

Chemical & Biomedical Engineering

2009 Seminar Series

Mohan Sankaran, Ph.D.

Department of Chemical Engineering

Case Western Reserve University

Friday, November 6th 2 - 3:30 pm

ENC 1002

Title: Microplasma-based approaches to nanomaterials synthesis

Abstract:

Unlike conventional plasmas, microplasmas operate at small volumes (less than 1 nanoliter) and high pressures (up to and exceeding atmospheric). The unique geometry and process conditions afforded by microplasmas opens new avenues for materials synthesis. Vapor precursors can be non-thermally dissociated in a microplasma to produce high densities of radical species and homogeneously nucleate nanoparticles in the gas phase. Excessive particle growth and agglomeration is limited by the short residence times in the microplasma, leading to the formation of particles less than 5 nm in size. By mixing different precursors in the microplasma, alloys of nanoparticles are also produced. The availability of dimensionally and compositionally-controlled metal nanoparticles lends itself to catalytic applications. In this talk, I will focus on catalytic studies of carbon nanotube growth. Single-walled carbon nanotubes are grown in the gas phase by carefully controlling the size of the metal nanocatalyst in the microplasma. On the other hand, tuning the nanocatalyst composition at constant particle size is found to impact the nanotube chirality (e.g. semiconducting vs. metallic). I will discuss these results in detail, highlighting synthesis, characterization, and applications of these novel nanomaterials.

Refreshments will be served.