

UNH Materials Science Seminar

11:00-12:00, Thursday, November 10, 2005

DeMeritt Hall 209B

University of New Hampshire

Morphology Control in Mesoporous Silica/Gold Nanomaterial Synthesis Using Surfactant Self-assembly

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Nanotechnology research is continuing to grow. The success of an idea in this exciting new field depends on the ability to control materials size and shape in the nanometer scale with good reproducibility and fewer steps. There are two major approaches to achieve this goal in the nanometer regime. One is the top down method using photolithography or more modern approaches like Dip-Pen Lithography and nanoimprint Lithography to produce nanoscale patterns. The other major method is building from bottom up using molecular self assembly.

Mesoporous materials are considered an important sub-class of materials used in Nanotechnology and the methods serve as very good examples of bottom up strategy. Because of their high surface area and large pore volume these materials attract broad interest and wide applicability not only in traditional fields such as Chromatography, Catalysis and Chemical sensing but also in the electronics industry as low K interconnects. One route to synthesizing them is through sol-gel chemistry in the presence of surfactant templates.

The first part of the talk will discuss the methods of making mesoporous silica materials with one additional level of complexity i.e to synthesize them on the surface of a nanoparticle like gold. The talk will highlight how the self assembly of the well known surfactant CTAB (Cetyl trimethylammonium bromide) and silica was manipulated using the mixed solvents and the source of organo siloxane precursors. This ultimately resulted in new morphologies of mesoporous silica and gold composites that were not observed before.

The last part of the talk will focus on the zeta potential measurement of gold nanoparticles using Capillary Electrophoresis which provided new insight into the nature of nanoparticle surfaces.