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Structural changes and phase behavior of densely packed microgel particles

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Colloidal suspensions of microgel particles are systems of great interest for applications and fundamental studies due to their reversible responsiveness to changes of their environment, such as temperature or hydrostatic pressure. Although it has been shown that microgel particles behave like hard spheres under many circumstances [1], they can reach states that are far beyond hard spheres due to their softness, especially at high concentrations [2].

We focus on highly concentrated poly(N-isopropylacrylamide) (pNIPAM) microgels and their volume transition as a function of temperature and hydrostatic pressure [3] and their form factors in highly overpacked states with effective volume fractions above random close packing. SANS and confocal microscopy measurements show that the particles shrink to some extent and interpenetrate in very densely packed suspensions. The SANS studies were carried out using contrast matching methods allowing the direct measurement of the form factor at very high concentrations [4]. The confocal microscopy study was done with particles dyed with two fluorescent dyes to allow the observation of particle overlap via color discrimination.

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