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Electrohydrodynamic deformation of capsules in electric field SUDIP DAS, ROCHISH THAOKAR, Indian Institute of Technology Bombay — Micron size capsules are abundant in natural, technological and biological processes but they still require extensive investigation for better understanding of their mechanical behavior. A spherical capusle containing a Newtonian fluid bounded by a viscoelastic membrane and immersed in another Newtonian fluid, and subject to electric field is considered. Discontinuity of electrical properties such as conductivity and permittivity leads to a net Maxwell stress at the capsule interface. In response the capsule undergoes elastic deformation, leading to strain fields and elastic stresses that can balance the applied forces. We investigate this problem with fully resolved hydrodynamics in the Stokes flow limit and electrostatics using the capacitance model. Effect of AC, DC and pulsed DC fields is investigated. Our results show that membrane electrical properties have a huge impact on the equilibrium deformation as well as on the break up of capsules. Our results match with the literature results in the limit of high conductance of the membrane. Analytical theory is employed using spherical harmonics and numerical investigations are conducted using the Boundary integral method.

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