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Structure and dynamics of polymer-tethered colloids in dilute solutions LEO GURY, SAMRUDDHI KAMBLE, University of Crete, JIANAN ZHANG, JAEJUN LEE, KRIS MATYJASZEWSKI, MICHAEL BOCKSTALLER, Carnegie Mellon University, DIMITRIS VLASSOPOULOS, GEORGE FYTAS, University of Crete — Photon correlation spectroscopy was employed in order to probe the form factor and the translational diffusion of a series of well-characterized polymer-tethered colloidal particles (particle brush) in dilute solution, as function of concentration, grafting density and polymer degree of polymerization (N) for constant core size. Analysis of form factor and diffusion coefficient revealed a pronounced dependence of the brush height on the grafting density of tethered chains. Hence, the thicknesses for seven different particle brush systems as functions of N do not superimpose on a single curve. An unexpected finding is the changing values of the apparent second virial coefficient under good solvency conditions, from negative for densely tethered particles to positive as the grafting density decreases. A tentative explanation calls for a change in the effective monomer-solvent interactions as the conformation of tethered chains is affected by their grafting density. This can be considered in a coarse-grained approach by means of a temperature-dependent potential developed originally for star polymers of varying functionality. The results give insight into the role of 'brush architecture' in determining interactions in polymer-tethered particle systems that could ultimately benefit the processing and application of particle-brush based materials.

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