The Chinese University of Hong Kong

Department of Biomedical Engineering

Time: 10:00 – 11:30 am, 16 May 2019 (Thursday)
Venue: Room 513, William M.W. Mong Engineering Building

All-electronic Nano-biosensors Based on Graphene Transistors

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Abstract

Probing biosystems with two-dimensional (2D) materials provides tremendous opportunities for highly sensitive detection of physiological properties at the molecular level, which can pave the way towards early-stage disease diagnosis and improved healthcare outcomes. In this talk, I will introduce the process I have developed for scalable fabrication of 2D-biosensor arrays for multiplexed detection of disease biomarkers, where a graphene field effect transistor (GFET) is utilized for signal transduction, and a biomolecular layer, e.g., protein, nuclide acid, serves as the biological recognition element. Further, integration of the hybridization chain reaction (HCR) process with GFET readout leads to oligonucleotide detection with sensitivity at the aM level. Looking to the future, I will discuss synthesis of crystalline multilayer graphene materials with a tunable energy band gap, which provides a pathway towards next-generation biosensors with even greater sensitivity. Finally, I will discuss the ongoing development of a universal sensing platform based on aptamer-GFET biosensors that is potentially useful for wearable electronics for detection of health and performance biomarkers in sweat.

Biography

Dr. Gao completed his Ph.D. with Prof. Matthew Yuen in the Department of Mechanical and Aerospace Engineering at Hong Kong University of Science and Technology in 2014. Since that time he has been a Post-doctoral Researcher in Prof. Charlie Johnson's group in the Nano/Bio Interface Center and Department of Physics and Astronomy at the University of Pennsylvania. His research interests include all-electronic biosensors for disease diagnosis and healthcare, wearable electronics, and two-dimensional (2D) nanomaterials. He developed a graphene sensor concept that enables sub-fM detection of nucleic acid biomarkers for disease diagnosis at early stage. He also invented a Ni-Cu gradient alloy catalytic system for manufacturable synthesis of crystalline multilayer graphene with a tunable energy band gap for applications in high-resolution biosensing. He currently serves on the editorial board of PLoS ONE in the area of Biosensors and Nanomaterials.

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