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Non-intuitive behavior in concentrated suspension of ideally polarizable particles in an electric field[1] SIAMAK MIRFENDERESKI, JAE SUNG PARK, University of Nebraska Lincoln — Large-scale numerical simulations are used to analyze the dynamics of ideally polarizable particles in concentrated suspensions under the effects of nonlinear electrokinetic phenomena. Particles are assumed to carry no net charge and considered to undergo the combination of dielectrophoresis and induced-charge electrophoresis termed dipolophoresis. The suspension dynamics seems to be hindered up to semi-dilute regimes by the increase in the magnitude of excluded volume interactions. Interestingly, a non-intuitive suspension behavior is observed in concentrated regimes, where the hydrodynamic diffusivity starts to increase with volume fraction and reach a local maximum before decreasing as approaching random close packing. This behavior is rationalized through an examination of the velocity fluctuations, suspension microstructure, and number-density fluctuations. We conclude that the non-intuitive behavior is attributed to a consequence of particle contacts, depending on the dominant mechanism of particle paring. While contacts are expected to occur along the field direction in dilute or semi-dilute regimes, very strong and massive contacts along the direction perpendicular to the applied field arise, promoting the non-intuitive behavior observed in concentrated regimes.

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