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Double-Layer AC Tangential Conduction Effects on Polarization, Assembly and Dielectrophoretic Mobility of Particles in Ionic Liquids[1]
ZACHARY GAGNON, HSUEH-CHIA CHANG, University of Notre Dame — Polarization of gas bubbles and liqud drops by an AC field in ionic liquids is shown to exhibit anomalous induced-dipole behaviors that cannot be explained by classical Maxwell-Wagner dielectric polarization theories. A dielectrophoretic cross-over frequency exists even though the ionic liquid has much higher permittivity and conductivity than the particle, even when conducting Stern layer effects are included. Moreover, the cross-over frequency is observed to be field and particle size dependent. Drops of different size can hence have anti-parallel induced dipoles and are observed to coalesce at an intermediate frequency between the cross-over frequencies of the two particles. A scaling theory based on a thin-layer tangential conduction model is found to collapse our measured cross-over frequency and dielectrophoretic velocity data.

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