ren. Hybrid Chalcopyrite−Polymer Magnetoconducting Materials. ACS Appl. Mater. Interfaces 2016, 8, 11215−11220.

6.Y. Wu,B. Zhou, C. Yang, S. Liao, W.-H. Zhang, C. Li. CuFeS2 colloidal nanocrystals as an efficient electrocatalyst for dye sensitized solar cells. Chem. Commun., 2016, 52, 11488—11491.

7.A. Layek, S. Middya, A. Dey, M. Das, J. Datta, C. Banerjee,P. P. Ray. Study of resonance energy transfer between MEH-PPV and CuFeS2 nanoparticle and their application in energy harvesting device. Journal of Alloys and Compounds 613 (2014) 364–369.

8.S. Sil, A. Dey, S. Halder, J. Datta, P. P. Ray.Possibility to Use Hydrothermally Synthesized CuFeS2 Nanocomposite as an Acceptor in Hybrid Solar Cell.J. of Mat. Engg.& Perf. https://doi.org/10.1007/s11665-018-3142-z.

Photocatalytic degradation of toxic dye using single walled carbon nanotube functionalized with cupric oxide nanoparticles for textile waste water treatment

C. Kalita1, Debika Devi Th.2, S. Karmakar1 and H. Chaturvedi2

1 Department of Instrumentation & USIC, Gauhati University, India,
2 Centre for Energy, IIT Guwahati, India

E-mail: harshc@iitg.ac.in

Dye is toxic. Textile industries are using numerous toxic dyes. These dyes are one of the major pollutants in waste water. Photo catalytic degradation of this dyes is investigated usingsingle walled carbon nanotube (SWNT) functionalized withcupric oxide nanoparticle. Pristine SWNTs were functionalized with cupric oxide in organic solvent. Morphology of the hybrid nanocomposite was studied using Field Emission Scanning Electron Microscope. Bonding and inter particle interactions and composition was characterized usingFourier Transform Infra Red spectroscopy and vibrational modes of hybrid composites were studied using Raman spectroscopy.Energy dispersive X-ray spectroscopy was used to analyze the quantitative chemical composition of the hybrid composite. The UV-visible spectrophotometer was used to study the absorption spectra of hybrid nanocomposite. UV-visible absorption spectra were used to estimate the band gap of thehybrid nanocomposite. Photocatalytic effect of the hybrid composite was studied using degradation of toxic dye and its effective usage for waste water treatment of textile industry is presented.

Key words: CuO nanoparticles, CNT, Photocatalytic degradation, toxic dye, waste water treatment

Wind Energy as An Alternative Resource: GIS Assessment andAnalysis

Pradhyun Kashyap*, Saikumar Rondla**, Manojkumar Gaddam***, Gajanan Ramteke****

*, ** & ***Department of Soil and Water Conservation Engineering, College of Agricultural Engineering, Kandi, Sangareddy, Telangana, India.

****Telangana State Remote Sensing Application Centre.

Being cleaner and climate friendly, wind energy has been increasingly utilized to meet the ever-growing global energy demands. In the region of Nalgonda, Telangana, India a wide gap exists between wind resource and actual energy production, and it is imperative to expand the wind energy development. Because of the formidable costs associated with wind energy development, the locations for new wind turbines need to be carefully selected to provide the greatest benefit for a given investment. Geographic Information Systems, have been widely used to identify the suitable wind farm locations. In this study, a GIS-based multi-criteria approach was developed to identify the areas that are best suited to wind energy development in Nalgonda Region. Several criteria were adopted in this method, including distance wind potential, land use, distance to cities, slope and exclusionary areas. The suitability of wind farm development was modeled by a weighted overlay of geospatial layers corresponding to these criteria. The results indicate that the model is capable of identifying locations moderately suited for wind farm development. The approach could help identify suitable wind farm locations in other areas with a similar geographic background.

Keywords: wind energy; GIS; multi-criteria; wind farm; Nalgonda

Energy Harvesting by using Piezoelectric Materials.

Shivaji H. Wankhade, Shivam Tiwari, Anupama Gaur and Pralay Maiti.

School of Materials Science and Technology, Indian Institute of Technology (BHU) Varanasi

Nowadays, there is very increase in energy demand. So, to fulfill it we have prepared a device which can generate electrical energy from waste mechanical energy. This can be done by using piezoelectric materials like PZT, PVDF etc.

We have used PZT and PVDF materials for our purpose. PZT has very high d33 value around 580 pC/N but it is ceramic and cannot be used for vibration energy harvesting application directly So, we make hybrid with PVDF. PVDF is piezoelectric polymer with d33 around -15 pC/N. Synthesis of PZT was done by Solid State Synthesis and XRD confirms the formation of Pure Phase. Hybrid was prepared by Solution method using different m/m ratio (0-30%) PZT to PVDF to get maximum energy harvesting efficiency Then thin film was prepared by using hot pressing. Energy Harvesting device was fabricated and it demonstrated very high output voltage 63 V and Power density 66 μW/cm2 .

Keywords: Energy Harvesting · Nanohybrid · Piezoelectricity ·PVDF ·PZT.

References

1] A. Gaur, C. Kumar, R. Shukla, and P. Maiti.Induced Piezoelectricity in Poly(vinylidene fluoride) Hybrid as Efficient Energy Harvester. ChemistrySelect 2017, 2, 8278 – 8287.

2] A. Gaur, C. Kumar, S. Tiwari, and P. Maiti,†Efficient Energy Harvesting Using Processed Poly(vinylidenefluoride) Nanogenerator. : ACS Appl. Energy Mater. 2018, 1, 3019−3024

Study on Climate-Responsive Architecture and Traditional Designs of North East Optimized for Modern Needs

Chodnekar Haresh Bhupendra Mohini1, Dr. Harsh Chaturvedi2

1 MS(R) - Centre for Energy, IIT Guwahati, India

2 Assistant Professor, Centre for Energy, IIT Guwahati, India

Email:chodneka@iitg.ac.in

Energy consumption in the building sector is constantly increasing due to the increasing world's population and improvement in living standards. In recent decades, for energy conservation, the need for research on the concepts of energy efficient buildings and passive architecture is constantly increasing. Traditional design and architecture found in the North-eastern region of India has been sustained and practised over hundreds of years thereby optimizing the lifestyle requirements and architecture with the local weather conditions. Although traditional designs have remained the same, the lifestyles have changed; suitable optimized methods will be suggested to integrate the energy requirements of the current lifestyle with the traditional designs. The study focuses on the traditional design concepts and architecture, scientifically validated and energy efficient integration of the current renewable energy sources and electronics and other new age methods of energy consumption. Energy evaluation of the traditional practices will be done in comparison to the new age buildings in the same region. The evaluation and analysis will be made based on different aspects like building form and

orientation, envelope design, internal space arrangements, shading, openings and use of natural ventilation etc.

