FUNCTIONAL COMPOSITES FROM BLOCK COPOLYMER AND NANOPARTICLE SELF-ASSEMBLY

Uli Wiesner

Materials Science and Engineering, Cornell University, Ithaca NY, 14835

ABSTRACT

This talk will describe how self-assembly concepts developed in the field of polymer science can be successfully employed to structure various inorganic/solid-state materials on the tens of nanometer scale into complex, multifunctional materials. By using thermodynamic principles established for block copolymers and mixtures with nanoparticles, well-defined morphologies are obtained. Varying processing steps of the polymer-inorganic hybrids results in nanoporous materials with uniform pores and hexagonal as well as bicontinuous cubic pore structures. These concepts are applied to aluminosilicates, non-oxide type ceramics stable up to 1500°C, crystalline transition metal oxides, metals as well as silicon. The talk will discuss details of the various chemical approaches and will give perspectives of the results in the context of nanomaterials for the life sciences and energy generation and storage applications.