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Microstructure of Dense Colloidal Suspensions and Gels. S. Ramakrishnan, Y.L. Chen, S.A. Shah, K.S. Schweizer, C.F. Zukoski, Univ. of Illinois-Urbana-Champaign.

We have performed a systematic and comprehensive study of the microstructure and mechanical properties of gels formed from colloidal suspensions by two distinct methods. First we add nonadsorbing polymer to a colloidal suspension to produce depletion attractions and depletion gels. Secondly, we synthesize a suspension where interparticle attractions are generated by lowering suspension temperature. The experiments performed at the UNICAT facility were the first systematic studies of microstructure on a model colloid-polymer system and have led to valuable insights about the microstructure of gels and also about the process of gelation itself. Gelation is characterized by the arrest of the first peak of the structure factor, enhanced scattering at low angles (due to the formation of clusters and voids) and suppressed scattering at intermediate wave vectors. The picture of the microstructure of the gel as composed of clusters and voids plays an important role in determining the elastic modulus of the resulting gelled suspension. Here we contrast this microstructure with that seen in temperature sensitive gels. These experimental studies are used to build a theoretical model capable of predicting gelation behavior and mechanical properties of these model systems.