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Dynamics of Lipid Bilayer Vesicles and Droplets in DC Electric Fields LANE MCCONNELL, Northwestern University, PETIA VLAHOVSKA, Brown University, MICHAEL MIKSIS, Northwestern University — Closed lipid bilayers (vesicles) serve as a model system to study the mechanics of the biomembranes encapsulating cells and cellular organelles. We present a numerical investigation using the Boundary Integral Method of the dynamics and stability of a charge-free lipid bilayer vesicle in a uniform DC electric field. The lipid membrane is modeled as a zero-thickness, capacitive, area-incompressible interface, and bulk fluids are assumed to be leaky dielectrics. Vesicle shape is determined by balancing the electric, hydrodynamic, bending, and surface tension stresses along the interface. Investigations of vesicle response to electric fields are limited, but recent small deformation analysis has revealed several interesting phenomena not observed with droplets, including transitions from oblate to prolate shapes. Our numerical investigations highlight the differences in the behavior of vesicles and drops due to the capacitive nature of the bilayer membrane.

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