Preferential biosorption of cationic dyes on Salvinia minima biosorbent: An economical alternative for azo dyes removal

Arnab Ghosh1*, Gopal Das1,2

1Centre for the Environment, Indian Institute of Technology Guwahati, Assam-781039, India

2Department of Chemistry, Indian Institute of Technology Guwahati, Assam-781039, India

* Corresponding author: arnab.ghosh@iitg.ac.in

Salvinia minima is a tropical aquatic floating plant, which has become a weed in the tropical and subtropical regions due to its high productivity and tolerance to a wide range of temperatures. Such weeds pose serious problems where the water bodies get choked due to explosive growth of the weeds. National Research Centre for Weed Science, Jabalpur has classified Salvinia spp. as one of the most dominant weeds of Assam. The objective of the present work is to explore the use of salvinia biomass as potential biosorbent for preferential removal of the cationic dyes viz Methylene blue (MB), Crystal violet (CV) and Bismark brown (BB) in a batch adsorption process. The biosorbernt was characterized using FTIR, PXRD, FESEM, DLS and Surface area analyzer. The influence of different adsorption parameters such as adsorbent dose, solution pH, contact time, initial dye concentration and temperature were examined and the optimal experimental conditions were determined. The experimental data fitted well with the pseudo second order kinetic model which revealed the adsorption mechanism to be predominantly chemisorption. The adsorption process followed Freundlich isotherm model where maximum adsorption capacity (qm) for MB and BB was calculated to be 163.9 mg/g and 228 mg/g respectively. The dye removal efficiencies were obtained to be 99.4%, 99.1% and 96.5% for CV, MB, BB respectively at 50 mg/l initial concentration. Overall the biosorbent proved to be a potent economical alternative for the treatment of dye containing wastewater.

Preparation of Polystyrene Nanocomposites from Waste Thermocol encapsulated with green synthesized Silver Nanoparticles

Anupama Bora1, Animes Kr. Golder1,3, SubhenduSekhar Bag*,1,2

1 Centre for the Environment, IIT Guwahati, Assam, India-781039
2Department of Chemistry, IIT Guwahati, Assam, India-781039
3Department of Chemical Engineering, IIT Guwahati, Assam, Inida-781039

Email: anupama.bora@iitg.ac.in

Polymer nanocomposites provide a better alternative against the conventional polymers or single phase metals as they have advantageous properties. Polystyrene has excellent processing properties as it is a thermoplastic polymer. Polymer nanocomposites are considered novel functional materials with various potential applications. Properties of these polymer based composites like mechanical, barrier to gases, thermal stability etc can be enhanced by using silver nanoparticles. In the study, silver nanoparticles (AgNPs) were synthesized using Musa balbisiana (Bhimkol; an indigenous variety of banana of Assam) peels which is a green process. AgNPs were characterized by UV-Visible spectroscopy, Field Emission Scanning Electron Microscope (FESEM) and Field Emission Transmission Electron Microscope (FETEM) and impregnated into polystyrene (PS) matrix. The PS/AgNPs nanocomposites were prepared in different concentrations and their morphology were characterized using FESEM and FETEM. Fourier transform infrared spectroscopy (FTIR) were used to evaluate the surface chemical bonding and surface composition of the prepared nanocomposites. Also, its tensile strength was estimated. These PS/Ag nanocomposites revealed antibacterial effect against E.coli which is a gram-negative bacteria commonly found in water. These nanocomposites prepared from thermocol waste can be used for water disinfection

purpose and further can be utilized for water storage purposes in rural areas and also as food packaging materials.

Keywords: Waste polystyrene; Silver nanoparticles; Polystyrene/Ag nanocomposites; disinfecti

Green-synthesized Gold Nano-carrier for Antibiofilm drug delivery

G. Bhattacharjee1 , A. Kamra2 and L. M. kundu 2

1 Centre for Environment, IIT Guwahati, India. 2 Department of Chemistry, IIT Guwahati, India.

E-mail: gourav18@iitg.ac.in

Nano-carriers and metal nanoparticles have found many biological applications including effective drug delivery. Carefully designed nanoparticles encapsulated with drugs also showed promising antibiofilm activities. Metal nanoparticles, synthesized using natural sources as template and stabilizing agent, show high biocompatibility, reduced cytotoxicity and improved cell-penetration ability. We have synthesized size and shape controlled gold nano-triangles (GNT) following a completely green route, using Aloe vera gel as reducing agent. Aloe vera is known to have many medicinal properties and it is also known to increase the absorption and bio availability of drugs in gut. By keeping all these in mind we have loaded the GNTs with antimicrobial drugs. The antimicrobial and antibiofilm activity of our nano-carrier are being studied.

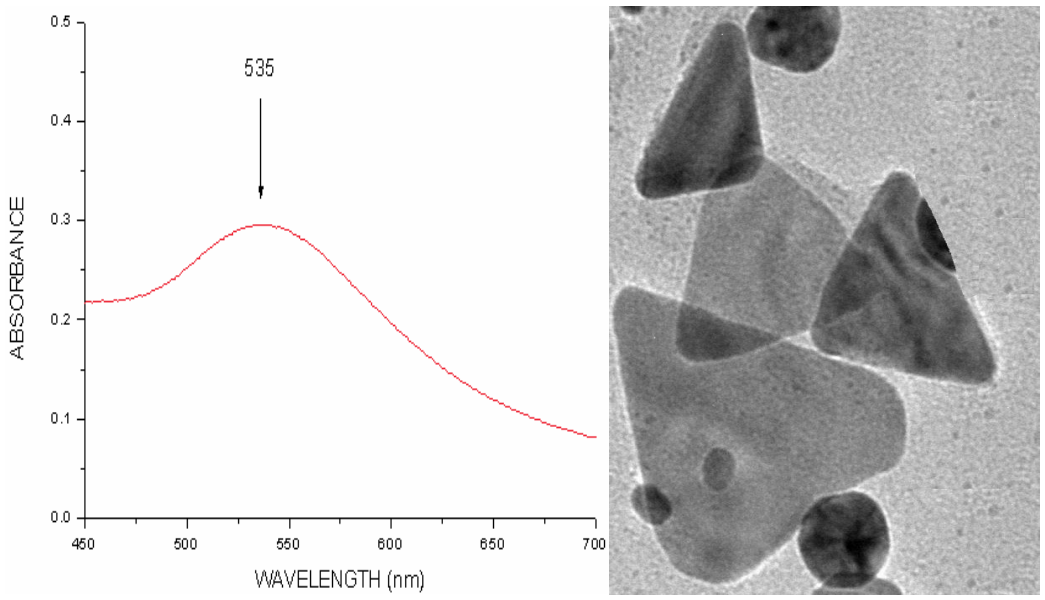


Fig. 1: (A) UV-VIS spectra of Gold nano-triangle solution synthesized by using Aloe vera gel extract and (B) FE-TEM image of Gold Nano tri-particle

Reference:

1. Ghosh P, Han G, De M, Kim CK, Rotello VM. Gold nanoparticles in delivery applications. Adv Drug Deliv Rev. 2008;60: 1307–1315. doi:10.1016/j.addr.2008.03.016

2. Ramachandra CT, Srinivasa Rao P. Processing of Aloe vera leaf gel: A review. Am J Agric Biol Sci. 2008;3: 502– 510. doi:10.3844/ajabssp.2008.502.510

3. Hamman JH. Composition and applications of Aloe vera leaf gel. Molecules. 2008;13: 1599–1616. doi:10.3390/molecules13081599

Development of Chitosan conjugated prodrug nano-carrier for photo-mediated delivery of antitumor drug 5-Fluorouracil

H. Horo ,B.P. Mandal and L.M. Kundu Centre for the Environment, IIT Guwahati, India E-mail: himali@iitg.ac.in

Controlled drug delivery is a technique that provides enhanced therapeutic efficacy of the drugs with minimized side effects. Bio- polymers and their nanomaterial's have been extensively used as effective carriers for controlled delivery of various drugs. We have developed a prodrug of 5 fluorouracil

(5-FU), an antitumor drug which is covalently conjugated to low molecular weight chitosan(LMWC) via a photo cleavable linker. The conjugate was designed in such a way that it gets cleaved upon exposure to 365 nm UV-A radiations, which is regarded as relatively safe for the cells and release 5-FU in a dose-dependent manner. The conjugate also showed enhanced water solubility compared to LMWC and forms hydrogel and DMSO gel. The drug conjugate was also fabricated into nanoparticles by ionic gelation technique. The size of the nanoparticles was found to be in the range 70–90 nm, thus should have the ability to penetrate into living cells.

