

Pumpless dispensing drop-on-demand using electric induction and liquid bridge break-up

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Dispensing pico-to-nanoliter droplets on a solid substrate has various applications from printing to biotechnology. Microarrays, including their fabrication, is one of the largest fields where small and uniform droplets are needed to analyze accurately a large amount of data at the same time. DNA microarrays and all the chips with cells, bio-molecules, or particles, can be fabricated using this drop-on-solid printing. In this work, a novel method for dispensing droplet on a substrate using an electric field with an inverse geometry is suggested and successfully demonstrated. The process of dispensing droplets consists of two stages: liquid bridge formation by electric induction and its break-up by the motion of a top plate relative to a bottom nozzle. We characterized the droplet diameter as a function of nozzle-to-plate distance and the plate velocity. For over a thousand droplets, the size varied only about 2 %, which clearly confirms the high uniformity of this method.