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Tuning Structural Properties of Biocompatible Block Copolymer Micelles by Varying Solvent Composition TYLER COOKSEY, AVANTIKA SINGH, KIM MAI LE, SHU WANG, Univ of Houston, ELIZABETH KELLEY, Univ of Delaware, NIST, LILIN HE, ORNL, SAMEER VAJJALA KESAVA, ENRIQUE GOMEZ, Penn State, BRYCE KIDD, LOUIS MADSEN, Virginia Tech, MEGAN ROBERTSON, Univ of Houston — The self-assembly of block copolymers into micelles when introduced to selective solvents enables a wide array of applications, ranging from drug delivery to personal care products to nanoreactors. In order to probe the assembly and dynamics of micellar systems, the structural properties and solvent uptake of biocompatible poly(ethylene oxide-b-ε-caprolactone) (PEO-PCL) diblock copolymers in deuterated water (D_2O) / tetrahydrofuran (THF_{d8}) mixtures were investigated using small-angle neutron scattering in combination with nuclear magnetic resonance. PEO-PCL block copolymers, of varying molecular weight yet constant block ratio, formed spherical micelles through a wide range of solvent compositions. Varying the composition from 10 to 60 % by volume THF_{d8} in D_2O / THF_{d8} mixtures was a means of varying the core-corona interfacial tension in the micelle system. An increase in THF_{d8} content in the bulk solvent increased the solvent uptake within the micelle core, which was comparable for the two series, irrespective of the polymer molecular weight. Differences in the behaviors of the micelle size parameters as the solvent composition varied originated from the differing trends in aggregation number for the two micelle series. Incorporation of the known unimer content determined from NMR allowed refinement of extracted micelle parameters.

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