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Measurement of Diffusion in Entangled Rod-Coil Triblock Copolymers B.D. OLSEN, M. WANG, Massachusetts Institute of Technology — Although rod-coil block copolymers have attracted increasing attention for functional nanomaterials, their dynamics relevant to self-assembly and processing have not been widely investigated. Because the rod and coil blocks have different reptation behavior and persistence lengths, the mechanism by which block copolymers will diffuse is unclear. In order to understand the effect of the rigid block on reptation, tracer diffusion of a coil-rod-coil block copolymer through an entangled coil polymer matrix was experimentally measured. A monodisperse, high molecular weight coil-rod-coil triblock was synthesized using artificial protein engineering to prepare the helical rod and bioconjugaiton of poly(ethylene glycol) coils to produce the final triblock. Diffusion measurements were performed using Forced Rayleigh scattering (FRS), at varying ratios of the rod length to entanglement length, where genetic engineering is used to control the protein rod length and the polymer matrix concentration controls the entanglement length. As compared to PEO homopolymer tracers, the coil-rod-coil triblocks show markedly slower diffusion, suggesting that the mismatch between rod and coil reptation mechanisms results in hindered diffusion of these molecules in the entangled state.

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