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Dynamics of associating networks SHENGCHANG TANG, Massachusetts Institute of Technology, AXEL HABICHT, Freie Universitt Berlin, MUZHOU WANG, SHUAILI LI, Massachusetts Institute of Technology, SEBASTIAN SEIFFERT, Freie Universitt Berlin, BRADLEY OLSEN, Massachusetts Institute of Technology — Associating polymers offer important technological solutions to renewable and self-healing materials, conducting electrolytes for energy storage and transport, and vehicles for cell and protein deliveries. The interplay between polymer topologies and association chemistries warrants new interesting physics from associating networks, yet poses significant challenges to study these systems over a wide range of time and length scales. In a series of studies, we explored self-diffusion mechanisms of associating polymers above the percolation threshold, by combining experimental measurements using forced Rayleigh scattering and analytical insights from a two-state model. Despite the differences in molecular structures, a universal super-diffusion phenomenon is observed when diffusion of molecular species is hindered by dissociation kinetics. The molecular dissociation rate can be used to renormalize shear rheology data, which yields an unprecedented time-temperature-concentration superposition. The obtained shear rheology master curves provide experimental evidence of the relaxation hierarchy in associating networks.

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