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Molecular model for the diffusion of associating telechelic polymer networks JORGE RAMIREZ, Univ Politecnica de Madrid, THOMAS DURSCH, BRADLEY OLSEN, Massachusetts Institute of Technology — Understanding the mechanisms of motion and stress relaxation of associating polymers at the molecular level is critical for advanced technological applications such as enhanced oil-recovery, self-healing materials or drug delivery. In associating polymers, the strength and rates of association/dissociation of the reversible physical crosslinks govern the dynamics of the network and therefore all the macroscopic properties, like self-diffusion and rheology. Recently, by means of forced Rayleigh scattering experiments, we have proved that associating polymers of different architectures show super-diffusive behavior when the free motion of single molecular species is slowed down by association/dissociation kinetics. Here we discuss a new molecular picture for unentangled associating telechelic polymers that considers concentration, molecular weight, number of arms of the molecules and equilibrium and rate constants of association/dissociation. The model predicts super-diffusive behavior under the right combination of values of the parameters. We discuss some of the predictions of the model using scaling arguments, show detailed results from Brownian dynamics simulations of the FRS experiments, and attempt to compare the predictions of the model to experimental data.

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