In vitro release study of 5-FU from the conjugate showed controlled release of the antitumor drug over time. The synthesized nanoparticles and the gel, therefore,could be a good model for controlled release of antitumor drugs.

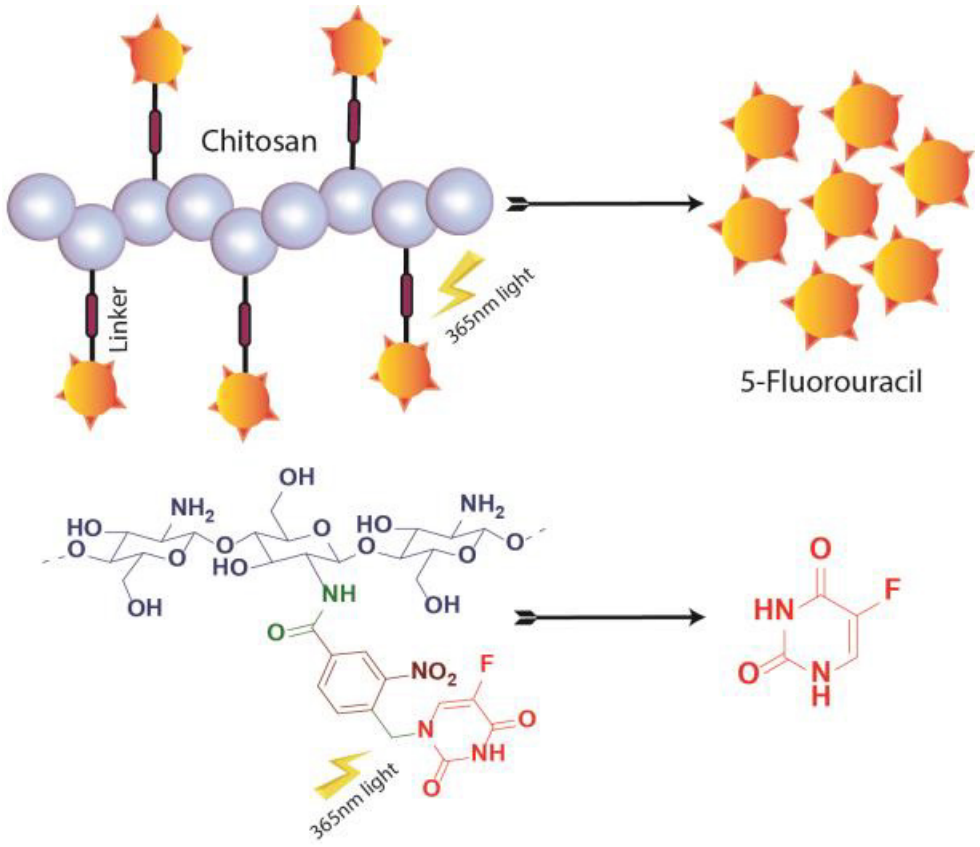


Fig. 1. Release mechanism of 5-Fluorouracil from the LMWC-5 FU conjugate prodrug upon irradiating with λ = 365 nm light

References:

1. N. Bhattarai, J. Gunn, M. Zhang, Chitosan-based hydrogels for controlled, localized drug delivery, Adv. Drug Deliv. Rev. 62 (2010) 83–99.

2. D. Paolino, D. Cosco, R. Muzzalupo, E. Trapasso, N. Picci, M. Fresta, Innovative bolasurfactant niosomes as topical delivery systems of 5-fluorouracil for the treatment of skin cancer, Pharm. Nanotechnol. 353 (2008) 233– 242.

3. M.F. Sadek, H. Azli, N. Wendling, J.L. Cvitkovic, E. Rahal, M. Mamelle, G. Avril, Treatment of advanced squamous cell carcinoma of the skin with cisplatin, 5-fluorouracil, and bleomycin, Cancer 66 (1990) 1692–1696.

Formation of Iron based metal complex and its application in Pollutant removal

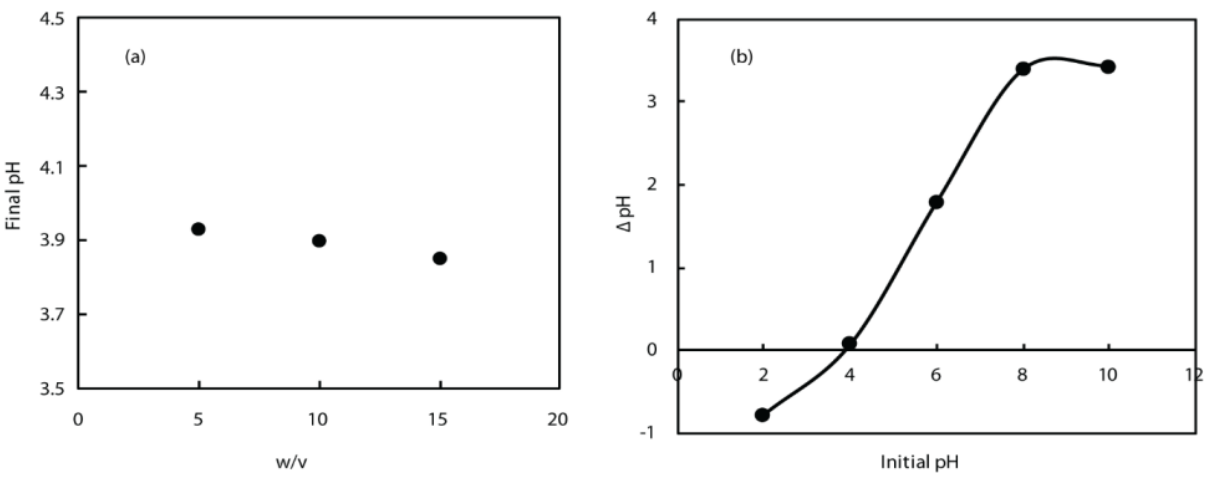
Jinat Aktar1, Saswati Chakraborty2, Manabendra Ray3*

1Centre for the Environment, Indian Institute of Technology Guwahati, Guwahati, Assam-781039, India,

2Department of Civil Engineering, Indian Institute of Technology Guwahati, Guwahati, Assam-781039, India,

3*Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati, Assam-781039, India

Materials were prepared from natural resources and using these materials for pollutant removal is an active but highly diverse area. Our intention was to synthesize materials from polyphenol rich plant extract and iron and evaluate these materials as adsorbent for fluoride removal. We choose leaves of guava (Psidium guajava) to work with due to its relatively higher polyphenol content. Multiple reports showed that nano-material from plant extract has potential for pollutant removal. However, existing reports varied and lacking in terms of (a) principle of formation, (b) exact nature of the material, (c) usefulness and (d) understanding mechanism.Our focus was improve those lacking portion and improve our understanding.



