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Polymer Dynamics under Cylindrical Nano-Confinement KAREN WINEY, WEI-SHAO TUNG, ROBERT RIGGLEMAN, University of Pennsylvania — Polymer melts under cylindrical confinement have previously been shown to exhibit chain conformations elongated parallel to the cylinder axis and compressed perpendicular to the cylinder. Further, simulations and theory found that the number of entanglements per chain decreases as the cylinder diameter decreases. This talk presents the local dynamics and polymer diffusion under cylindrical nanoconfinement using simulations and experiments. For the molecular dynamics simulations, an entangled polymer is confined by an amorphous cylindrical confinement. Local dynamics and local packing of monomers are affected by the cylindrical confinement and an anisotropic mean-squared displacement is observed with faster motion along the cylinder axes that increases with increasing confinement. Using elastic recoil detection experiments, polymer diffusion coefficients along cylindrical nanopores were measured for deuterated polystyrene diffusing into nanoporous membranes infiltrated with polystyrene. The tracer diffusion coefficient increased with decreasing pore size, although the increase is less pronounced than found in the simulations. Results will be discussed in terms of the reptation model.

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