MAR10-2009-006149

Abstract for an Invited Paper
for the MAR10 Meeting of
the American Physical Society

Strain hardening, fracture and toughening mechanisms in self-assembling gels

KENNETH SHULL, Northwestern University

Polymer gels based on triblock copolymers in a midblock-selective solvent are excellent model systems for studying fundamental features of network mechanics. We use a series of acrylic triblock gels that exhibit both a concentration dependent "structural" gelation phenomenon and a temperature dependent "dynamic" gelation phenomenon. Dynamic gelation is controlled by the exchange kinetics of endblock between different aggregates, and is strongly temperature dependent because of an underlying glass transition of the endblock aggregates. Structural gelation is controlled by midblock chains which form a percolated network of endblock aggregates above a critical concentration. The focus of this talk is on the non-linear mechanical response of these materials, including strain hardening and fracture in both extension and in shear. We also discuss the design of high toughness ionically crosslinked gels with a type of double network structure.