**Joint Meeting** with the **Chemical Sciences Division**

**Wednesday, July 26, 2006**

11:00 am
CNMS Executive Conference Room (8610, L-183)

**Refreshments will be served at 10:45 am**

“From Germanium Zintl Clusters to Periodic Nano-Ordered Porous Germanium: Synthesis and Characterization”

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**Abstract***

A new class of non-oxide mesoporous materials based on germanium has been synthesized from germanium Zintl clusters, discrete Ge\(_6^2-\) or polymeric (Ge\(_9^2-\))\(_n\) species, through electrostatically driven co-assembly with cationic surfactants. Depending upon the surfactant and clusters used in the synthesis, the periodicity of the nano-structured composites can be transformed from hexagonal to lamellar, or to worm-like. The germanium framework of the honeycomb composite was condensed by oxidative coupling between the germanium Zintl clusters. EXAFS indicates that the process breaks up the clusters and produces tetrahedrally coordinated germanium. The cationic surfactant molecules inside the pores can further be removed by ion-exchange with a proton-exchange resin. The resulting mesoporous germanium exhibits surface area up to 500 m\(^2\)/g. As expected for a pure Ge material, the porous germanium is a narrow-band gap semiconductor. Optical experiments further indicate that the band gap can be tuned by changing the wall thickness, by adsorption of surface species on the pore walls, or by modifying the elemental composition of the inorganic framework.

*Dong Sun et al., *Nature *441*, 1126 (29 June 2006).*