

The Department of Mechanical Engineering/College of Engineering and Applied Sciences
Stony Brook University

Mechanical Engineering Seminar

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Lecture Title: Interfacial Phenomena at the Micro/Nano Scales and Its Impact on Point of Care Diagnostics

Wednesday, July 29, 2009, 2:00 PM, Room 173 Engineering Building

Abstract

Recent developments in dry and wet nanotechnology have led to unprecedented potential to integrate various systems- e.g. mechanical, fluidic, electromechanical, or optical- into one chip for novel applications. As the result of the miniaturization, the interfacial phenomena at the micro/nano scales are dramatically different from at the macro scale. In the course of evolution, Nature has developed unique strategies to take advantage of interfacial phenomena for complex functions. Learning from Nature not only advances our basic understanding of interfacial phenomena at the micro/nano scales, but also gives us inspirations to create artificial materials and achieve desired functions by virtue of nanoengineering. In the first part of my talk, I will present the development of bio-inspired superhydrophobic materials with two-tier surface roughness that have a wide range of applications, ranging from self cleaning to drag reduction. I will show that by tailoring three-phase interface using nanoengineering, materials can exhibit superhydrophobic behavior under both static and dynamic conditions, otherwise unavailable on the flat surface. In the second part of my talk, I will discuss how to dynamically modify the interfacial behavior of liquid at the three-phase interface. Specifically, I will discuss electrically controlled wetting and dewetting of droplets on rough surfaces and liquid transport through nanostructured membranes and how the transport may be precisely controlled by electro-chemical means. At the end, I will conclude with the impact of interfacial phenomena on the biomedical and life sciences, with an emphasis on the development of microfluidics based cell counter for point of care diagnostics in the resource poor settings

Biography

Zuankai Wang is currently a postdoctoral associate in the Department of Biomedical Engineering at Columbia University and will join in the Department of Manufacturing Engineering and Engineering Management at the City University of Hong Kong as an assistant professor in 2009 September. He earned his Ph. D. degree in the Department of Mechanical, Aerospace and Nuclear Engineering at Rensselaer Polytechnic Institute in 2008 August. His Ph.D. dissertation was invited to publish as a book chapter and some of his research works have been featured in many media reports, such as Nature News, BBC Radio's Science in Action Program. His research interests include microfluidics, MEMS, and nanoengineering. Dr. Wang has published over ten scientific papers, and won the Materials Research Society Graduate Student Silver Award (2007 Fall Meeting) and 2007 Chinese Government Outstanding Self-Financed Students Abroad Award.

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