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BME

RESEARCH SEMINAR
FACULTY CANDIDATE, DEPARTMENT OF BIOENGINEERING

NANOSTRUCTURED BASED LAB-ON-CHIPS FOR OPTICAL AND ELECTRICAL DETECTION

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Nanofeatures on semiconductor and metal oxides are used for biomolecule detection and low resolution sequencing of DNA. Most notably, metallic nanostructured possess unique physical and electrical properties with potential applications in nanobiosensors. The large surface area of such nanostructures provides an extended site for (electro) chemical and biochemical reactions. It also provides the enhanced ability of immobilization of DNA and proteins for indirect detection of a variety of biomolecules.
In order to efficiently deliver the sample to the detection sites, one approach would be to integrate the nanostructures with sample delivery systems, such as micro/nanofluidic channels. Classical micor/nanochannel based lab-on-chip devices allows highly parallel biomolecular analysis. However, they are limited either by sensing resolution or by low concentration of molecules at the nanofeatures.
In order to overcome technical challenges we have developed a new method that utilizes reversible, tunable nanofluidic confinement of the dielectric particles based on di-electrophoresis (DEP) force and Silicon nitride and Indium Tin Oxide Nanopatterned electrodes. Fourthly, the device can concentrate molecules as well as manipulate them, leading to higher throughout at lower molecule concentrations as the loading is induced by the DEP-force. This allows the creation of open and simple designs (no need for permanent bonding), in particular for ease of buffer exchange and integration with nanostructured electrodes as the site of detection.
The ease of fabrication and instrumentation makes our device a unique point of care instrument for optical and electrical detection of biomolecules. As a proof-of-principle demonstration, we show reversible and tunable DEP assisted DNA loading, concentration and stretching it in nano-channels for optical detection.

Friday, October 23
Macdonald Engineering Building, Room 267
1:00 p.m.
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