Physics
AT QUEENS COLLEGE

Colloquium Notice

Mahua Biswas

New Jersey Institute of Technology

Optical properties and morphology of ZnO nanostructures and organic photovoltaic devices

The talk will mainly concentrate on the results of optical and morphological properties of zinc oxide (ZnO) nanostructures and on some recent work on organic polymer based photovoltaic devices. Low dimensional nanostructures of ZnO have potential to improve the efficiency and compactness of electronic and photonic devices including LEDs, optical waveguides and sensors. The growth mechanism and characterization of ZnO nanorod and nanowall systems grown on sapphire and Si substrates using vapour phase transport (VPT) method will be presented. The experimental growth conditions to achieve well-aligned ZnO nanorod and naorod/nanowall morphology are optimized by using different forms of carbon powder as source. For ZnO nanostructures to be effectively utilized in devices, it must be possible to dope these structures effectively and homogeneously. The distribution of In and Al dopants with ZnO nanostructures grown on Si and a-sapphire substrates is investigated using low temperature cathodoluminescence. The photoluminescence (PL) peak seemingly unique to ZnO nanostructure at ~3.367 eV, known as the surface exciton (SX) peak, believed to be due to surface adsorbed species are investigated aimed at elucidation of the nature and origin of the emission and its relationship to the nanostructure morphology. The optical and electronic properties of the active layer (usually a blend of semiconducting polymer and fullerene), contributes to the generation of electron-hole (e-h) pairs (excitons) and their dissociation in an organic photovoltaic cell. To improve the optical and electronic properties of the active layer, dye doping in polymers/fullerene blend and concept of hybrid polymer/inorganic nanorod photovoltaic cells are implemented. Dye molecules with the polymer/fullerene composite are used to enhance absorption at longer wavelengths, which could not be harvested otherwise. In hybrid solar cell concept, ZnO nanorods are used in the active layer to increasing the donor-acceptor interfacial area and creating electron transport pathways toward the negative electrode that possess very high electron mobility.

Wednesday
October 12, 2011
Starts at 12:15 PM
Coffee at 12:00 PM
Physics Conference Room, SB B326