

Mean-field calculation of the electrophoretic mobility of hard colloid and charged liquid droplets

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Electrophoresis of both soft and hard colloids exhibits a range of complex phenomena with important implications for phase separation and transport in biological systems. In this presentation, I will review our recent work on the electrophoretic mobility of charged liquid droplets [1], as well as on charge-regulated hard colloids in saline aqueous solutions [2]. Liquid droplets, in particular, display rich and nontrivial behavior due to ion partitioning, the internal degrees of freedom of dissolved ions, and the non-rigid nature of the fluid–fluid interface. Our investigations are primarily conducted at the mean-field level and are complemented by simulations using a Color-Gradient multicomponent lattice Boltzmann method to study freely suspended liquid droplets under an applied external electric field. For the case of charge-regulating colloids, we further examine the influence of CO₂ on electrophoretic mobility, revealing additional interesting and unexpected effects.

Keywords:

colloidal electrophoresis

References:

[1] A. Reinauer, C. Holm, in preparation. [2] P Vogel, D Beyer, C Holm, T Palberg, *Soft Matter* 20 (46), 9261-9272 (2024). [3] V Lobaskin, B Dünweg, M Medebach, T Palberg, C Holm, *Physical Review Letters* 98, 176105 (2007).