

## UC SAN DIEGO NANOENGINEERING SEMINAR

*Wednesday, February 21 2018*

*Seminar Presentation: 2:00 - 3:00pm*

**ASML Conference Center (SME 248)**

### **“Semiconductor Nanomaterials and Devices: Innovation for Electronic, Photonic, and Biomedical Applications”**

**Xiuling Li**

*Professor, Department of Electrical and Computer Engineering  
University of Illinois at Urbana-Champaign*

**Abstract:** My group's general interests are in the area of semiconductor materials and devices. We focus on developing innovative semiconductor structures and device concepts through both bottom-up and top-down approaches to bring lasting impact to the field of semiconductor nanotechnology, electronics, and photonics; and possibly medicine. I will give a brief overview of several recent nanotechnologies developed at Illinois. (1) I will first introduce a bottom-up growth method to realize scalable 3D III-V HEMTs using MOCVD grown planar nanowire arrays with record  $f_T/f_{max}$ . (2) I will then present an unorthodox anisotropic wet etching method, metal-assisted chemical etching (MacEtch), that enables site-controlled semiconductor nanostructure top-down fabrication with unprecedented aspect ratio and versatility. Several examples of devices uniquely enabled by MacEtch will be discussed, include ultra-high aspect ratio (40:1) InP junctionless FinFETs realized with excellent subthreshold slope (63 mV/dec), InGaAs nanopillar array MOSCAPs with low  $D_{it}$ , and Ge and  $Ga_2O_3$  nanotextured photodiodes. (3) Using a bottom-up and top-down combined approach, we have established a 3D self-rolled-up membrane (S-RuM) nanotechnology platform for extreme miniaturization (10 – 100X) of passive electronic components for radio frequency integrated circuits (RFICs) and millimeter wave communications. I will discuss the design, fabrication, and performance of S-RuM based inductors and transformers, as well as using S-RuM tubes as an active conformal interface to guide and accelerate neuron cell growth.

**Biosketch:** Xiuling Li received her B.S. degree from Peking University and Ph.D. degree from the University of California at Los Angeles. Following post-doctoral positions at California Institute of Technology and University of Illinois, as well as industry experience at EpiWorks, Inc., she joined the faculty of the University of Illinois in 2007 as an Assistant Professor in the Department of Electrical and Computer Engineering. She was promoted to Associate Professor with tenure in 2012, and to Professor in 2015. She has published >130 journal papers and holds >20 patents (11 issued and 10+ pending) in the area of semiconductor materials and devices. She is an IEEE Fellow. Her other honors and awards include NSF CAREER award, DARPA Young Faculty Award, ONR Young Investigator Award. She is a Deputy Editor of Applied Physics Letters and Vice President for Finance and Administration of the IEEE Photonics Society.