Training soft colloidal gels by shear flows

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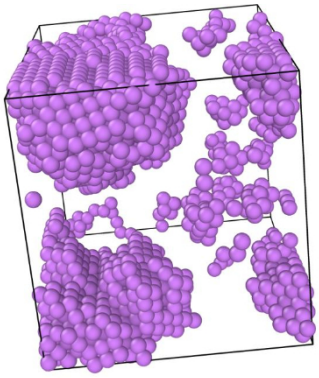
We investigate the structural and dynamical properties of soft colloidal gels formed a Lennard-Jones-Yukawa potential using Langevin dynamics simulations. After quantifying equilibrium properties at different densities and temperatures we train their mechanical properties by applying steady shear flow of varying shear rate. We identify different distinct mechanical deformation modes under shear including non-isotropic deformation and re-structuring, breakup and non-isotropic crystalline droplet formation. Interestingly, while shearing the system, we identified dynamical restructuring of the entire gel at intermediate length scales associated to the break-up and formation of arms of the colloidal gels. After further cessation we identified the emergence of distinct structural phases deviating from the untrained structures, which depend on the applied shear rate during training, temperature and the packing fraction of the gels.

Keywords:
colloidal gels, shear flow, mechanical training, cessation, Langevin dynamics simulations



Gel structure after cessation