518a Equilibrium Self-Assembly of Rod-Coil Block Copolymer Thin Films

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Well ordered rod-coil block copolymers are interesting for a number of applications in organic optoelectronics and biology. Due to the deviation of one block from a random coil configuration, a number of intriguing and unusual phases have been observed. However, most rod-coil block copolymer systems are highly segregated and have inaccessible order-disorder transitions. This has previously prevented the formulation of a thermodynamic equilibrium phase diagram analogous to that of classical coil-coil diblock copolymers. We have synthesized a model rod-coil block copolymer consisting of a conjugated rod block with regularly spaced sidechains similar in composition to the coil. We demonstrate that by careful tuning of sidechain chemistry we can alter block interactions and gain insight into the complex self-assembly of these materials. In a weakly segregated model system, we observe lamellae, a phase-mixed nematic and finally an isotropic, mixed phase as temperature is increased across a wide range of rod block fractions. In this talk, I will discuss the effects of molecular conformation on self-assembly and describe the experimental phase diagram of a new weakly segregated rod-coil block copolymer. I will also discuss control over order in rod-coil polymer thin films and compare our results to simulations of rod-coil block copolymer phase separation.