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Speaker/affiliation: Prof. Jaun G. Santiago, Stanford University, USA

Tentative topic of the invited talk

Experimental Study of Trapping and Stretching of Single DNA Molecules on a Channel Wall

Abstract of the invited talk

Trapping, linearization, and imaging of single molecule DNA is of broad interest to biophysicists and has applications to nucleic acid analysis methods such as karyotyping and optical mapping. In this work, we drive DNA molecules with an axial electric field through microchannels and study the dynamics on a single-molecule basis. We discovered a new method to trap and visualize DNA molecules. Namely, above a threshold electric field, individual DNA molecules become pinned to the channel walls at a vertex and fold into a hairpin shape as they are stretched in the direction opposite to the electric field. We hypothesize that polyvinylpyrrolidone (PVP), a neutral polymer added to the buffer to suppress electroosmosis, adsorbs on the channel surfaces and forms a scaffold onto which DNA becomes entangled. Upon removal of the electric field, DNA molecules undergo relaxation within a few seconds to a Brownian coil around the vertex. After 10's of seconds, DNA is released and free to diffuse and electromigrate. We analyze the conditions needed for trapping, the relaxation dynamics, and the repeatability of vertex pinning. The method enables high quality imaging of single-molecule DNA with high throughput using simple-to-fabricate fluidic structures.