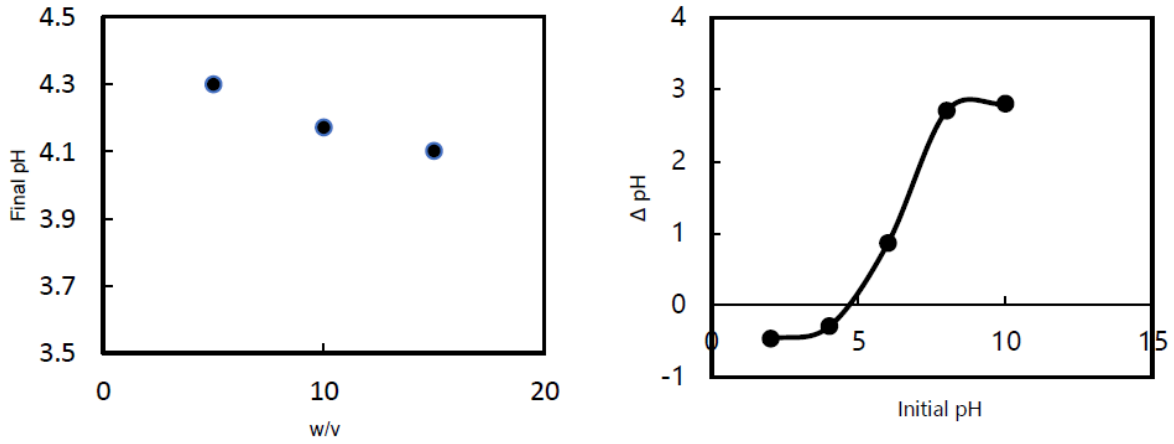


Figure. Fig. Determination of pHzpc (a) Immersion technique Material 1(Tannic-Iron complex)

(b) Mass titration Material 1, (c) Immersion technique Material 2(Guava-Iron complex)

and (d) Mass titration Material 2

Plant extracts tend to have a mixture which poses difficulty in characterization and scientific study. For this reason, along with plant extract, we have also used tannic acid, gallic acid, and egallic acid1, polyphenols2 are known to occur in guava leaves, to improve our understanding.

References

[1] Mandal, A.; Grupp, A.; Schwederski, B.; Kaim, W.; Lahiri, G. K. Noninnocently behaving bridging anions of the widely distributed antioxidant ellagic acid in diruthenium complexes. Inorganic chemistry. 2015, 54(20), 10049-10057.

[2]International Organization for Standardization. Content of Total Polyphenols in Tea — Colorimetric Method Using Folin-Ciocalteu Reagent. 2005.

Anaerobic co-digestion of rice straw and hydrilla verticillata- Modeling and process parameter optimization study

Jyoti Kaintholaa, Ajay Kalamdhada,b and V.V. Gouda,c
aCentre for the Environment, Indian Institute of Technology Guwahati, Assam, India.
bDepartment of Civil Engineering, Indian Institute of Technology Guwahati, Assam, India.
cDepartment of Chemical engineering, Indian Institute of Technology Guwahati, Assam, India.

This study exhibits the necessity for co-digestion to improve physicochemical and biochemical progression compared to mono-digestion. The individual effect of carbon/nitrogen ratio (C/N) ratio, food/microorganisms (F/M) ratio and pH, in addition to their interaction effects on methane yield (mL CH4/g-VSadded) were explored in this study. A central composite design (CCD) – response surface methodology (RSM) was used for defining the experimental design for anaerobic co-digestion of rice straw and hydrilla verticillata. Results of this study showed significant interaction of C/N ratio and F/M ratio, and individual response parameters on methane yields. The optimum condition for anaerobic co-digestion (C/N ratio 29.7, F/M ratio 2.15 and pH 7.34) showed methane yield of 287.6 mL CH4/g-VSadded, 1.81 fold (156.32 mL CH4/g-VSadded)higher than mono-digestion. Model validation proved

the high adequacy of the model and methane yield is good output response variable for co-digestion study and it is necessary to optimize the transient variation in C/N ratio, F/M ratio and pH.

Keywords: Rice straw, C/N ratios, co-digestion, hydrilla verticillata, RSM

Metal salen complex catalyzed electrochemical reduction of CO2 to value-added products

Paulomi Bose1, Chandan Mukherjee 1, 2 and Animes Kumar Golder 1, 3

1Centre for the Environment, Indian Institute of Technology Guwahati, Assam, INDIA-781039

2 Dept. of Chemistry, Indian Institute of Technology Guwahati, Assam, INDIA-781039

3Dept. of Chemical Engineering, Indian Institute of Technology Guwahati, Assam, INDIA -781039

E-mail: paulomi@iitg.ac.in

Fossil fuels, industrial development, and other anthropogenic activities increase the CO2 concentration which causes the rise in global temperature. Thus, converting CO2 into value-added products (hydrocarbons, alcohols, etc.) has become a necessity of the hour. Electrochemical reduction of CO2 (ERC) can be performed under ambient temperature and pressure utilizing only renewable resources. Various metal catalysts are effective for this purpose but they suffer from poor efficiency and low product selectivity towards deep-reduction to hydrocarbons and alcohols. Thus, the development of new heterogeneous molecular catalysts which increases the productivity by breaking the CC bond has become a major research challenge. With this aim, a salen ligand [H2LNH2] and corresponding Cu and Ni complexes were synthesized and had been introduced in ERC. The reactions were conducted in 0.5 M KHCO3 solution and CO2 gas was purged for 45 mins prior to each experiment till reached the saturation (pH 7.2). A custommade H-type reactor was employed for ERC experiments (Figure 1). Cu complex could effectively reduce CO2 to HCOOH, CH3OH, CH3COOH (C1) and C2H5OH (C2) products with an overall Faradaic efficiency (FE) of 36 %. Ni complex could reduce CO2 mostly to C2H5OH, HCOOH, and CH3OH (overall FE 49 %). This enhanced catalytic activity is attributed to the attached –NH2 anchoring group in the ligand backbone and the redox behavior of the centre Cu(I) and Ni(I) metals

