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Lyapunov Based Predictions of Droplet Shapes in Thermocapillary Driven Nanofilms ZACHARY NICOLAOU, SANDRA TROIAN, California Institute of Technology, MC 128-95, Pasadena, CA — Previous work in our group has focused on the spontaneous formation of pillar arrays in nanoscale molten films subject to an extremely large transverse thermal gradient.[1,2,3]. The shape of these formations is influenced by the relative strength of thermocapillary to capillary forces which is strongly dependent on the system geometry, fluid properties, magnitude of the initial thermal gradient, and whether volume is conserved or not. Here we examine the parameter regime corresponding to steady state shapes resembling either isolated or extended sinusoidal-like waveforms. The stability of these one dimensional and axisymmetric shapes is investigated by a combination of Lyapunov analysis, asymptotic techniques and numerical simulations. Our findings indicate that radially symmetric arrays with small peak heights are linearly stable to perturbations. The existence of such stable states for parameter values accessible to experiment offers an intriguing route for non-contact fabrication of optical and photonic components.

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Sandra Troian
California Institute of Technology, MC 128-95, Pasadena, CA

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