

Physics Colloquium

Michigan Technological University

Thursday, March 20th, 2008, 4:00 pm
Room 139, Fisher Hall

Inertial Particle Clustering in Turbulence by Ewe-Wei Saw. Advisor: Raymond Shaw

Abstract: My research focuses on the clustering of particles having much higher mass density than the surrounding fluid (inertial particles) when embedded in turbulence flow. On the fundamental level, turbulence has been called "the last unsolved problem in classical mechanics" by some and this research provides a good check on some of the theories developed for the understanding of turbulence. On the application side, this became of interest because it may provide some insights on the process of rain formation in liquid clouds. Currently my interest is mostly in discerning the fundamental features of this phenomena and how it relates to what we know about turbulent flow. Our work is mainly experimental which includes observations carried out in a turbulent wind tunnel and some in-clouds field studies. In this talk, I will briefly discuss the theoretical background of this problem which includes a short introduction to turbulent flow and an introduction of the radial distribution function (RDF), a tool for quantifying particle clustering. This is followed by a description of a wind tunnel experiment in which this phenomenon is studied. Lastly I will highlight and discuss some of the results we obtained.

Controlled Growth of Zinc Oxide Nanostructures and Conducting Nanowires for Molecular Electronics by Abhishek Prasad Advisor: Dr. Yoke Khin Yap

Abstract: ZnO has proven to be a versatile functional material with promising properties. ZnO nanostructures are especially promising for applications at the nanoscale. Here we report the controlled growth of ZnO nanostructures and its applications. A conventional thermal CVD technique was used for the synthesis of these interesting ZnO nanostructures.

Characterization of these ZnO nanostructures was conducted by X-ray powder diffraction (XRD), high-resolution transmission electron microscopy (HRTEM), Field-emission scanning electron microscopy (FESEM), Raman spectroscopy, and photoluminescence (PL). Results indicate that these ZnO nanostructures were single crystals of pure hexagonal wurtzite structure. Also diameter, density and position of growth of ZnO nanostructures depend on oxygen flow rate, temperature and duration of growth. Details of our growth model guided by the theory of nucleation and the vapor-solid crystal growth mechanism will be discussed. Application of the ZnO nanostructures will also be discussed.

Also one dimensional conducting nanowires are proposed to be used as electrodes in molecular electronics. Among these, Au nanowires are the best suited candidates due to its ability to bind molecules by self-assembly. Here we report the growth of Anodic Alumina membrane to be used as template for the growth gold nanowires.