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Lyapunov Analysis of the Stability of Nanodroplet Arrays Arising From Steady State Bénard Flow in the Long Wavelength Limit ZACHARY NICOLAOU, SANDRA TROIAN, California Institute of Technology, MC 128-95, Pasadena, CA 91125 — Previous work in our group has focused on a novel Bénard like instability leading to nanopillar arrays in ultrathin viscous films subject to a transverse thermal gradient.[1,2,3] The shape and size of these formations is influenced by the relative strength of the thermocapillary to capillary stresses. In turn, this ratio is dependent on the system geometry, fluid material properties, overall magnitude of the applied thermal gradient, and whether volume is conserved. Here we examine the parameter regime corresponding to steady state solutions resembling either isolated or extended sinusoidal-like states. The linear stability of rectilinear and axisymmetric formations is investigated by a combination of Lyapunov analysis, asymptotic methods, and numerical simulations. Our findings indicate that radially symmetric arrays with small peak heights are linearly stable. The existence of stable axisymmetric states for parameter values accessible to experiment offers an intriguing route for non-contact fabrication of microlens arrays.

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