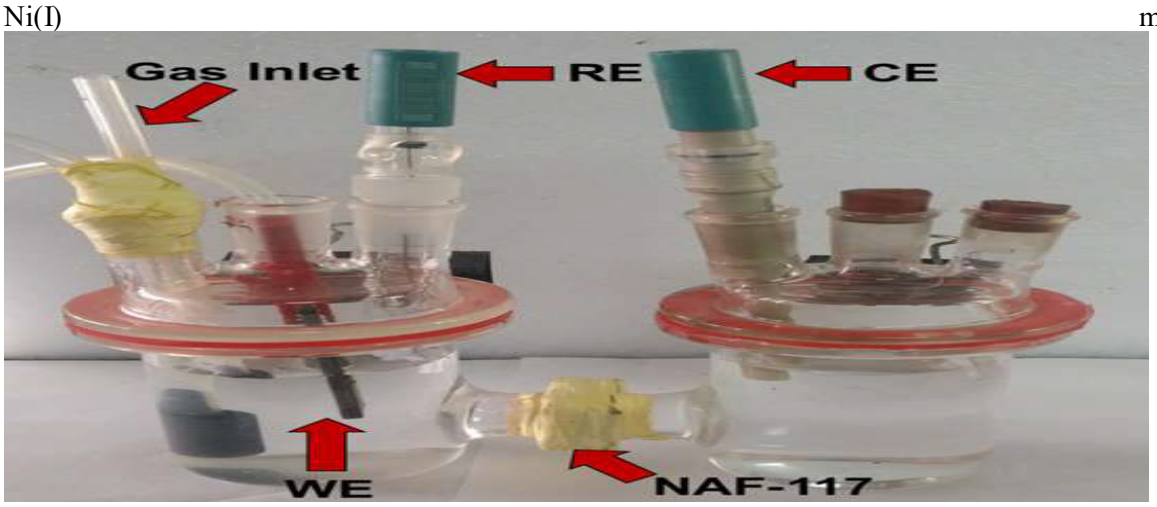


Figure 1: Custom made H-type divided electrochemical cell employed in ERC (WE = Working electrode, CE =Counter electrode, and RE= Reference electrode)

Oil quality improvement post compost application

Payal Mazumder*1, Akhil PM2, Ajay Kalamdhad3

1Centre for the Environment, Indian Institute of Technology Guwahati, Assam-781039, India

2Department of Civil Engineering, National Institute of Technology Agartala, Tripura-799046, India

3Department of Civil Engineering, Indian Institute of Technology Guwahati, Assam-781039, India

payal93@iitg.ac.in

The present study deals with the management of the aquatic weed Eichhornia crassipes commonly known as water hyacinth which is a major problem in most of the water bodies due to their vast growth and invasive nature. Rotary drum composting seems to be a good remedy for utilization of this waste to a valuable product. In this work water hyacinth compost was made and was applied to soil in different ratios (w/w) to see the change in physical properties of the soil. It is concluded that water hyacinth compost can be used as a soil conditioner.

Keywords: Water Hyacinth, Solid waste, Compost, Soil quality

The scope of n-hexadecane degrading microbial strains isolated from petroleum waste contaminated site for bioremediation of refinery waste

Prithwi Chayan Chatterjee1, Debasree Kundu2, Sanjukta Patra1,2*

1Centre for the Environment, Indian Institute of Technology Guwahati, Guwahati – 781039

2Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati – 781039

*Corresponding author E-mail: sanjukta@iitg.ac.in

Petroleum industries is one of the most important sector for social and economic development of India. Wastes generated from such unit are released in the form of oily sludge which pollutes soil, water and its associated habitats. Microbial remediation has proved to be an effective strategy to reduce such contamination. n-hexadecane being one of the crucial components was considered as the pollutant in the present study. 7 indigenous strains were isolated from a contaminated soil of the discharge point of oil refinery. The inherent characteristics of all the isolates were studied. High COD, TSS and bacterial count indicated high pollution in the soil environment. For the MIC of 500 mg/L n-hexadecane, GR2 and GS1 exhibited visible growth for 39 days whereas the minimum survival was observed for GR1, GR3 and GR4 (3 days). It was validated by the highest bacterial count and biomass concentration for GR2 and GS1 (~109CFU/mL and ~2.85 mg/mL respectively). Maximum removal was observed for GR2 and GE1 (~94%) at an initial concentration of 250 mg/L. The removal efficiency at 50, 100 and 500 mg/L n-hexadecane was in the order GR2 > GS1 > GE1 > GE2 > GR1 > GR3 > GR4. Also, highest μm and Ks values were obtained for GR2 (0.0588 d-1) and GR1 (6.067 mg/L) respectively. Thus, the strains took long time to acclimatize in the hydrocarbon environment to attain complete mineralization. The strains have potential for bioremediation of refinery waste.

Keywords: Microbial, MIC, n-hexadecane, Indigenous, Petroleum, Remediation, Soi

Refinery wastewater treatment using the oleaginous Rhodococcus opacus and bio-oil production from the lipid rich bacterial biomass by hydrothermal liquefaction

Tanushree Paul1, Kannan Pakshirajan1, 2* and G. Pugazhenthi1, 3

1Center for the Environment, Indian Institute Technology Guwahati,

2Department of Biosciences and Bioengineering, Indian Institute Technology Guwahati,

3Department of Chemical Engineering, Indian Institute Technology Guwahati,

*Corresponding author: Department of Biosciences and Bioengineering, Indian Institute Technology Guwahati, Guwahati, Assam, 781039, India (pakshi@iitg.ac.in)

The present study was focused on utilizing raw refinery wastewater by the oleaginous bacterium Rhodococcus opacus for converting it into bio-oil via hydrothermal liquefaction (HTL) of the lipid rich biomass produced during the treatment process. For treating the wastewater, different operating modes using a laboratory scale bioreactor were evaluated including batch, fed-batch, sequential batch, continuous and continuous with cell recycle using low cost tubular ceramic membrane. Among the different strategies, the continuous cell recycle system proved efficient in terms of very high removal of chemical oxygen demand (COD) (99%) and excellent lipid production (86%, w/w) at a hydraulic retention time (HRT) of 16 h (dilution rate of 0.06 h-1). Following cell recycle, the residual biomass was collected for HTL and a maximum bio-oil yield (25.53%) was obtained with Higher Heating Value (HHV) of 30.54 MJ/Kg. Gas Chromatography-Mass Spectromertry (GC-MS) analysis of the obtained bio-oil revealed the presence of a variety of compounds mainly aldehydes, ketones and fatty acid in the product whereas the aqueous phase by-product contained mainly alcohols and phenol compounds. Further analysis of the aqueous phase concluded its potential for reuse owing to its nutritional contents.

Keywords: Bio-oil; continuous with cell-recycle; hydrothermal liquefaction; Rhodococcus opacus; refinery wastewater

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Single Stranded DNA Based Silver Nanoplex for Liver Cancer Treatment

Aditi Banerjee1, Neha Arora2, Pallab Sanpui3, Siddhartha Sankar Ghosh1,2
1Centre for Nanotechnology, IIT Guwahati, Guwahati- 781039, Assam
2Department of Biosciences and Bioengineering, IIT Guwahati, Guwahati- 781039, Assam
3Department of Biotechnology, BITS Pilani, Dubai Campus, PO Box 345055, Dubai International Academic City, Dubai, United Arab Emirates

A single stranded DNA-silver nanocluster -chitosan complex was formulated for bioimaging and anti-cell proliferative activities against liver cancer treatment. A 27bp ssDNA template enabled synthesis of AgNCs, which upon complexation with chitosn formed a “nanoplex”. Characterization of nanoplex confirmed the synthesis of spherical complex with size 43 nm embedded with 10 silver atoms. Cell viability assay of drug loaded nanoplex on liver cancerous cell line HuH7 depicted IC50 of 0.18 □g/ml and 0.04 □g/ml for doxorubicin and cisplatin, respectively.

