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Studying the effect of the curvature of a polymer-grafted nanoparticle surface on equilibrium brush dimensions via small-angle neutron scattering (SANS) and polymer field theory MICHAEL J. A. HORE, BOUALEM HAMMOUDA, National Institute of Standards and Technology — For polymer-grafted nanoparticles with a size that is on the order of the radius of gyration of the polymer chains, the curvature of the nanoparticle surface has a role in determining the equilibrium brush structure. The curvature can cause an increase in the conformational entropy of the brush chains relative to that of a flat surface, and hence has large implications for dispersion of nanoparticles within a polymer matrix. Here, small-angle neutron scattering (SANS) is performed to measure the radius of gyration of a poly(ethylene glycol) (PEG) brush that is grafted to the surface of gold nanorods (diameter x length: 10 x 30 nm) and nanospheres (diameter: 10 nm) in both solution and a within a polymer melt. To help interpret the SANS measurements, field theoretic simulations are employed to calculate density profiles for the brush polymer in solution and a polymer melt as a function of nanoparticle shape, radius, and brush grafting density .

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