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Laser-induced liquid flow and phase change phenomena in thin metal films JILL KLENTZMAN, VLADIMIR AJAEV, DAVID WILLIS, Southern Methodist University — We develop a mathematical model of the liquid flow and phase change phenomena involved in the laser ablation of thin metal films deposited on glass substrates. Applications include the manufacture of micro- and nanochannels for use in various microfluidic devices. Interaction of the laser beam with the metal film is a complicated process, characterized by high temperature gradients. In this work we investigate the regime in which the temperature is high enough to cause phase explosion to occur in a small region of the metal film surrounded by a pool of molten metal. To model the liquid flow in the melt region, we include the effects of both evaporation from the surface and viscous flow induced by thermocapillary stresses. Evolution of the surface of the molten film is investigated, and the impact of phase explosion on the flow is discussed.

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