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Focused liquid jet formation from micrometer-sized cavities using impulsive boundary deformation EMRE TURKOZ, LUC DEIKE, CRAIG B. ARNOLD, Princeton University — Laser-induced jetting is an area of interest for jet-based printing and dispensing techniques. In this study, we are examining the flow focusing and subsequent high-speed jet formation from micrometer-sized cavities on a polymer thin film. A nanosecond laser pulse is absorbed within a polymer layer which hosts micrometer-sized cavities that are introduced using a picosecond laser and coated with the ink to be printed. The absorption of the laser pulse leads to impulsive boundary deformation that induces jet formation from the ink which is located inside the cavity. Due to the micrometer size of cavities, surface tension effects are enhanced and the formed jets are very thin due to the resulting flow focusing effect at the concave ink-ambient air interface. Furthermore, droplets generated from the induced thin jets have small diameter values that could not be obtained without the flow-focusing effect. A time-resolved imaging setup along with direct numerical simulations of the two-phase Navier-Stokes equations are used to examine the underlying physics and effects of the experiment parameters to the resulting jet formation. The experimental conditions such as the cavity size and laser energy are examined for single-drop ejections, which are desirable for high-resolution printing.

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