

University of Rochester
Department of Electrical and Computer Engineering
Colloquia Series

Atomic Layer Semiconducting Crystals – 2D NEMS Coupled with Nanoelectronics and Optics

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Wednesday, November 11th

12:00PM – 1:00PM

Computer Studies Building (CSB) 209

Abstract: Nanoscience today enables exciting emergences of low-dimensional nanostructures and new materials with previously inaccessible properties. We explore these intriguing properties, coupled with mechanical degrees of freedom in designed and engineered nanostructures, to innovate new nanomachines and transducers, for sensing and information processing. In particular, nanoscale electromechanical systems (NEMS) operating in their resonant modes can be exquisitely sensitive to various processes, and are highly efficient for signal transduction among multi-physical domains (e.g., mechanical, electrical, optical). By engineering high-performance NEMS resonators in the radio frequency (RF) and microwave bands, especially those based on atomic layer two-dimensional (2D) nanostructures, we have demonstrated various ultrasensitive transducers. In this talk, I will focus on introducing 2D NEMS based on atomically-thin crystals beyond graphene, such as layers from transition metal di-chalcogenides (TMDCs) and black phosphorus, which have sizable and tunable bandgaps. Atomic layer structures derived from these materials possess a number of interesting electrical, optical, and mechanical properties, and are attractive for new nanodevices. I will describe our recent experiments on demonstrating various 2D RF NEMS resonators, and their coupling with nanoelectronic and optical effects in these devices. Challenges and advances in experimental techniques will also be discussed.

Bio: Philip Feng is currently an Assistant Professor in Electrical Engineering at Case School of Engineering, Case Western Reserve University. His research is primarily focused on nanoscale devices and systems. Prior to joining the faculty at Case, Feng was at the Kavli Nanoscience Institute, California Institute of Technology (Caltech), where he served as a Staff Scientist and a Co-Principal Investigator from 2007 to 2010. He received his Ph.D. from Caltech in 2007 for developing ultra high frequency (UHF) nanoelectromechanical systems (NEMS) with low-noise technologies for real-time single-molecule sensing. His recent awards include a National Science Foundation CAREER Award, 3 Best Paper Awards (with his advisees, at IEEE NEMS 2013, IEEE Int. Freq. Control Symp. 2014, and AVS Int. Symp. 2014) out of 8 nominated Finalists for Best Paper Award Competitions, a T. Keith Glennan Fellowship, and an Innovative Incentive Award. Feng was one of the 81 young engineers selected to participate in the National Academy of Engineering (NAE) 2013 U.S. Frontier of Engineering (USFOE) Symposium. Subsequently, he received the NAE Grainger Foundation Frontiers of Engineering Award in 2014. He also received the Case School of Engineering Graduate Teaching Award (2014) and Case School of Engineering Research Award (2015). He has been serving on the Technical Committees for IEEE IEDM, IEEE MEMS, Transducers, IFCS, and other IEEE conferences. He is a senior member of IEEE, and member of APS, AVS

Pizza and soda will be provided.