THE Alan G. MacDiarmid NanoTech Institute

PRESENTS

Alan B. Dalton

Senior Lecturer, Dept. of Physics
University of Surrey

Wednesday, September 28 at 10 a.m.
ECS North 2.704

Alan received his Ph.D in Polymer Physics from Trinity College Dublin (T.C.D.) in 1999. Following this, he was an Arnold Graves Fellow at the Dublin Institute of Technology before spending a short period as a visiting scientist at Honeywell Technologies. He spent 3 years as a research fellow at the Nanotech Institute at University of Texas at Dallas before joining the University of Surrey (UK) in 2005. He is currently an Associate Professor in Soft Condensed Matter Physics. Alan has published over 100 journal articles in the general area of functional nanostructured materials and holds 5 international patents.

University of Texas at Dallas
2601 N. Floyd Rd. BE26
Richardson, TX 75081

Phone: 972-883-6530
Fax: 972-883-6529
Email: exr063000@utdallas.edu

Latex Based Templated Assembly of Carbon Nanotube and Graphene Based Functional Materials

Focused studies of one-dimensional (1D) nanostructures, such as rods, wires and carbon nanotubes, are driven by their wide-ranging potential applications. However, utilizing the often-extraordinary physical and chemical properties in macroscale systems remains a real bottleneck to generalized application. There is a real need to develop practical technologies for transforming the as-produced nanotubes into materials or integrated assemblies with properties that are both fundamentally interesting and useful for applications. A novel method for tailoring the properties of nanocomposites by controlling the way in which nanomaterials are ordered, using colloidally derived polymer latex crystals is described. This simple colloidal deposition process facilitates the formation of highly ordered multi-arrays of polymer particles, which act as a template for the assembly of carbon nanotubes into three-dimensional hexagonal patterns and thus creates the possibility to overcome problems with filler distribution. The individual particles deform into rhombic dodecahedra, which is mainly driven by capillary forces as the system dries. Nanotubes are assembled and positioned at interstitial sites between the polymer particles resulting in a honeycomb-like arrangement. The use of this facile and elegant technology allows for the formation of robust mechanical composites with electrical percolations markedly lower than witnessed in more conventional polymer composites. The resulting composites maintain their electrical properties but can undergo large strain before failure. More surprisingly, when the stress is released the sample return to its original shape before deformation, while maintaining the inherent structural arrangement of nanotubes at interstitial points. The physical properties of these composites can be tuned by varying controllable parameters such as polymer glass transition temperature, particle size and crystal assembly method. There use as actuators and photonic crystals will also be described.