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Determination of the Tracer Diffusion Coefficient of Soft Polystyrene Nanoparticles using Neutron Reflectivity ADAM IMEL, BRAD MILLER, University of Tennessee-Knoxville, WADE HOLLEY, Oak Ridge National Laboratory, DURAIRAJ BASKARAN, JIMMY MAYS, MARK DADMUN, University of Tennessee-Knoxville — The diffusion properties of nanoparticles in polymer nanocomposites are largely unknown and depend intimately on the dispersion of the nanoparticles. We examine the diffusion of soft, organic nanoparticles, which disperse in a polymer matrix due to the interpenetration of polymer chains and particles and the reduction in the depletion of entropy in the system. The impact of the presence of soft nanoparticles on the diffusion coefficient of polystyrene chains has recently been determined with neutron reflectivity. This was completed by monitoring the interdiffusion of deuterated and protonated polystyrene nanocomposite bilayers with and without the soft nanoparticles dispersed throughout both layers and extracting the diffusion coefficient from the one-dimensional solution to Fick's second law of diffusion. In this work, we extend this method to bilayer systems with only the soft nanoparticles as one of the layers and a linear deuterated polystyrene as an adjacent layer. The development of this method allows us to determine the tracer diffusion coefficient of the soft polystyrene nanoparticles for the first time by analyzing the mutual diffusion coefficient from Fick's second law and the fast and slow modes theories for diffusion.

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