

Abstract Submitted  
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**Polymer Diffusion in Nanocomposites with Nanorods: Bridging the Gap between Nanosphere and Nanotube fillers** JIHOON CHOI, University of Pennsylvania, NIGEL CLARKE, University of Sheffield, KAREN I. WINEY, RUSSELL J. COMPOSTO, University of Pennsylvania — The tracer diffusion of deuterated polystyrene (dPS; 168-3200 kg/mol) is measured in polystyrene (650 kg/mol) nanocomposites containing phenyl-capped nanorods with a similar aspect ratio ( $AR = 9$ ) but different sizes, NR-short ( $\text{TiO}_2$ ;  $l = 43.1$  nm and  $d = 4.6$  nm) and NR-long ( $\text{SiO}_2\text{-}[\text{Ni}(\text{N}_2\text{H}_4)_3]\text{Cl}_2$ ;  $l = 371$  nm and  $d = 43$  nm). For NR-long where  $l > 2R_g$ , the diffusion coefficient initially decreases as nanorod volume fraction increases but then begins to increase for near the percolation threshold. In this system,  $R < R_g$  and the diffusion behavior is consistent with previous studies of carbon nanotubes (i.e.,  $l \gg 2R_g$ ). However, for NR-short (i.e.,  $l < 2R_g$ ), diffusion shows a monotonic slowing down as the volume fraction increases despite the small values of  $R/R_g$ . This behavior is similar to the slowing down observed for isotropic nanoparticles. These experiments demonstrate that not only radius but also length of the nanoparticle plays a key role in diffusion. Moreover, these results indicate that a comprehensive model for polymer dynamics should include the geometry of the nanoparticle relative to  $R_g$ .

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