Liquid to solid phase transition of colloidal suspensions in confined geometry

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The rheological properties of colloidal suspensions are mainly dependent on their internal volume fraction of colloidal particles. When the volume fraction is very low (<0.05), most suspensions follow the Einstein equation so that the viscosity of the suspensions do not differ significantly from that of the solvent. Therefore, if the solvent is low viscosity Newtonian fluid, their colloidal suspensions of dilute particle concentrations are inviscid liquids as well. However, they can behave like solid-like gel in confined geometry when the colloidal particles have attractive interaction each other. In this study, the oscillatory shear modulus of the colloidal suspensions was measured while changing the gap between two parallel plates. Accordingly, we figured out that the phase transition of suspensions from the liquid to the solid occurs without changing the volume fraction or the temperature.