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The role of short-ranged and long-ranged hydrodynamic interactions on aggregation of colloidal particle in colloid-polymer mixtures
ARMAN BOROMAND, SAFA JAMALI, JOAO MAIA, Case Western Reserve University — Colloidal Gels i.e. disordered arrested systems has been studied extensively during the past decades both experimentally and computationally. Despite their widespread applications in various industries e.g. cosmetic, food, their physical principals are still far beyond being understood. The interplay between different types of interactions e.g. quantum scale, short-ranged, and long-ranged turned dynamics and thermodynamics of the colloidal systems to one the most intriguing areas in Physics. Many authors have implemented different simulation techniques such as molecular dynamics (MD) and Brownian dynamics (BD) to capture better picture during phase separation in colloidal system with short-ranged attractive force e.g. colloid-polymer mixtures. However, BD neglects multi-body hydrodynamic interactions (HI) and MD is limited considering the time and length scale of gel formation and long-time dynamics. In this presentation we used Core-modified dissipative particle dynamics (CM-DPD) with modified depletion potential, as a coarse-grain model, to address the gel formation process in short ranged-attractive colloidal systems. Due to the possibility to study short- and long-ranged HI separately in this method we studied the effect of each of those interactions on the final morphology and report on one of the controversial question in this field. In the second part of the presentation, we include colloidal-polymer interactions to extend/modify the Asakura-Oosawa potential model to semi-dilute region of polymer solution.

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