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Experimental diffusion measurements of entangled rod-coil block copolymers MUZHOU WANG, KSENIA TIMACHOVA, ALFREDO ALEXANDER-KATZ, BRADLEY OLSEN, Massachusetts Institute of Technology — A fundamental theory for the dynamics of rod-coil block copolymers is important for understanding diffusion, mechanics, and self-assembly kinetics in functional nanostructured materials for organic electronics and biomaterials. Recently our group has proposed a reptation theory for the diffusion of entangled rod-coil block copolymers, showing the slower dynamics of rod-coils is due to the mismatch between the curvature of the rod and coil blocks. Here we present experimental tracer diffusion measurements of model rod-coil diblock and coil-rod-coil triblock copolymers that support this theory. The model systems are composed of poly(ethylene oxide) coils and polyalanine α-helical rods synthesized by bacterial expression and bioconjugation, and tracer diffusion in entangled solutions is measured by forced Rayleigh scattering. The experiments support both the activated reptation and arm retraction mechanism for the small and large rod regimes that were previously presented in our theory. Comparison of both simulation and experiments between diblock and triblock copolymers suggests that the diffusion mechanisms are independent of the different symmetry and molecular architecture of the molecules.

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