28c Interactions between Nanoparticles in Solutions of Polymers

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Adsorption of polymer on colloidal surfaces plays an important role in many practical applications like bridging flocculation, steric stabilization, protein crystallization and polymer nanocomposites. In the present talk, we present a multiscale approach that examines the phase behavior of colloidal suspensions in adsorbing polymeric solutions. We use generalized McMillan Mayer theory to coarse-grain the polymeric component. This leads to a framework wherein the effective interactions between the colloids can be computed quite accurately using polymer self-consistent field theory. By solving the self-consistent field theory equations numerically in bispherical coordinates we account for possible size disparities between the colloids and polymers. Here, we present our results on the effective interactions, polymer conformations and phase behavior of colloids in solutions of reversibly and irreversibly adsorbing polymers. Our results suggest that specific interactions between polymers and colloids can lead to significant changes in both the interactions and the resulting phase behavior of the system. Further, we extend the self-consistent framework to characterize the structure of adsorbed polymer layers in terms of conformational statistics of bridges, loops and tails. We present a comparison between polymer adsorption on planar surface and that on a spherical particle and our results show a strong dependence of structure of adsorbed layer on surface curvature.