Field-driven dynamics of binary colloidal mixtures

N. A. M. Araújo
Departamento de Física, Faculdade de Ciências, and Centro de Física Teórica e Computacional, Universidade de Lisboa, 1749-016 Lisboa, Portugal

Spatially and time varying periodic fields may be used to position colloidal particles into desired structures. Under such external constraints, even single component suspensions can be driven out of equilibrium. The dynamics involves the competition of various mechanisms occurring at different length and time scales. For multicomponent suspensions, the dynamics is even richer, for the response of each component to the field is in general different. We combined Brownian dynamics and the simplest dynamic density-functional theory to study the response of a binary mixture of colloids with distinct mobilities (hydrodynamic radii) to a periodic field. Even for purely repulsive, identical pairwise colloid-colloid interactions, we found dynamic demixing, in a wide region of the parameter space, driven by rapid accumulation of the high mobility colloids around the zero-field minima. The lifetime of this non-equilibrium demixed state diverges when the high mobility colloids crystallize. Pratical implications of our findings are also discussed.