Rethinking Jettable Fluids, or Novel Dynamic Volume Control in Jetting of Complex Fluids

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Abstract

The delivery of precise fluid volumes utilizing inkjet-like drop on-demand jetting technology is primarily controlled by the piezo voltage that actuates the jetting chamber. The jetting of large volumes, in excess of 1 nL, of complex highly viscous fluids is complicated by the difficulty of filling the ejection chamber quickly after the previous droplet ejection. In order to ensure the delivery of fluid to the ejection chamber, a mechanism utilizing a helical viscous pump has been introduced and implemented by the authors. The ejection mechanism consists of a piezo actuated piston that drives the fluid in the chamber through the nozzle on to the intended surface. The ejected volume of fluid has been studied with respect to piezo voltage, Vp , pulse time, tp , of the piezo signal and the angular speed of the helical viscous pump. It has been shown in the experimental jetting setup that the volume of a jetted deposit is only affected to a minor degree by the chosen piezo voltage, Vp , acting on the piston. Through imaging experiments, it has been shown that the speed of the ejected droplet has a nearly linear response to the piezo voltage, Vp.