



MMAE SEMINAR

**Monday, April 12, 2010
E-1 BUILDING – CRAWFORD AUDITORIUM
3:30 – 4:30 PM**

Hybrid Nanomaterials for Chemical and Biological Sensing

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Abstract

Hybrid nanomaterials comprising nanoparticles (NPs) distributing on the surfaces of carbon nanotubes (CNTs) represent a new class of materials. These materials could potentially display not only the unique properties of NPs and those of CNTs, but also additional novel properties due to the interaction (e.g., electronic) between the NP and the CNT. Such hybrid NP-CNT structures are promising for various innovative technological applications, including chemical sensors, biosensors, water treatment, nanoelectronics, photovoltaic cells, fuel cells, hydrogen storage, and lithium ion batteries. This talk will introduce a material-independent, dry route based on the electrostatic force directed assembly (ESFDA) to assemble both aerosol and colloidal NPs onto CNTs to form NP-CNT hybrid structures. The method takes advantage of the small diameter of CNTs for a significantly enhanced electric field near the CNT surface, which facilitates the attraction of oppositely-charged NPs onto CNTs. The ESFDA technique works for both random CNTs and aligned CNT arrays without the need for chemical functionalization or other pretreatments of CNTs. The areal density and the size distribution of NPs on the CNT can be controlled. Due to the inherent material-independence nature of the electrostatic force, various compositions of such NP-CNT hybrid structures can be produced using this technique. Example applications of hybrid nanomaterials, such as the detection of chemical and biological species, will be presented. Through the combination of high-performance CNTs and nanoparticles of popular sensing materials, the hybrid nanostructures exhibit high sensitivity to low-concentration chemical and biological species at room temperature.