Electrostatics versus capillarities: effects of particle size on interparticle interactions

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Colloidal particles attach very strongly and irreversibly to the fluid-fluid interface. This adsorption phenomenon reduces the interfacial tension and consequently stabilizes the interface. Thus, conventional colloidal particles can be a good alternative to costly and environmentally hazardous molecular surfactants. The behavior of the particles at the interface is determined by electrostatics and capillarites. In general, the electrostatic interaction induces repulsions between the particles, while the capillary interaction minimizes surface free energy, thereby inducing interparticle attraction. Since the relative strength between the two interactions determines the colloidal microstructure and rheological properties, it is important to study quantitatively the interaction forces between the particles. In this work, to understand the effect of particle size on the interactions, we make polystyrene particles with well-controlled particle size distribution and measure their interactions when they are adsorbed on the interface.