Beitrag ID: **19** Typ: **Talk**

Numerical simulations of liquid bridges between colloids

Colloids suspended in a primary fluid can be made to aggregate by adding a small amount of an immiscible secondary liquid: the three types of interfacial tension in this system conspire to form liquid bridges between the colloids that bind the colloids together, see as illustrated. The resulting mixtures vary from viscous fluids to elastic gels, with various promising applications, e.g. in the food industry, porous filter manufacturing and battery slurries production. We use Multibody Dissipative Particle Dynamics (mDPD) to simulate two equally sized colloids connected by a liquid bridge suspended in a bulk fluid. The force exerted on the solid particles by the liquid bridge is measured by constraining the distance between the colloids in the simulations. We compare the force versus elongation curves with fitted expressions in the literature and numerical solutions of a phenomenological macroscopic theory. We propose an improved fit function of the force valid over a much wider range of contact angles and droplet volumes

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