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Department of Chemistry

Seminar

9:45 a.m. Tuesday, September 3, 2013 • 331 Smith Hall

Regents Professor

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Ion Gels and Hydrogels: Designer Soft Materials from Triblock Polymers

Research interests: multicomponent polymer systems, such as block copolymers, which can undergo self-assembly to form interesting nanostructures in both solution and bulk.
Website: http://www.chem.umn.edu/directory/faculty.lasso?serial=456

Abstract

Gels—polymeric networks swollen with a substantial amount of solvent—represent a fascinating class of soft materials, with wide-ranging applications in fields as diverse as biomedicine, pharmaceutics, personal care products, foods, sensors, actuators, flexible electronics, oil recovery, and adhesives. Physical gels are held together by non-covalent interactions, which may be as specific as hydrogen bonds, or as general as solvophobic association of insoluble blocks. Among the attractive features of physical gels are reversibility, stimuli-responsiveness, and tunability of macroscopic properties. There are exciting opportunities to design new gel systems based on block polymers, given the relative ease with which tailored architectures can be synthesized by modern controlled polymerization techniques.

In this talk, two classes of physical gels will be highlighted. In one, the ability of ABC block terpolymers to form novel hydrogel structures will be demonstrated, where blocks A and C are mutually immiscible and hydrophobic, while B is hydrophilic. In particular, the formation of hydrogels by sequential association (first A, then C) leads to a remarkably sharp gelation transition, at a relatively low polymer concentration, compared to analogous gels formed from ABA systems. In the other, ion gels formed by self-assembly of various ABA and ABC systems in ionic liquids will be described, and in particular how gelation can be controlled through factors such as block chemistry, temperature, choice of ionic liquid, and application of light. Use of these gels in applications as diverse as printed plastic electronics and CO_2 separations will also be described.

Refreshments will be served prior to the seminar.