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Electrohydrodynamic instabilities in thin viscoelastic films: AC and DC fields LEONARDO ESPIN, ANDREW CORBETT, SATISH KUMAR, Department of Chemical Engineering and Materials Science, University of Minnesota, KUMAR RESEARCH GROUP TEAM — Electrohydrodynamic instabilities in thin liquid films are a promising route for the self-assembly of well-defined topographical features on the surfaces of materials. Here, we study the effect of viscoelasticity on these instabilities under the influence of AC and DC electric fields. Viscoelasticity is incorporated via a Jeffreys model and both perfect and leaky dielectric materials are considered. In the case of DC fields, asymptotic methods are employed to shed light on the nature of a singularity that arises when solvent viscosity is neglected (i.e., the Maxwell-fluid limit). In the case of AC fields, we apply a numerical procedure based on Floquet theory to determine the maximum growth rate and corresponding wavenumber as a function of the oscillation amplitude and frequency. Elasticity is found to increase both the maximum growth rate and the corresponding wavenumber, with the effects being the most pronounced when the oscillation period is comparable to the fluid relaxation time.

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