

**JOINT INSTITUTE FOR MOLECULAR AND NANOSCALE INNOVATION (IMNI)
AND DIVISION OF ENGINEERING**

**“Semiconductor Nanowires: Properties, Integration and Applications
for Electronics, Sensors and Energy Harvesting”**

Zhiyong Fan, Ph.D.

Department of Electrical Engineering and Computer Science
University of California, Berkeley

April 17, 2009

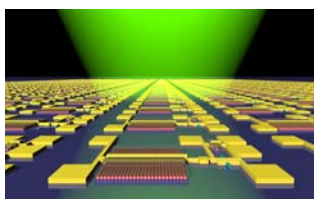
Barus & Holley, Room 190

9:30 AM

Abstract

Semiconductor nanowires represent an important class of nanomaterials provoking research interests in their fundamental physical and chemical properties. They are also considered as potential building blocks for electronics, sensors and energy harvesting devices, for their small dimensions, high material quality, large surface-to-volume ratio, tunable composition, *etc.* This talk will present the fundamental aspects of semiconductor nanowires at the beginning, including bottom-up growth mechanism, structural characterization, electrical, optical and chemical sensing properties investigations. These studies are performed by configuring single nanowires as two and three terminal devices, which are the fundamental components of electronics and optoelectronics. To implement semiconductor nanowires for technological applications, two unique approaches have been developed in parallel to assemble nanowires into two-dimensional and three-dimensional arrays at large scale. The assembled nanowire arrays have high nanowire density and long range regularity; they can be readily utilized for electronic and photonic applications. We have successfully fabricated nanowire array based electronic devices and achieved heterogeneous integration of nanowires for all-nanowire integrated sensor circuitry. To explore applications of semiconductor nanowires for energy harvesting, high density three dimensional nanowire arrays are fabricated into photovoltaic devices on low cost and flexible substrates. This unique device structure facilitates photo-carrier collection efficiency and enables cost effective solar cells.

II. Proof of concept of an all-nanowire integrated image sensor circuit



I. Flexible solar cell made of 3D nanowires array

