MAR14-2013-000699

Abstract for an Invited Paper
for the MAR14 Meeting of
the American Physical Society

Responsive Hydrogels and Ion Gels by Self-Assembly of ABA and ABC Triblock Polymers

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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. In this talk two classes of physical gels will be highlighted. In one, the ability of ABC block terpolymers to form novel structures will be demonstrated, where blocks A and C are mutually immiscible and solvophobic, while B is solvophilic. In particular, the formation of gels 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 second class, gels formed by self-assembly of a variety of ABA 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.