The Chinese University of Hong Kong
Department of Biomedical Engineering

Graduate Seminar – PhD Oral Defence

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Date	***:***	18 July 2024
Time	***:***	2:00 pm (HKT)
Venue	***:***	Room 1122, William M W Mong Engineering Building, CUHK

Title: In-tube Silicon Nanopore for Inertial-kinetic Sensing of Molecules

Nanopore sensing is a commonly employed method for achieving high-resolution and label-free detection and analysis of molecules by measuring the ionic current change with the application of bias potential across the nanopore. As a molecule translocate through the nanopore, it induces a temporary perturbation in the ionic current, enabling valuable insights into various characteristics of the molecule, such as its size, configuration, surface charge. The stochastic nature of molecular dynamics in nanopores hampers precise translocation control and limits sensitive measurements of molecular conformation. The research work mainly focuses on regulating translocation of proteins and obtaining stable signals of long and adjustable dwell times and high conformational sensitivity by adjusting the kinetic properties of a funnel-shaped inertial force field. The inertial sensing method incorporates an inertial force kinetically regulated molecular translocation method into micro-pyramidal silicon nanopore that fabricated by using a photovoltaic electrochemical etch-stop effect. By manipulating the inertial angle and centrifugation acceleration, significant controllability over the translocation speeds and trajectories of molecules is demonstrated, resulting in adjustable frequency of translocation events and current signals with a high signal-to-noise ratio. The controlled translocation speed and passage trajectory within the in-tube device also enhance the stability of current blockade signals, enabling a low coefficient of variation for resultant signals. Additionally, the in-tube nanopore device enabled instantaneous sensing and discrimination of molecules, as well as longitudinal monitoring of molecular reactions and conformation changes by measuring the characteristic features in current blockade readouts.

***** ALL ARE WELCOME *****

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