NANOMATERIALS SPEAKER SERIES

SEEING IS BELIEVING: PLAMONIC IMAGING TECHNIQUES FOR ENERGY AND BIOMEDICAL RESEARCH AT NANOSCALE

February 10, 2017 at 12:30pm

Engineering Building 2, Rm W122

Modern imaging techniques, ranging from optical to scanning probe microscopy, have extended human vision from tens of microns all the way down to fractions of a nanometer - small enough to resolve the structure of a single molecule. These new approaches and techniques have enabled numerous scientific discoveries and created unprecedented possibilities to investigate the structure and function of biological samples and nanomaterials. However, most of the existing techniques mainly image the morphology. To fully understand the biological and chemical processes, one would have to image chemical, electrical, mechanical, and thermal responses in living systems. In this talk, I will review my recent effort focusing on developing novel imaging technologies and applying them to nanomaterials and biological research. Three different methods have been developed and applied. First, a novel plasmonic-based electrochemical current microscope (P-ECM) technique will be introduced. It can image local catalytic current and surface impedance at extremely high speed and sensitivity. This technique has been used to image the catalytic current of single nanoparticles for the first time. Second, plasmonic impedance microscopy (PIM) was applied to: 1) map quantum capacitance of single layer graphene; and 2) imaging apoptosis process of cancer cells. Third, mechanical amplification strategy was developed and applied to measure small molecule-membrane receptor interaction. It is based on nanometer-precision tracking of molecular binding-induced mechanical deformation in cell membrane via an optical imaging technology. The second part of the talk will introduce my future research interests which focus on solving the critical problems in biomedical and energy research by developing novel imaging and detection techniques.

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SPEAKER BIO

Xiaonan Shan received his Bachelor's and Master's degrees from the Department of Microelectronics from Peking University in China in 2003 and 2006, respectively. He received his Ph.D. in Electrical Engineering from Arizona State University in 2011, where he has developed plasmonic imaging techniques and their applications in nano, energy conversion, and energy storage research. He was a post doc and research assistant professor in the Center for Bioelectronics and Biosensors in the Biodesign Institute at ASU from 2011 to 2016, where he has worked on developing novel imaging techniques to study nanomaterials catalytic efficiency and biomolecular interactions at single cell level. He join ECE department at University of Houston in September 2016.

Contact Professor Jiming Bao at jbao@uh.edu if you would like to arrange for a time to meet with Dr. Shan.

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