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Nanoparticle Polymer Suspensions: Structure and Dynamics SAMANVAYA SRIVASTAVA, LYNDEN ARCHER, Cornell University — We present structure and rheology measurements for model nanoparticle suspensions, which comprise of silica nanoparticles, densely grafted with small polyethylene glycol (PEG) chains and suspended in PEG oligomers. Structure characterization, using electron microscopy and X-ray scattering, reveals well-dispersed nanoparticles leading to stable suspensions across a range of particle volume fractions. At the same time, X-ray photon correlation spectroscopy studies reveal arrested dynamics and extremely small nanoparticle diffusivities in the high volume fraction suspensions, consistent with the expectations for a soft glass. The liquid-soft glassy solid transition is found to occur at strikingly low core volume fractions and the glassy suspensions are found to exhibit a range of unique features including strong shear thinning, presence of a zero shear Newtonian plateau, strain accelerated relaxation and prominent stress overshoots in flow startup. Comparisons of our experimental findings with the SGR model are provided and on this basis, we propose our suspensions as model systems for understanding the jamming transition and other properties of soft glasses. Further, we elucidate the form of particle interactions and compare them with models for spherical polymer brushes.

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