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Do attractive interactions slow down diffusion in polymer nanocomposites? CHIA-CHUN LIN, SANGAH GAM, University of Pennsylvania, JEFFREY S. METH, DuPont Co. , NIGEL CLARKE, University of Sheffield, KAREN I. WINEY, RUSSELL J. COMPOSTO, University of Pennsylvania — Diffusion of deuterated poly(methyl methacrylate) (dPMMA) is slowed down in PMMA matrix filled with spherical silica nanoparticles (NPs) ranging from 13 to 50 nm in diameter. NPs are well dispersed in the matrix up to 40 vol%. The normalized diffusion coefficients (D/D_0) decrease as the volume fractions increases, and this decrease is stronger as NPs size decreases. When plotted against the confinement parameter, $ID/2R_g$, where ID is interparticle distance and $2R_g$ is probe size, D/D_0 collapse onto a master curve. In the strongly confined region where $ID < 2R_g$, D/D_0 decrease dramatically up to 80 %, whereas in the weakly confined region where $ID > 2R_g$, D/D_0 decrease moderately. Even when ID is eight times larger than $2R_g$, a 15 % reduction in the diffusion is observed. The master curve of this study, an attractive system, compared with a weakly interacting system previously studied, indicating attractive interactions do not significantly alter center of mass polymer diffusion in polymer nanocomposites.

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None

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