

Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Enhanced gel formation in binary mixtures of nanocolloids with tunable short-range attraction R. LEHENY, Johns Hopkins University, H. GUO, NIST, M. BERTRAND, University of Ottawa, T. SHENDRUK, University of Oxford, S. RAMAKRISHNAN, Florida State University, J. HARDEN, University of Ottawa — We report a combined experimental, theoretical, and simulation study of the phase behavior and microstructural dynamics of concentrated binary mixtures of spherical nanocolloids with a size ratio near two and with a tunable, intrinsic short-range attraction. In the absence of the attraction, the suspensions behave as well mixed, hard-sphere liquids. For sufficiently strong attraction, the suspensions undergo a gel transition. Rheometry measurements show that the fluid-gel boundary of the mixtures does not follow an ideal mixing law, but rather the gel state is stable at weaker interparticle attraction in the mixtures than in the corresponding monodisperse suspensions. X-ray photon correlation spectroscopy measurements reveal that, in contrast with depletion-driven gelation at larger size ratio, gel formation in the mixtures coincides with dynamic arrest of the smaller colloids while the larger colloids remain mobile. Molecular dynamics simulations indicate the arrest results from microphase separation that is caused by a subtle interplay of entropic and enthalpic effects and that drives the smaller particles to form dense regions.

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Date submitted: 06 Nov 2015

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