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Unexpected Decoupling of Translational and Reorientational Segmental Dynamics in Attractive Polymer Nanocomposites PHILIP GRIFFIN, ERIC BAILEY, University of Pennsylvania, MADHUSUDAN TYAGI, NIST, KAREN WINEY, University of Pennsylvania — Polymer dynamics in the vicinity of an enthalpically attractive surface can be significantly modified relative to the bulk state depending on the length scale being probed. We characterize the local segmental relaxations in attractive polymer nanocomposites comprising 25 nm diameter silica nanoparticles (NPs) and lightly entangled poly(2-vinyl pyridine) over a wide range of NP concentrations (up to 50 vol%) using quasielastic neutron scattering and broadband dielectric spectroscopy. We find that the average translational diffusion coefficient of polymer segments is strongly suppressed in these attractive PNCs (by up to a factor of five), while the average reorientational segmental relaxation times are comparatively unaffected. Our results demonstrate that even on local intermolecular length scales, physisorbed polymer chains contain a large population of segments that are effectively translationally "bound" while still undergoing a dynamically decoupled, and relatively unperturbed, reorientational segmental relaxation process.

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