Keywords: single stranded DNA, silver naocluster, nanoplex, cytotoxicity,

Highly Selective Ammonia Sensing Device

Indrani Medhi1*, Parameswar K. Iyer 1, 2*

1 Centre for Nanotechnology, IITG

2 Department of Chemistry, IITG

Ageing population, proliferation of chronic diseases, increasing emphasis on quality of care and treatment, stringent regulatory measures focusing on patient safety, environment and cost-containment, empowered and informed customers, and emerging technologies have pressurized to reduce healthcare expenditure and consolidate health systems. The present era witnesses the rising demand for bio-devices which are easily accessible, portable and as cheap as possible. Accordingly, the fabrication methods along with the materials used have to be conditioned. In this regard, a microfluidic system provides novel functions due to smart geometries. Fabrication of a microfluidic device is mostly done with polydimethylsiloxane (PDMS) owing to its exceptional elastic property, optical transparency, ease of operation and biological compatibility. Most frequently used detection technique of biological samples is electrochemistry and fluorescence. Although these methods are effective, they are mostly being fabricated for research purpose. Further explorations in these areas need to be made as they show great biosensing potential. Certain factors such as sensitivity, selectivity, response time and stability of the biosensor should be improved. Also, the biosensors which are developed should not be confined to laboratories alone. It should be commercialized and made readily available for improving the healthcare condition of patients. Our work involves developing such cost effective flexible biomedical devices for green sensing.

Fabrication and Development of High Performance Organic and Inorganic Light Emitting Diodes

Ramesh Babu Yathirajula1, M.Adil.Afroz2 , Ritesh Kant Gupta1 and Parameswar.K.Iyer1,2,*

Centre for Nanotechnology1, and Department of Chemistry2 , Indian Institute of Technology Guwahati, Assam-781039.

Abstract: Organic optoelectronic devices have been the most promising candidates in today's emerging technology. Since the milestone study of light-emitting diodes (LEDs), enormous efforts following the pioneering work have been focused on the improvement of devices in terms of their efficiency, stability and color tunability, making them ideal for the future display and ambient lighting. Therein, LEDs have drawn particular attention owing to their favorable merits of high efficiency, low cost, easy flexibility, large area, high resolution, and low energy consumption in the full-color display and solid-state lighting applications. OLEDs with a structure of ITO/TPD/ Alq3/BCP/LiF/Al . we got the brightness above 5000 cd/m2 , EL Spectra at 540nm and CIE coordinates(0.37,0.54).In Perovskite Based LED structure ITO/PEDOT:PSS/Perov/TPBi/LiF/Al. Perovskite Solution made with (1:1) ratio of MACl and PbI2. PEDOT:PSS acting as a Hole transporting layer & TPBi acting as a Electron transporting Layer.

Keywords: LED, Brightness, Nanoscale Fabrication, CIE coordinates.

Synthesis of Polyaniline/Graphene/MoS2 Nanocomposite for High Performance Supercapacitor Electrode

Shatrudhan Palsaniya1, Harshal B. Nemade1,2, Ashok Kumar Dasmahapatra1,3 1

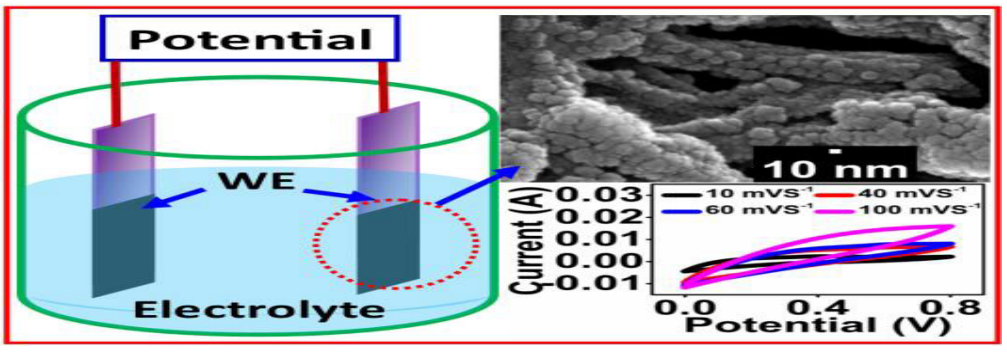
Centre for Nanotechnology, IIT Guwahati, India

1,2 Department of Electronics & Electrical Engineering, IIT Guwahati, India

1,3 Department of Chemical Engineering, IIT Guwahati, India

E-mail: shatrudhan@iitg.ac.in

Conducting polymers are usually good candidates for electrode materials of supercapacitors in spite of their lower cyclic stability, which can further be improved by combining with suitable nanofillers. In this work, we report the synthesis of nanocomposites of polyaniline (PANI), with equal weight% of graphene (G) and MoS2, prepared via in-situ oxidative polymerization of PANI, along with PANI-G binary nanocomposites. The morphological analysis confirms the formation of well-dispersed composite materials, and the ternary composite appears to be an interlayered structure of graphene and MoS2, encapsulating the PANI nanorods. As a result, the ternary composite exhibits an excellent



Scheme 1. Schematic diagram of electrochemical measurements of supercapacitor device

supercapacitance behavior, suitable for energy storage applications as revealed by an enhanced cyclic stability. The ternary composite PANI-G-MoS2 symmetric electrode measurement exhibits a remarkably high specific capacitance (Cs, 142.30 F g-1) over binary composites under galvanostatic charge-discharge (GCD) cycles. The improved cyclic stability has contributed significantly in recovering the capacitance retention as high as 98.11% in comparison with pure PANI (~ 40%) and binary composites (~ 60 – 96%). Further, PANI-G-MoS2 symmetric electrode (viz., based on two electrode measurement) exhibits a high energy density (2.65 Wh kg-1) at a power density of 119.21 W kg-1, which is attributed to the high charge transport phenomenon occurs at the interfacial region between electrodes and electrolyte.

DC dynamic pull-in predictions for a generalized clamped–clamped micro-beam

Siddhanta Roya, Prof. Roy P. Pailyb

a Centre for Nanotechnology, IIT-G, India

b Dept. of Electrical and Electronics Engineering, IIT-G, India

& Center for Nanotechnology, IIT-G, India

In this study, a precise predictions of the dc dynamic pull-in voltages of a clamped–clamped micro-beam based on a continuous model is provided. A pull-in phenomenon occurs when the electrostatic force on the micro-beam exceeds the elastic restoring force exerted by beam deformation, leading to contact between the actuated beam and bottom electrode. DC dynamic pull-in means that an instantaneous application of the voltage (a step function such as voltage) is applied. To derive the pull-in voltage, a dynamic model in partial differential equations is established based on the equilibrium among beam flexibility, inertia, residual stress, squeeze film, distributed electrostatic forces and its electrical field fringing effects. The method of Galerkin decomposition is then employed to convert the established system equations into reduced discrete modal equations. Considering lower-order modes and approximating the beam deflection by a different order series, bifurcation based on phase portraits is conducted to derive static and dynamic pull-in voltages. It is found that the static pull-in phenomenon follows dynamic instabilities, and the dc dynamic pull-in voltage is around 91–92% of the static counterpart. However, the derived dynamic pull-in voltage is found to be dependent on the varied beam parameters, different from a fixed predicted value derived in past works, where only lumped models are assumed. The predictions are finally validated by finite element analysis and available experimental data.

