Abstract Submitted
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Vesicle Electrohydrodynamics JONATHAN SCHWALBE, National Institute of Standards and Technology, PETIA VLAHOVSKA, Brown University, MICHAEL MIKSIS, Northwestern University — A small amplitude perturbation analysis is developed to describe the effect of a uniform electric field on the dynamics of a lipid bilayer vesicle in a simple shear flow. All media are treated as leaky dielectrics and fluid motion is described by the Stokes equations. The instantaneous vesicle shape is obtained by balancing electric, hydrodynamic, bending, and tension stresses exerted on the membrane. Solutions are presented as a function of the physical parameters. It is shown that in the absence of ambient shear flow, it is possible that an applied step-wise uniform DC electric field could cause the vesicle shape to evolve from oblate to prolate over time if the encapsulated fluid is less conducting than the suspending fluid. For a vesicle in ambient shear flow, the electric field modifies, and may even eliminate, the tank-treading to tumbling transition.

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