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Convective Polymer Depletion on Pair Particle Interactions[1] TAI-HSI FAN, Department of Mechanical Engineering, University of Connecticut, USA, TAKASHI TANIGUCHI, Department of Chemical Engineering, Kyoto University, Japan, REMCO TUINIER, DSM Research, The Netherlands — Understanding transport, reaction, aggregation, and viscoelastic properties of colloid-polymer mixture is of great importance in food, biomedical, and pharmaceutical sciences. In non-adsorbing polymer solutions, colloidal particles tend to aggregate due to the depletion-induced osmotic or entropic force. Our early development for the relative mobility of pair particles assumed that polymer reorganization around the particles is much faster than particle's diffusive time, so that the coupling of diffusive and convective effects can be neglected. Here we present a nonequilibrium two-fluid (polymer and solvent) model to resolve the convective depletion effect. The theoretical framework is based on ground state approximation and accounts for the coupling of fluid flow and polymer transport to better describe pair particle interactions. The momentum and polymer transport, chemical potential, and local viscosity and osmotic pressure are simultaneously solved by numerical approximation. This investigation is essential for predicting the demixing kinetics in the pairwise regime for colloid-polymer mixtures.

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