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Electrohydrodynamic instabilities of biomimetic bilayer membranes JACOPO SEIWERT, PETIA VLAHOVSKA, Brown University — A DC electric pulse can destabilize a fluid bilayer membrane, causing a transient bending of the interface [1]. The membrane deformation relaxes as the membrane capacitor charges. We investigate the possibility of using AC electric fields and charged lipids to control the instability. In AC fields, the dynamics of a charge-free membrane depends on the relative magnitudes of the inverse of the field frequency and the capacitor charging time. At low frequencies, where the capacitor is fully charged and draws no current, the membrane is stable. As the frequency increases and the capacitor becomes short-circuited, the membrane behaves as a simple interface separating leaky dielectric fluids and can become unstable depending on the fluid electric properties (conductivities and dielectric constants). In the presence of native charge, the charge redistribution leads to even more complex membrane dynamics.

[1] Schwalbe et al. Physics of Fluids 23: 041701 (2011)

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