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Effects of Attractive Interactions on Nanoparticle Diffusion in Entangled Polymer Melts PHILIP GRIFFIN, University of Pennsylvania, NIGEL CLARKE, University of Sheffield, RUSSELL COMPOSTO, KAREN WINEY, University of Pennsylvania — Developing a complete picture for the mechanism of nanoparticle diffusion in model polymer nanocomposites remains a great challenge, especially experimentally. Using Rutherford backscattering spectroscopy, we have measured the translational diffusion coefficient of spherical nanoparticles (diameter = 20 nm) infiltrated into poly(2-vinylpyridine) melts across a range of molecular weights (35-300 kg/mol). Our results reveal that the diffusion coefficient of nanoparticles in attractive nanocomposites is several times slower than what is predicted from the melt viscosity according to the Stokes-Einstein (SE) relation. This runs contrary to recent theoretical studies of non-attractive systems, where it is predicted that nanoparticle diffusion can be many orders of magnitude faster than SE predictions. Potential explanations for this unusual slowing of nanoparticle diffusion are discussed.

Philip Griffin
University of Pennsylvania

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