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Thermodynamics and Mechanism of the Block Copolymer Micelle Shuttle between Water and an Ionic Liquid[1] ZHIFENG BAI, TIMOTHY LODGE, University of Minnesota — The micelle shuttle, whereby amphiphilic poly((1,2-butadiene)-b- ethylene oxide) (PB-PEO) block copolymer micelles reversibly transfer between water and a hydrophobic ionic liquid upon a temperature stimulus, is of interest in delivery, reaction and separations in synthesis and biphasic catalysis involving ionic liquids. A solvophobic dye-labeled short PB homopolymer is loaded into the PB-PEO micelles and quantitatively shuttled between the two fluids. The micelle distribution in the biphasic system has a favorably strong temperature dependence as revealed by quantitative fluorescence analysis, which is further used to extract the standard Gibbs free energy change (ΔG°), enthalpy change (ΔH°) and entropy change (ΔS°) of the transfer. The slow yet spontaneous micelle shuttle is explored under quiescent conditions to understand the transfer kinetics. A detailed mechanism for the transfer is proposed.

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