



TEXAS TECH UNIVERSITY
Edward E. Whitacre Jr. College of Engineering

ECE Seminar in Nanophotonics

Seeing the very small: imaging and solid-state device engineering at the nanoscale

Edward T. Yu
Microelectronics Research Center
The University of Texas at Austin
Austin, TX 78758
<http://etylaboratory.ece.utexas.edu>

The science and engineering of materials and device structures at the nanometer scale have become central themes in fields ranging from solid-state electronics and photonics to the biological sciences. As a result, the characterization, understanding, and control of material and device properties at the nanometer to atomic scale have emerged as essential aspects of materials and device engineering. We will discuss some recent results from our laboratory directed towards the imaging, analysis, and application of nanoscale phenomena in variety of solid-state materials and devices. In the area of nanoscale imaging and metrology, we show how scanned probe imaging of electronic structure in InGaN/GaN quantum-well heterostructures reveals nanoscale variations in carrier accumulation behavior associated with monolayer fluctuations in InGaN quantum well thickness, and how scanning capacitance imaging of ErAs semimetallic nanoparticles embedded epitaxially in GaAs enables elucidation of nanoscale electronic structure, carrier modulation behavior, and ErAs nanoparticle size distributions well below the typical resolution limit in proximal probe microscopy. In the area of high-efficiency photovoltaics, we discuss approaches for design and fabrication of thin-film solar cells that exploit plasmonic effects and light scattering by metal and dielectric nanostructures integrated with the semiconductor device structure. We show that these approaches lead to substantial improvements in power conversion efficiency with the potential to enable realization of extremely thin, highly efficient solar cells and related devices.

Edward Yu received his A.B. (summa cum laude) and A.M. degrees in Physics from Harvard University in 1986, and his Ph.D. degree in Applied Physics from the California Institute of Technology in 1991. In September 1992, following a one-year postdoctoral appointment at the IBM Thomas J. Watson Research Center in Yorktown Heights, NY, he joined the faculty of the University of California, San Diego as Assistant Professor of Electrical and Computer Engineering. He was promoted to Associate Professor in 1996 and Professor in 1998. In 2009 he joined the faculty of the University of Texas at Austin as Professor of Electrical and Computer Engineering, and Judson S. Swearingen Regents Chair in Engineering. Professor Yu has been the recipient of an NSF CAREER Award, ONR Young Investigator Award, Alfred P. Sloan Research Fellowship, and UCSD ECE Graduate Teaching Award, and is an AVS and IEEE Fellow. He has served on numerous conference organizing committees including General Chair (2005-07) and Program Chair (2003-05) of the TMS Electronic Materials Committee and Electronic Materials Conference, and Division Chair and Program Chair of the AVS Nanometer-Scale Science and Technology Division. He currently serves as a member and Associate Chair of the DARPA Defense Sciences Research Council (DSRC). Current research interests in his laboratory include photovoltaics and other technologies for energy generation; nanoscale imaging and characterization techniques; and solid-state nanoscience and nanotechnology generally. The results of his research have been reported in over 140 archival journal publications.

Time: February 10th, Friday, 3:00 - 4:00 pm

Location: ECE 101 (Lankford Lab), Dept. of Electrical and Computer Engineering

Hosted by: Hongxing Jiang & Jingyu Lin