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Design and characterization of well-defined supramolecular polymers KATHLEEN SCHAEFER, MATTHEW KADE, CRAIG HAWKER, EDWARD KRAMER, UCSB — Polymeric materials with well-defined and controllable temperature dependent properties are of interest both for technological applications and fundamental physical studies. Melt processing requires low viscosity, while resistance to fracture is desirable at material operating temperatures, and these two properties are often mutually exclusive. Through controlled radical polymerization (ATRP) we have synthesized tailor-made polymers with MHB groups specifically located at one or both chain ends or randomly along the backbone to provide thermal tunability, and by changing the nature of the MHB group (complementary or self-complementary) we can control the specificity and type of the polymer-polymer interaction. As a simple model system, we investigate the case of two end-functional MHB homopolymers that form a novel supramolecular diblock copolymer. Two energies are expected to be important in this system—χN, the Flory-Huggins interaction parameter times the degree of polymerization, which describes the polymer-polymer interaction, and ε, the binding energy of the MHB group. Using deuterium labeled polymers in various multilayer thin film structures, dynamic secondary ion mass spectrometry (dSIMS) allows each of these parameters to be measured independently and these values used to design technologically and physically interesting new materials.

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