Physics Colloquium
Michigan Technological University

January 12 (Thursday) 4:00 to 5:00 pm
Room 139, Fisher Hall

A Turbulent Cloud in a Box

Jacob Fugal

Adviser: Dr. Raymond Shaw

Turbulence influences the way atmospheric clouds precipitate and scatter electromagnetic radiation such as sunlight and radar beams. The question remains to what extent and in what way does turbulence influence these cloud processes. While significant theoretical work has been done to answer this question, experimental work has just begun to test theoretical predictions. Our effort to test these predictions involves a laboratory turbulence chamber containing droplets, and with turbulence and droplet parameters made as similar as possible to typical cloud conditions. Our partially built turbulence chamber will be demonstrated. We measure the three-dimensional position of these droplets using holography and digital hologram reconstruction. We can measure the extent of inertial droplet clustering from single holograms and the particle trajectories, velocities and accelerations from a time series of holograms. We will use these measurements to determine the extent of turbulent influence on cloud processes.

Growth of Single/ Double Wall Carbon Nanotube and Directed Assembly of CNTs by Electric Field

Vijaya Kayastha

Advisor: Dr. Yoke Khin Yap

Structural control of carbon nanotubes (CNTs) and the assembly of CNTs at desired locations and orientations are two key steps for future CNT based nano-electronic and nano-sensing devices. We have previously demonstrated vertically oriented growth of multiwall CNTs. The growth mechanism was explained by the dissociative adsorption of acetylene (C_2H_2) molecules on Fe catalyst, and the vapor-liquid-solid processes. Here, we show that this mechanism is applicable for the growth of single- and double- wall CNTs by Al/Fe/Mo catalytic films. At optimum growth condition, vertically aligned double wall carbon nanotubes (DWNTs) were grown at a temperature as low as 700^{o}C. They were 15 μm long at 60sec growth duration and have diameters of 3-5nm. Single wall CNTs were also grown by the same approach at 1000^{o}C by using a burst of C_2H_2. In addition, we have obtained post growth oriented assembly of these CNTs by dielectrophoresis processes. We found that the density and degree of alignment of these CNTs are sensitive to the strength and frequency of the applied a. c. electric field. Purification of CNTs from particulates was also observed by this technique.