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AC electrohydrodynamic instabilities in thin liquid films SCOTT ROBERTS, SATISH KUMAR, Department of Chemical Engineering and Materials Science, University of Minnesota, Minneapolis, MN 55455 — When DC electric fields are applied to a thin liquid film, the interface may become unstable and form a series of pillars. We examine the possibility of using AC electric fields to exert further control over the size and shape of the pillars. For perfect dielectric films, linear stability analysis shows that the influence of an AC field can be understood by considering an effective DC field. For leaky dielectric films, Floquet theory is applied to carry out the linear stability analysis, and it reveals that high frequencies may be used to inhibit the accumulation of interfacial free charge, leading to a lowering of growth rates and wavenumbers. Nonlinear simulations confirm the results of the linear stability analysis while also uncovering additional mechanisms for tuning overall pillar height and width through adjustment of the magnitude and frequency of the AC field. The results presented here may of interest for the controlled creation of surface topographical features in applications such as patterned coatings and microelectronics.

Scott Roberts
Department of Chemical Engineering and Materials Science,
University of Minnesota, Minneapolis, MN 55455

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