Characteristics of Biomass Briquettes prepared in a low power screw press machine using wild Colocasia Esculenta tuber as binder

*ANJALI NARZARYa,Amarendra Kumar Dasb
aResearch Scholar,Centre for Rural Technology, IIT-Guwahati-781039, Assam, India
bProfessor, Department of Design, IIT-Guwahati-781039, Assam, *India*
Email id: anjalinarzary@iitg.ac.in

Biomass briquetting is a very promising technology that could be an answer to two major problems faced by our country and the world today. This particular technology can solve the problem related to waste management in the process of which generates clean cooking fuel that could be an answer to all the clean cooking fuel issues in the rural areas. Lots of literature reports on biomass briquetting using different techniques. Different machine designs, different raw materials, different approaches of pre-treatment, different pressure and temperature etc. and all of them in common strive to produce biomass briquettes that have good combustion properties, good physical properties, cheap and easy to produce and use. Many literature also report on techno-economic analysis, Life cycle assessment of briquetting machine as cost of production of briquettes should be optimum. Considering all these the present research focus on different methods to produce briquettes using a low power, low cost briquetting machine. Biomass briquettes were made using four different raw materials saw dust, grass, dry leaves and straw. Dry leaves were also mixed with charcoal at two ratios to make briquettes. Colocasia esculenta also known as taro tubers were used as binder throughout the study. Among all the briquettes 3:1 ratio of dry leaves and charcoal briquettes showed the highest volatile matter content of 83.21% and highest bulk density of 0.605 gm./cm3 and highest calorific value of 5414.5MJ/Kg., 1:1 ratio of grass and sawdust showed the lowest ash content of 4.618%.

Key words: Biomass Briquettes, Colocasia esculenta, calorific value, low power screw press machine.

Macro-Fungal biodiversity for sustainable development prospects in rural areas of North East India

Bhaskar Kalita,1 and Sanjukta Patra1,2*

1Centre for Rural Technology, Indian Institute of Technology Guwahati, Guwahati, Assam, India

2*Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Guwahati, Assam, India

* Corresponding Author: Dr. Sanjukta Patra, Professor

Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati

Email: sanjukta@iitg.ernet.in

Fungal world has its own significance and contribution to bio-diversity. Northeastern region of India is rich with different varieties of macro-fungus. Macro-fungus have profound biological, ecological and economical impact in the rural society. It can contribute to food security, provide nutritious diets and contribute to therapeutics. Indigenous people of North-East India have consumed natural edible fungi as a dietary product. However, due to continuous degraded environment and natural resources their availability are significantly reduced. Current study advocates the sustainable usage of various macro-fungus, which could add new dimensions to food security. Approximately, 80% of North-eastern land were found covered by macro-fungus where were picked from forest, tea gardens etc. Highest frequency of occurrence was found for Ganoderma lucidum was followed by Cantharellus tubaeformis, Agaricus

bisporus, Schizophyllum commune, Boletus luteus, Cantherallus cibarius, Lycoperdon cladopus, Auricularia auricula, Lentinus edodes, Laetiporus sulphureus, Morchella esculanta, Termitomyces mammiformies, Auricularia polytricha, Calvatia gigantia, Lentinus sajor-cajo, Lentinus ostreatus, Tricholoma terreum, Agaricus campestries, Lenzites betulina, Lycoperdon pyriforme, Termitomyces robustus, and lowest frequency of occurrence was found for Termitomyces microcarpus. Average carbohydrate, protein and fat content among all the species studied reported in the range 64-68%, 19-27.5% and 1.0-5.3% of dry weight respectively. The macronutrient and micronutrient profile also revealed that macro-fungus are rich sources of Ca, P, Fe, Mn, Cu, Zn, Na, K, Mg, Se and vitamin C which have therapeutics properties. Hence, appropriate agro-entrepreneurship ventures could help in better commercialization of macro-fungus and their products. On the other benefited side, it would lead to rural socio-economic development and poverty alleviation in rural areas driven by bio-innovation and technological disseminations.

Keywords: Macro-fungi, Therapeutics, Rural, Agro-entrepreneurship, Sustainability

Anthropometric study of Male Hira community of Assam: Redesigning a Pottery wheel using the data

Bibhuti Ranjan Bhattacharjya1& Sashindra Kumar Kakoty2

Centre for Rural Technology, Indian Institute of Technology

b.bibhuti@iitg.ac.in1 &sashin@iitg.ac.in2

Anthropometric data of Hira communities of Assam, India are summarized here. The study considered 15 anthropometric dimensions including age and weight. The mean age of the sample male population is 35.05± 10.60 years. The mean stature and body weights are 152.48± 4.3 cm and 49.36 ± 9.89 kg respectively for female population of the survey. The Pearson's Correlation coefficients are also calculated. Further, collected data is used to redesign traditional pottery wheel to improve the productivity and comfort of pottery artisans.

Key words: Anthropometric study; Pottery wheel; Ergonomics

Thermal pretreatment - a prerequisite for the reduction of hydrolysis stage during anaerobic digestion of Ageratum conyzoides.

Biswanath Sahaa*, Meena Khwairakpama, Ajay S. Kalamdhadb

a Centre for Rural Technology, Indian Institute of Technology, Guwahati 789039, Assam, India

bDepartment of Civil Engineering, Indian Institute of Technology, Guwahati 789039, Assam, India.

*Email Id:biswanathsaha33@gmail.com

The present study mainly focused on the effect of different thermal pre-treatment on Ageratum conyzoides. Thermal pretreatment reduced the hydrolysis period and at the same time increased biogas production, compared to the untreated Ageratum conyzoides.The effect of four different thermal pretreatment technique i.e., hot air oven, microwave, autoclave and hot water bathon the anaerobic

digestion of Ageratum conyzoideswas studied. Among them autoclave found to be more efficient followed by hot water bath, hot air oven and microwave pretreatment. Autoclave pretreatment enhanced the solubilisation and an increment in volatile fatty acids was observed i.e. 55.33% and 54.59% at 90° C for 90 min respectively, as compared to the control/untreated. Cumulative methane production after autoclave pretreatment had raised to 4053 mL CH4/g VS in 35daysfrom 3011 mL CH4/g VS in 50 days for the untreated sample.

Keywords:A. conyzoides; Thermal pretreatment; biogas; Lignin; Autoclave.

ANAEROBIC CO-DIGESTION OF TERRESTRIAL WEEDS (PARTHENIUM HYSTEROPHORUS AND LANTANA CAMARA)

Palem Mohammed Yunusa*, Meena Khwairakpama* , Ajay S. Kalamdhadb*,

a Centre for Rural Technology, Indian Institute of Technology, Guwahati 789039, Assam, India

bDepartment of Civil Engineering, Indian Institute of Technology, Guwahati 789039, Assam, India

*Email Id: yunus174154004@iitg.ac.in

Parthenium hysteroporus and Lantana camara are considered to be noxious weeds which decreases agricultural productivity and causes allelopathic effects. Hence to control its growth, it can be utilised in some other useful way. Initial characterisation of Parthenium hysteroporus, Lantana camara revealed good amount of moisture content, sCOD etc., which acts as good feedstock for Anaerobic digestion. Co-digestion and digestion of Parthenium hysteroporus, Lantana camara and food waste were studied using Cow dung as an inoculum. In 1 litre batch BMP study it was observed that co-digestion of Parthenium hysteroporus and food waste produced 165 mL CH4 g-1 VS on 17th day and co-digestion of Lantana camara and food waste produced 211 mL CH4 g-1 VS on 14th day. The lag phase was minimum in co-digestion resulting in highest methane production in 14 (Lantana camara) days and 17 (Parthenium hysteroporus) days. Where as in digestion highest methane production was observed on 26th day for both substrates.

