

MAR16-2015-000807

Abstract for an Invited Paper  
for the MAR16 Meeting of  
the American Physical Society

### **Dynamics of Chain Exchange in Block Copolymer Micelles**

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Block copolymer micelles are rarely at equilibrium. The primary reason is the large number of repeat units in the insoluble block,  $N_{core}$ , which makes the thermodynamic penalty for extracting a single chain (“unimer exchange”) substantial. As a consequence, the critical micelle concentration (CMC) is rarely accessed experimentally; however, in the proximity of a critical micelle temperature (CMT), equilibration is possible. We have been using time-resolved small angle neutron scattering (TR-SANS) to obtain a detailed picture of the mechanisms and time scales for chain exchange, at or near equilibrium. Our model system is poly(styrene)-*block*-poly(ethylene-*alt*-propylene) (PS-PEP), in the PEP-selective solvent squalane (C<sub>30</sub>H<sub>62</sub>). Equivalent micelles with either normal (hPS) or perdeuterated (dPS) cores are initially mixed in a blend of isotopically substituted squalane, designed to contrast-match a 50:50 hPS:dPS core. Samples are then annealed at a target temperature, and chain exchange is revealed quantitatively by the temporal decay in scattered intensity. The rate of exchange as function of concentration, temperature,  $N_{core}$ ,  $N_{corona}$ , and chain architecture (diblock versus triblock) will be discussed.