Numerical simulation of a rising bubble under the influence of electric forces using ISPH method

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The motion of a single rising bubble is simulated under the effect of electric forces using the ISPH method. In order to model interfacial forces on bubble surface, a diffusive interface with a finite thickness is employed. Using the leaky dielectric model, the electric forces act on the bubble interface and change the topology of the rising bubble, in competence with other interfacial and volumetric forces. Figure 1 represents the influence of the applied electric field on a rising bubble for an oil-water system with realistic density and viscosity ratios. Then, the effect of interfacial forces on the bubble shape and flow behaviour will be illustrated in variations of Electro-capillary (Ec) and Bond (Bo) numbers.
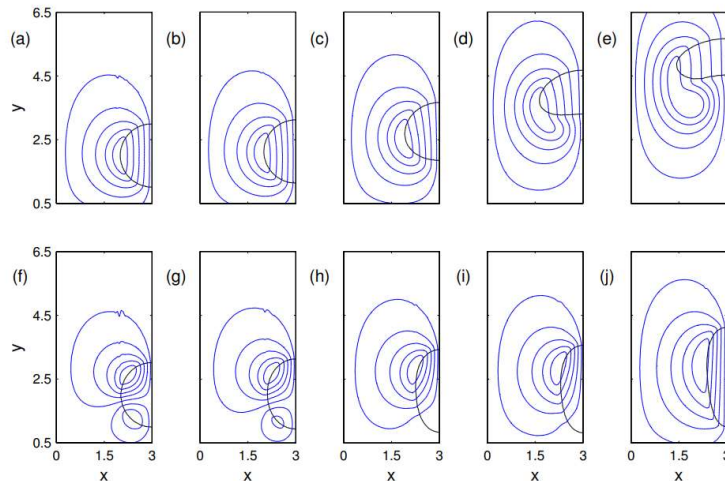

Figure 1: The influence of electric forces on a rising bubble; the top row shows a non-electrified rising bubble at different rising moments, and the bottom row shows a rising bubble with identical simulation parameters under the influence of electric forces.