Potential of Food Waste as a source of decentralized electricity generation

Prakash Singh1, Biswanath Kumar Saha1, K. Dhamodharan2 and Ajay Kalamdhad2

1Centre for Rural Technology, IIT Guwahati, India

2Department of Civil Engineering, IIT Guwahati, India

E- mail: singh174154005@iitg.ac.in

Municipal solid waste is produced on large scale and has a significant impact on the environment. Disposition on landfills is not sufficient and especially food waste causes problems mainly through the generation of the greenhouse gas methane. Food waste (FW) is biodegradable material which can be utilized for the production of methane gas. Inoculum plays a major role in the process of anaerobic digestion. A suitable treatment is the anaerobic digestion. Within the process the organic matter gets biologically degraded and produces next to carbon dioxide methane, that can function as a source of

energy. The digestion is a sensitive process because of the micro bacterial activity, thus parameters like pH, volatile fatty acids etc. have to be frequently controlled to maintain optimal conditions. The objective of this study is to find the best loading rate and HRT for a maximum methane production and organic degradation. In addition, the purification of biogas should be enhanced to increase the methane quantity thus increasing the heating value. For identifying the best ratio of Substrate/ Inoculum (F/M) a biomethane potential (BMP) analysis was conducted. Afterwards the Hydraulic retention time (HRT) was determined in a batch study. Eventually the optimum organic loading rate was found with the ABBR, a continuous reactor. The BMP test found the best F/M ratio of 2.0 with the highest Volatile solid (VS) reduction of 50.38 % and cumulative methane production of 2.97 L.

Studying properties of bricks by partial substitution of soil with powdered rice straw

aRAMA SHIRWALKAR, aPRAKASH SINGH, aVINNY KOHLI and bGAURAV GOEL

aCentre for Rural Technology, bDepartment of Civil Engineering, Indian Institute of Technology, Guwahati-781039, Assam, India

Email: rama.shirwalkar@gmail.com

This study reports the results of an exploratory experiment to understand effects of partial substitution of laterite soil by powdered rice straw in composition of bricks. The study is carried out on scaled down brick models (1:4). The mix ratio between powdered rice straw and laterite soil was varied (0%, 5%, 10%, 15% and 20%) and was fired at temperature of 900oC.The performance after adding powdered rice straw into the mix was tested by evaluating properties such as compressive strength and water absorption of bricks as recommended by the relevant Indian and ASTM standard codes. Based on the results, an optimum mix of 5% substitution of powdered rice straw with laterite soil was found suitable for Type B brick. Results obtained in this study will be helpful to identify further scope of experimentation in incorporation of powdered rice straw in bricks making.

Physico-chemical Changes of Indigenous Rice Varieties of North East India

C, Shashikumar1*, Dr. Siddharth Singha2*, Dr. Sudip Mitra3*

1Ph.D. Research Scholar, 2Assistant professor, 3Associate professor

*Centre for Rural Technology, Indian Institute of Technology, Guwahati, Assam

Email: shash176154102@iitg.ac.in

Rice is a staple food for a major percentage of Indian population including Northeast (NE) India. NE is the home for many indigenous verities of rice. It is cultivated in diverse agro climatic conditions; irrigated or rain-fed lowland, irrigated or rain-fed upland and deep-water conditions. These rice varieties possess distinct dietary, cultural and social values for the local population. However, farmers in the NE region are currently struggling to retain the traditional varieties of rice growing practice because of competition from high yielding rice varieties, uncertainties forced by climate change and post-harvest losses. Therefore, the present study is to fill the gap of reducing on-storage losses of the traditional rice varieties. The well-known Joha (aromatic rice), Chokowa (soft rice), and Chakhao (Black aromatic rice native of Manipur) varieties typically grown in Barak Valley of south Assam have been selected to study

their physico-chemical changes during storage. Parameters like mean size, bulk and true density, color etc. indicated extent of insect infestation in the rice. Water absorption capacity and other cooking qualities plus microscopic and spectroscopic study revealed the changes in the starch quality. Also, the study gave valuable insight for effect of packaging system on the physico-chemical properties of these rice varieties during storage which may help in their better marketing.

Keywords: Rice, Joha rice, Chokowa rice, Chakho rice.

A Review on the Performance of Solar Greenhouse Dryer: Prospects of its integration in North-Eastern India

Srimonti Dutta*, Pankaj Kalita and Ramagopal V. S. Uppaluri

Centre for Rural Technology, Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India

*E-mail: srimonti@iitg.ac.in

Drying of agricultural produce is an essential step in the process of increasing the shelf life of agricultural products. Open sun drying, the cheapest and most widely used drying technique in developing countries compromise on a lot of aspects such as product quality, hygiene, etc. In developing countries, where a continuous grid connected electricity supply is not available on demand in remote places, solar greenhouse or solar tunnel dryers make for a very appropriate and suitable alternative as compared to conventional dryers for the rural India. In this paper, an exhaustive review on the classification of solar dryers and the research and development work carried out with various kinds of solar greenhouse dryers has been given. Along with a technical assessment on various parameters and their effect on the performance of the solar dryer, the economic aspect of greenhouse dryers have also been discussed here. A theoretical performance evaluation considering thermal modelling, mathematical modelling and characteristic curve has also been scrutinized in this review paper while giving a special emphasis on the prospects, functionality and implementability of solar greenhouse dryers in the north eastern region of India.

Keywords: Solar Energy; Greenhouse Dryer; Tunnel Dryer; Performance; Economic Evaluation; North Eastern India

Identification of Critical Variables for a Traditional Cheese of North East RegionUsing Statistical Design of Experiment

Vinny Kohli and Siddhartha Singha*

Centre for Rural Technology, Indian Institute of Technology, Guwahati- 781039, Assam, India

Email: vinny174154010@iitg.ac.in

Traditional food products are important for social, economic and nutritional wellbeing of a society. Especially, fermented food plays a vital role in nutritional security, preservation of food, and ethnic cultures. An indigenous solid fermented milk product called Chhurpi is found to be consumed in some parts of the Northeastern region of India. It is similar to an unripened variety of soft cheese, which is used in the preparation of various culinary dishes and pickles. The present study aimed at identification of most important process variables in production of Chhurpi using Plackett Burman design of experiment. The critical variables then would ensure achievement of safe and commercially acceptable quality of the traditional cheese. Furthermore, the physicochemical (structure, proximate

composition and protein quality) and sensory (appearance, color, odor, taste and texture) analysis on traditional cheese and similar solid structured dairy products were performed. The study revealed not only a better way of commercial production of Chhurpi but also its potential as functionally active solid dairy product.

Keywords: Traditional fermented product, Chhurpi, cheese, functional property, protein

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