355a Structuring of Nanoparticles and Micelles Confined between Surfaces

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The aim of this work is to investigate the structuring of charged spherical particles between two surfaces as a function of bulk particle concentration. The structuring behavior of the particles can be deduced from the force profiles between two surfaces. In this work, we measure the force between a silica particle and a silica plate in aqueous solutions of particles by atomic force microscopy. We use two types of spherical particles: nanoparticles and micelles. The nanoparticles are Ludox silica, and the micelles are composed of sodium dodecylsulfate. In both systems, the force profiles are oscillatory and the wavelength of the force profiles scales with the spacing between the particles in the bulk (i.e. (bulk number density)$^{-1/3}$), rather than the effective size of the particles. At a high concentration of nanoparticles (above 10% by volume) in a low ionic strength solution, the wavelength becomes smaller than the bulk spacing. Addition of salt to the solution returns the wavelength to the bulk spacing. We also perform Monte Carlo simulations to more precisely determine bulk particle spacing and to better understand the structuring behavior of particles confined between surfaces.