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Equilibrium Phase Diagram of a Model Rod-Coil Block Copolymer B.D. OLSEN, R.A. SEGALMAN, University of California Berkeley and Lawrence Berkeley National Lab — Rod-coil block copolymers can be used to form important self-assembled structures containing functional blocks such as helical polypeptides or conducting polymers. The thermodynamics of these materials is distinct from classical block copolymers due to the conformational asymmetry of the polymer chain and the effect of liquid crystallinity on the microphase structure. We have recently developed a weakly segregated model system, poly(alkoxyphenylene vinylene-b-isoprene) (PPV-b-PI), in which rod-rod and rod-coil interactions are modulated by the presence of short side chains on the rod. We present the phase diagram for rod-coil block copolymers in the weak segregation limit, demonstrating equilibrium lamellar, nematic, and isotropic phases. As molecular weight is increased, subtle order-order transitions in the lamellar phase become obvious. In particular, we will discuss the relative stabilities of smectic phases based on scattering data. Finally, we will discuss the non-lamellar hexagonal phases that are observed as the relative rod-fraction of the block copolymer is decreased.

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