



International Conference on Micro Nano Fluidics (ICOM 2025)



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Tentative topic of the invited talk

Role of Interfacial Forces in Biomedical Applications

Abstract of the invited talk

Transport processes at the interface provide insights into a number of diverse processes at the micro-scale e.g., droplet and digital microfluidics, biomicrofluidics, disease detection, crack formation, formation of dendrites—to name a few. In this regard, paper-based analytical devices (μ PADs) have emerged as powerful platforms that leverage solid–liquid interfacial phenomena to drive fluid transport without the need for external actuation. From blood plasma separation to point-of-care screening of chronic diseases such as anaemia and diabetes, these devices offer transformative potential for user-friendly, equipment-free diagnostics. Here, we delve into the physics underlying two key innovations: enhanced transport through engineered paper creases for high-fidelity anaemia detection, and the integration of sessile droplet–driven convective mixing into μ PADs for multiplex glucose and albumin sensing. We demonstrate that strategic manipulation of interfacial forces—including capillarity, evaporation, and convection—can significantly improve microscale transport, paving the way for next-generation microfluidic platforms for real-world biomedical applications.