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Pumpless femtoliter drop-on-demand generation via satellite formation[1] DUSTIN MOON, DONG WOOK LEE, IN SEOK KANG, POSTECH — Manipulation of discrete or digital droplets can be a key process in chemical, pharmaceutical process in micro scale. This paper provides a drop-on-demand generation method of such micro droplets. Many drop generation techniques have been developed, from flow focusing to electrospray, dispensing droplets into different phases. But due to relatively long microchannel length and the use of syringe pumps, these methods show some limitations for single drop generation at a wanted time. Satellites, an unwanted droplet generated from liquid bridge breakup, have rather stable size distribution resulting from its rapid formation mechanism. In this experimental work, satellites are formed between metallic capillaries of outer diameter 910, 460, 260 micron respectively, and inside a PDMS channel of 100 micron-depth. To form a liquid bridge and break it, capillaries can be moved, or pulsed electric field is applied to deform, elongate droplets, and to form an unstable liquid bridge, and break. Several fluids from DI water to PEG with and without polystyrene particles and E.Coli. were used to form satellite drops in air and in oil. Details of each behavior were captured using Photron PCI 1024X high speed camera and analyzed accordingly.

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