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Chain exchange in triblock copolymer micelles JIE LU, TIMOTHY LODGE, FRANK BATES, University of Minnesota — Block polymer micelles offer a host of technological applications including drug delivery, viscosity modification, toughening of plastics, and colloidal stabilization. Molecular exchange between micelles directly influences the stability, structure and access to an equilibrium state in such systems and this property recently has been shown to be extraordinarily sensitive to the core block molecular weight in diblock copolymers. The dependence of micelle chain exchange dynamics on molecular architecture has not been reported. The present work conclusively addresses this issue using time-resolved small-angle neutron scattering (TR-SANS) applied to complimentary S-EP-S and EP-S-EP triblock copolymers dissolved in squalane, a selective solvent for the EP blocks, where S and EP refer to poly(styrene) and poly(ethylenepropylene), respectively. Following the overall SANS intensity as a function of time from judiciously deuterium labelled polymer and solvent mixtures directly probes the rate of molecular exchange. Remarkably, the two triblocks display exchange rates that differ by approximately ten orders of magnitude, even though the solvophobic S blocks are of comparable size. This discovery is considered in the context of a model that successfully explains S-EP diblock exchange dynamics.

Jie Lu
University of Minnesota

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