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ΣΕΜΙΝΑΡΙΟ

ΟΜΙΛΗΤΗΣ: Dr. George Karanikolos
University of Minnesota, USA

ΘΕΜΑ: **Controlled Synthesis of Nanostructures:**
(1) Templated Growth of Semiconductor Nanocrystals
(2) Seeded Growth of Nanoporous Molecular Sieves

ΤΟΠΟΣ: Αίθουσα Σεμιναρίων ΙΤΕ/ΕΙΧΗΜΥΘ

ΗΜΕΡΟΜΗΝΙΑ: Δευτέρα, 15 Μαίου 2006

ΩΡΑ: 16:00

ΠΕΡΙΛΗΨΗ

Semiconductor nanocrystals, that confine excitons (i.e., electron-hole pairs) in zero, one, or two dimensions, are currently attracting great attention due to their unique size- and shape-dependent properties that have the potential to revolutionize clinical diagnostics, photovoltaics, and high-density optoelectronics. The first part of the presentation will focus on the templated growth of compound semiconductor nanostructures (e.g. ZnSe, CdSe, CdS, PbSe, etc.) by two new techniques that were developed in our lab and that exploit the dispersed phase of self-assembled block copolymer microemulsions and lyotropic liquid crystals to form numerous identical nanoreactors, producing almost monodisperse nanocrystal populations at room temperature. The rich structural polymorphism of PEO-PPO-PEO block copolymers in selective solvents allowed the production of nanostructures with a variety of sizes and shapes, each having a completely distinct set of optical and electronic properties, that include quantum dots, nanowires, self-standing nanoplates and disks, hollow spheres, and nanotubes.

The second part of the presentation will focus on the development of oriented nanoporous molecular sieve films by seeded growth. The aluminophosphate $AlPO_4$-5 will be discussed in particular. Controlling the orientation of the subnanometer-sized channels of $AlPO_4$-5 molecular sieves is of particular interest for separation membranes, size-selective chemical sensors, and optical systems. The secondary or seeded growth technique involves the synthesis of a suspension of molecular sieve particles (~ 100-500 nm) and the deposition of particles on appropriate supports to form a seed layer. The seeded surface is then exposed to hydrothermal growth conditions, whereupon the seed crystals grow into a polycrystalline film. This method offers great flexibility in controlling the orientation of the molecular sieve crystals and the microstructure of the film, since it decouples the nucleation and the growth steps. As a result, the orientation and morphology of the crystals can be manipulated, in principle, by changing the morphology and orientation of the deposited seed layer, followed by secondary growth under the appropriate conditions.