

Abstract Submitted
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The Role of Excluded Volume on the Reduction of Polymer Diffusion into Nanocomposites JEFF METH, DuPont Co, SANGAH GAM, RUSSELL COMPOSTO, KAREN WINEY, University of Pennsylvania — An analytic model for the reduction of polymer chain diffusion in nanocomposites attributable to excluded volume effects is presented. The nanocomposite is modeled as an ensemble of cylinders through which the polymer chain diffuses. The distribution of cylinder diameters in the ensemble is predicted from statistical mechanical theories based on the packing of spheres. The reduction in polymer diffusion is accounted for by the truncation of the partition function for a random walk in a cylinder. For low loadings of spherical particles in nanocomposites, we show that this theory results in a master curve for the reduced diffusion coefficient. The theory, with no adjustable parameters, is in agreement with recent data for tracer diffusion measurements in polymer nanocomposites at low loading.

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