



**MATERIALS DEPARTMENT / MRL  
JOINT COLLOQUIUM**

Friday, September 25, 2009, 4:00 PM, ESB 1001



**DOW LECTURER**

**“Confinement-Induced Self-Assembly of Mushroom  
Cap-Shaped Colloids for Photonics”**

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**Abstract**

Controlling light-matter interactions with materials structured at micron and submicron length scales has been predicted as the basis for enhancements in the performance of a range of technologies, including photovoltaics, sensors and solid state lighting devices. However, the types of thermodynamically stable structures from building blocks such as colloidal spheres with simple interactions are limited. For example, face-centered cubic structures have been a staple as templates for mesoporous materials although the light-matter interaction in the structure is known to be relatively weak as compared to other arrangements. Recent advances in colloid synthesis to prepare monodisperse shape-anisotropic particles provide the opportunity to address the challenge and produce a diverse range of ordered structures. In particular, computational simulations and mechanical models suggest that upon system compression (densification) nonspherical dimmer colloids should undergo disorder-order and order-order phase transitions to unconventional solid structures based on free energy minimization. The particle systems have notable analogy to molecular systems, where the shape of molecules and their packing density has been shown to critically influence structural phase behavior and lead to a rich diversity of structures, both natural and synthetic. The engineering challenges have been in attaining sufficiently monodisperse colloidal building blocks, as well as the lack of understanding and control of self-assembly processes for non-spherical colloids. This talk will highlight our investigations of how particle shape and confinement programs the self-organization of structure. Optical property simulations for unconventional arrangements with nonspherical particle bases will also be discussed.

Host: Graduate Students for Diversity in Science

**LIGHT REFRESHMENTS WILL BE SERVED PRIOR TO THE SEMINAR AT 3:45PM**