2.1.1: Mechanics and non-linear rheology of soft gels
2.1.4: Jamming of particulate matter

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Swelling, Structure, and Phase Stability of Soft, Compressible Microgels[1] ALAN R. DENTON, MATTHEW URICH, Department of Physics, North Dakota State University — Microgels are soft colloidal particles that swell when dispersed in a solvent. The equilibrium particle size is governed by a delicate balance of osmotic pressures, which can be tuned by varying single-particle properties and externally controlled conditions, such as temperature, pH, ionic strength, and concentration. Because of their tunable size and ability to encapsulate dye or drug molecules, microgels have practical relevance for biosensing, drug delivery, carbon capture, and filtration. Using Monte Carlo simulation, we model suspensions of microgels that interact via Hertzian elastic interparticle forces and can expand or contract via trial size changes governed by the FloryRehner free energy of crosslinked polymer gels. We analyze the influence of particle compressibility and size fluctuations on bulk structural and thermal properties by computing swelling ratios, radial distribution functions, static structure factors, osmotic pressures, and freezing densities. With increasing density, microgels progressively deswell and their intrinsic polydispersity broadens, while compressibility acts to forestall crystallization*.

*M. Urich and A. R. Denton, *Soft Matter* **12**, 9086 (2016).
A. R. Denton and Q. Tang, *J. Chem. Phys.* **145**, 164901 (2016).

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