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Solution of the Inverse Problem for Thin Film Patterning by Electrohydrodynamic Forces CHENGZHE ZHOU, SANDRA TROIAN, California Institute of Technology, 1200 E. California Blvd., MC 128-95, Pasadena, CA — Micro- and nanopatterning techniques for applications ranging from optoelectronics to biofluidics have multiplied in number over the past decade to include adaptations of mature technologies as well as novel lithographic techniques based on periodic spatial modulation of surface stresses. We focus here on one such technique which relies on shape changes in nanofilms responding to a patterned counter-electrode. The interaction of a patterned electric field with the polarization charges at the liquid interface causes a patterned electrostatic pressure counterbalanced by capillary pressure which leads to 3D protrusions whose shape and evolution can be terminated as needed. All studies to date, however, have investigated the evolution of the liquid film in response to a *preset* counter-electrode pattern. In this talk, we present solution of the inverse problem for the thin film equation governing the electrohydrodynamic response by treating the system as a transient control problem. Optimality conditions are derived and an efficient corresponding solution algorithm is presented. We demonstrate such implementation of film control to achieve periodic, free surface shapes ranging from simple circular cap arrays to more complex square and sawtooth patterns.

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