MAR09-2008-000879

Abstract for an Invited Paper
for the MAR09 Meeting of
the American Physical Society

Phase behavior and rheology of ionic microgels

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Our aim is to understand and control the mechanical properties of dense microgel suspensions, where the softness of the constituent particles can have important effects over the macroscopic behavior. In particular, we are using ionic microgel particles based on poly(vinylpyridine), a monomer that ionizes with pH. When de-swollen, the particles are essentially charged hard spheres and crystallize at high enough volume fractions. By contrast, when the microgels are swollen, light and neutron scattering experiments show that the suspension does not crystallize, irrespective of particle density. But even more remarkably, these highly packed systems remain essentially liquid and do not seem to exhibit glassy behavior. This phenomenology is markedly different to that of ordinary colloids and suggests that the properties of the single particle can dramatically affect the phase behavior and mechanical properties of the packed suspension.