

Abstract Submitted
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Bubble deformation, translation, collapse and bursting in a uniform electric field¹ STEPHEN SHAW, PETER SPELT, OMAR MATAR, Imperial College London — We study the dynamics of a bubble in a dielectric fluid subjected to a uniform electric field in the limit of weak viscosity and compressibility. We use a domain perturbation method to derive a set of ordinary differential equations that govern the evolution of the bubble deformation, oscillation and translation; these equations contain second-order interaction terms. Both steady-state and time-dependent solutions are presented. Our analysis of the results indicates that for initially uncharged spherical bubbles, only even shape modes and odd components of the charge density are excited. We show that situations wherein all modes are excited could give rise to an instability over a certain range of parameter values. This instability manifests itself via sudden bubble acceleration and growth, which ultimately renders the theory invalid.

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