

Physics Colloquium

Michigan Technological University

Thursday, February 28, 2008, 4:00 pm

Room 139, Fisher Hall

Toward Application of Vertically-Aligned Carbon Nanotubes for Electron Field Emission and Biological Sensing

By Archana Pandey

Advisor: Dr. Yoke Khin Yap

Abstract: Carbon nanotubes are of special interest due to their unique electronic and structural characteristics. These nano-materials are promising for the development of novel technological applications such as electron field emitters, scanning probe microscopy tips, sensors etc. In this talk I will discuss about the growth and applications of Vertically Aligned Multi- Walled Carbon Nanotubes (VA-MWCNTs). The growth of these VA-MWCNTs by a dual-radio frequency Plasma-Enhanced Chemical Vapor Deposition (PECVD) will first be described. Then, the processing and applications of these VA-MWCNTs will be discussed. In particular, the performance of these VA-MWCNTs as the electron field emitters will be discussed by referring to the effects of the catalyst particles at the tips of these VA-MWCNTs, and the electric field screening effects on these VA-MWCNTs. Future applications of these VA-MWCNTs for biosensors will also be described.

QUANTUM TRANSPORT IN A MOLECULAR DEVICE

By Partha Pal

Advisor: Dr. Ranjit Pati

Abstract: Since Aviram and Ratner's groundbreaking proposal [1] of using an organic molecule for current rectification, which was later realized experimentally by Martin *et al.* [2], researchers have taken a lot of interest in fabricating electronic devices using organic molecules. Silicon based semi-conductor electronic devices are struggling to keep up with the Moore's law due to fundamental physical limitations. Abundance of organic molecules combined with their structural flexibility and cheap synthesis procedure make them promising candidates for their usage in the new generation electronic devices. In this talk, I will give an outline of the "Quantum Tunneling" effect which is the basic principle behind electron transport in these devices. I will also talk about controlling this "Tunneling" current in molecular circuit which would be the ultimate dream-purpose of an electronic device.

[1] A. Aviram and M. A. Ratner, *Chem. Phys. Lett.* **29**, 277(1974).

[2] A. S. Martin, J. R. Sambles, and G. J. Ashwell, *Phys. Rev. Lett.* **70**, 218(1993).