University of Texas at San Antonio

Department of Physics & Astronomy

Dr. Mike Downer

Professor, Department of Physics College of Natural Sciences at Univ. of Texas at Austin

Friday, Mar, 9 2012

Time: 3:15 p.m.-4:15 p.m.

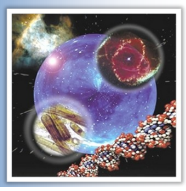
BB 3.04.18

Epi-optic spectroscopy of Si nano-interfaces

The unique properties of nanostructured materials stem from their high surface-to-volume ratio. I will discuss interface-specific optical spectroscopy (*i.e.* "epi-optic" spectroscopy) of Si structures that are nano-confined in two or three spatial dimensions.

Step-edges of vicinal Si surfaces are confined in 2D, and provide templates for nano-fabrication. I will demonstrate optical fingerprinting of vicinal surface bonds using *nonresonant*, but rotationally anisotropic, second-harmonic generation (RA-SHG) and reflectance-anisotropy spectroscopy (RAS). As specific examples, I will present *in-situ* RA-SHG observations that track chemical reactions of cyclopentene with step-edge rebonds and terrace dimers of reconstructed vicinal Si (001) surfaces, and suggest pathways for growing better organic films on silicon.

Silicon nanocrystals embedded in SiO_2 are confined in 3D, and provide a basis for light-emitting Si devices. I will present comparative SHG, ellipsometric, photoluminescence excitation and Raman backscatter spectra of silica-embedded Si nanocrystals of 3 and 5 nm average diameter.[1] The spectra provide clear signatures of the crystalline Si (c-Si) cores, and of a disordered interfacial transition region between the c-Si core and the amorphous silica matrix that is more prominent in smaller nanocrystals, consistent with recent computations of the nanocrystalline structure.



Department Contact Information
Dr. Marcelo Marucho • 210.458.7862 • Marcelo.Marucho@utsa.edu
Nakia Scott 210.458.5698 Nakia.Scott@utsa.edu