Physics Colloquium
Michigan Technological University

February 2 (Thursday) 4:00 to 5:00 pm
Room 139, Fisher Hall

Towards Controlled Growth of Zinc Oxide Nanostructures

Samuel L. Mensah

Advisor: Dr. Yoke Khin Yap

We have attempted to understand the growth of zinc oxide (ZnO) nanostructures by a vapor phase transport process at temperatures ranging from 900 –500 deg. C. Mixture of ZnO and graphite powders are used as the raw materials and result in the growth of ZnO films, nanobelts, nanowires, nanocombs, nanonails/nanopins, nanoflowers etc. at various temperature zones when Au catalysts are used. We found that pure ZnO nanowires, nanonails and nanorods can be grown on catalyst free substrates. This is obtained at the temperature zone 500 to 650 deg. C, a region beyond those for growing nanobelts. This means catalyst play a role in the growth of nanobelts and nanocombs. In addition, we found that ZnO nanotubes can be grown without catalyst when appropriate cooling procedures are applied. We have also defined a new approach to growth pure phase of ZnO nanowires. Long nanowires with uniform diameter of about 50 nm were obtained. Results obtained by Field-Emission scanning electron microscopy (FESEM), X-ray powder diffraction (XRD), high-resolution transmission electron microscopy (HRTEM), Raman spectroscopy and photoluminescence (PL) will be discussed in the talk.

Gamma Ray Bursts as Distant Cosmological Beacons that Probe the Universe

Vithal Tilvi

Advisor: Dr. Robert Nemiroff

Gamma Ray Bursts (GRBs) are the most violent and energetic explosions in the universe since the Big Bang. Their extremely large luminosities make them detectable to very large distances ~12 billion light years. We explore the relations among different GRB parameters to use the GRBs as distance indicators to high redshifts. Their use to test the Lorentz invariance, dispersion due to medium (Quantum gravity) and other cosmological parameters will be presented.