

Abstract Submitted  
for the MAR06 Meeting of  
The American Physical Society

**Highly Responsive Self-Assembled Gels from Triblock Copolymers in Liquid Crystal Solvent** NEAL SCRUGGS, California Institute of Technology, RAFAEL VERDUZCO, California Institute of Technology, JULIA KORNFIELD, California Institute of Technology — Triblock copolymers having random coil endblocks and a side-group liquid crystalline polymer (SGLCP) midblock self-assemble in small-molecule liquid crystal (LC) solvent to form highly responsive gels. In these block copolymers, the LC solvent switches from being strongly selective toward the SGLCP block below its isotropic-nematic transition ( $T < T_{NI}$ ) to being a good solvent for both blocks in the isotropic phase. In the nematic phase, the LC solvent is a poor solvent for the polystyrene (PS) endblocks, driving them to physically associate to form the network crosslinks. In the isotropic phase, at dilute polymer concentrations, the PS endblocks are solubilized to yield a solution of free polymer chains. Synergistic coupling between polymer and solvent results in a gel with novel properties; the orientational order of the nematic LC solvent imparts electro-optic and mechano-optic properties that are forbidden by symmetry in isotropic gels, and the polymer network provides memory via long-time relaxation processes that do not exist in the bulk LC. Gels can be aligned into a single-crystal monodomain by applied shear, electric fields, magnetic fields, or surface effects, and the alignment state is preserved by the network's elastic restoring force. Insights into the structure and dynamics of the gels are gained by rheometry, small-angle neutron scattering, and electro-optical switching experiments.

Neal Scruggs  
California Institute of Technology

Date submitted: 30 Nov 2005

Electronic form version 1.4