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A boundary element method for particle and droplet electrohydrodynamics in the Quincke regime DEBASISH DAS, DAVID SAINTILLAN, None — Quincke electrorotation is the spontaneous rotation of dielectric particles suspended in a dielectric liquid of higher conductivity when placed in a sufficiently strong electric field. This phenomenon of Quincke rotation has interesting implications for the rheology of these suspensions, whose effective viscosity can be controlled and reduced by application of an external field. While spherical harmonics can be used to solve the governing equations for a spherical particle, they cannot be used to study the dynamics of particles of more complex shapes or deformable particles or droplets. Here, we develop a novel boundary element formulation to model the dynamics of a dielectric particle under Quincke rotation based on the Taylor-Melcher leaky dielectric model, and compare the numerical results to theoretical predictions. We then employ this boundary element method to analyze the dynamics of a two-dimensional drop under Quincke rotation, where we allow the drop to deform under the electric field. Extensions to three-dimensions and to the electrohydrodynamic interactions of multiple droplets are also discussed.

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None

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