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Self-Assembly of Block Copolymers in a Nematic Liquid Crystal Solvent NEAL SCRUGGS, RAFAEL VERDUZCO, JULIA KORNFIELD, California Institute of Technology — Solutions of side-group liquid crystal polymers (SGLCPs) in a liquid crystal (LC) solvent are governed by rich thermodynamics resulting from the competition between the solvent's orientational order and the polymer's conformational entropy. Solutions of SGLCP-random coil block copolymers in LC solvent have an additional layer of complexity deriving from lyophilic/lyophobic interactions between the blocks and the solvent. Dissolving a triblock copolymer yields an LC gel where synergistic coupling between polymer and solvent results in novel properties; the orientational order of the nematic LC solvent imparts electo-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. The gels are thermoreversible because the random coil block becomes soluble above the solvent's isotropic transition temperature. The exceptional sensitivity of these block copolymers' self-assembled structures to temperature and polymer architecture is demonstrated by small-angle neutron scattering and rheometry. NMR and neutron scattering give a detailed understanding of the coupling between the solvent order and SGLCP conformation.

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