Stevens Institute of Technology

Nanotechnology Graduate Program

# Assembled Nanostructures: Engineering mechanical, electrical and biological properties of nanomaterials

**Wednesday September 19, 2007**
**Burchard 118, Time 11am**

**Professor Nicholas Kotov**
Department of Chemical Engineering
University of Michigan

Nanoscale building blocks are individually exceptionally strong. The extension of their properties to macroscale composites is a challenging fundamental problem with much practical significance. Assembly of a clay/polymer composite one nanoscale layer after another following the layer-by-layer assembly technology allowed for preparation of a homogeneous, optically transparent material with planar orientation of alumosilicate nanosheets. The stiffness and tensile strength of these multilayer composites are an order of magnitude greater than those for analogous nanocomposites. The same approach can be used for SWNT and other nanotubes. The strength of the resulting composite does not match the strength of individual carbon nanotubes, but still present the record among non-fibrous SWNT composites. The extensive networks of nanotubes formed upon layer-by-layer deposition are very beneficial for electrical properties of SWNT coatings. Control of nanoscale structure in LBL films makes possible combining conductivity and mechanical strength. First steps toward potential applications of SWNT layered composites in solar energy, electronics, fuel cells and implants for electrical stimulation of nerve and muscle tissues will be demonstrated.

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**Prof. Nicholas A. Kotov** (PhD, Moscow State University, 1990) is an Associate Professor at the Departments of Chemical Engineering, Materials Science and Biomedical Engineering at the University of Michigan. He is an expert in nanostructured thin films, nanoscale self-organization processes, and layer-by-layer assembly with 150+ publications in a variety of peer-reviewed scientific magazines including Science, Nature, Angewante Chemie, Nano Letters, Nature Materials, Langmuir, and others. Kotov's areas of scientific interests include organized nanoscale systems and their optical, mechanical, electrical and biological properties. His group is developing now the concepts of protein-nanoparticle analogy, plasmon-exciton hybrid states, transparent electronics with carbon nanotubes, hierarchical design of nanocomposites, and ex-vivo replication of human organs in 3D cell scaffolds. Nicholas Kotov is a recipient of multiple national and international recognitions, which include NSF CAREER Award, Boeing Welliver Fellowship, Humboldt Fellowship, CNRS Fellowship, and Outstanding Young Scholar Award.

**Light refreshments will be served prior to seminar**

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