

Abstract Submitted
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Polymer Diffusion Slows Down in Nanocomposites Containing Hard Nanospheres¹ RUSSELL COMPOSTO, SANGAH GAM, KAREN WINEY, University of Pennsylvania, NIGEL CLARKE, University of Sheffield, JEFFREY METH, E.I. DuPont de Nemours & Co. — Here, we present two experimental studies of tracer diffusion in polymer nanocomposites (PNCs). Tracer diffusion of deuterated polystyrene (dPS) in a PS matrix containing phenyl-grafted silica (13nm and 29nm) represents a PNC with a weak polymer/particle interaction [1]. However, tracer diffusion of deuterated poly(methyl methacrylate) (dPMMA) in a PMMA matrix containing hydroxyl-terminated silica (13 nm and 28nm) represents a PNC with a strongly attractive polymer/particle interaction. In the former case, the normalized diffusion coefficients fall on a master curve when plotted against the confinement parameter, namely the interparticle separation normalized by the probe size. However in the latter case, the reduced diffusion coefficients in the PMMA matrix with 13nm nanoparticles are less than those with 29nm nanoparticles, suggesting that enthalpic interactions play a role in slowing down diffusion. These experimental studies indicate that a successful model of polymer dynamics must include contributions due to constraints imposed by the nanoparticles as well as interactions between polymer and nanoparticles.

[1] Gam, S., *et. al.*, *Macromolecules* **44**, 3494-3501, 2011.

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