



## ~~Special Polymer Physics Seminar ~~

### **Professor Lynn M. Walker**

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**10:00 AM Tuesday**  
**January 18<sup>th</sup>, 2011**  
**301 Steidle Bldg.**

### **Structure and Shear Alignment of Nanoparticle-Block Copolymer Hydrogels**

Self-assembled block copolymer templates are used to control the nanoscale structure of materials that would not otherwise order in solution. In this work, we have developed a technique to use close-packed cubic and cylindrical mesophases of a thermoreversible block copolymer (PEO-PPO-PEO) to impart spatial order on dispersed nanoparticles. The thermoreversible nature of the template allows for the dispersion of particles synthesized outside the template. This feature extends the applicability of this templating method to many particle-polymer systems and also permits a systematic evaluation of the impact of design parameters on the structure and mechanical properties of the nanocomposites. The criteria for forming co-crystals has been fully characterized using contrast-matching small-angle neutron scattering (SANS) and the mechanical properties of these soft crystals determined. SANS experiments also demonstrate that shear can be used to align the nanocomposites into single-crystal macro-domains; the first demonstration of the formation of single-crystal nanoparticle superlattices. Numerous crystal structures have been reported for the block copolymer system and we have taken advantage of several to generate soft co-crystals. We are currently utilizing SANS to understand the flow mechanisms of several types of these co-crystals.