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Microfluidic Printing and Ablation of Metallic Films by Modulated Capillary and Maxwell Stresses GERRY DELLA ROCCA, SANDRA TROIAN, California Institute of Technology, MC 128-95, Pasadena, CA 91125 —

Liquid dosing strategies for micro/nanofluidic applications normally rely on interior flow driven by external pressure gradients. To maintain a constant flow rate, the effective pressure drop over a given length conduit must scale inversely as the fourth power in the conduit radius, as prescribed by the Hagen-Poiseuille relation. For micron or nanoscale capillaries, this constraint requires enormous pressure gradients and external control mechanisms. This burden, coupled with the likelihood of occlusions due to gas bubbles, contaminants or carrier particles, limits the usefulness of internal flow strategies for applications involving emission of charged droplets or ions. In this talk, we focus on capillary flow in slender V grooves as a more robust and self-regulating fluidic delivery system. When coupled with spatiotemporal modulation of Maxwell stresses induced by an external electric field, beams of droplets or ions can be metered reliably and effectively. Here we explore the steady state, transient and oscillatory flow characteristics of microscale metallic films in V-grooves subject to capillary and Maxwell stresses. The geometry investigated will focus on printing and ion ablation of thin films for electronic circuits and photovoltaic displays.

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