Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Controlling the Growth Modes of Femtoliter Sessile Droplets Nucleating on Chemically Patterned Surfaces XUEHUA ZHANG, LEI BAO, ZENON WERBIUK, Royal Melbourne Institute of Technology, DETLEF LOHSE, University of Twente — Femtoliter droplet arrays on immersed substrates are essential elements in a broad range of advanced droplet-based technologies, such as light manipulation, sensing, and high throughput diagnosis. Solvent exchange is a bottom-up approach for producing those droplets from a pulse of oil oversaturation when a good solvent of the droplet liquid is displaced by a poor solvent. The position and arrangement of the droplets are regulated by chemical micropatterns on the substrate. Here we show experimentally and theoretically that the growth modes of droplets confined in planar micropatterns on the surface can be manipulated through the laminar flow of the solvent exchange. The control parameters are the area size of the micropatterns and the flow rate, and the observables are the contact angle and the final droplet volume. For a given pattern size, the Peclet number of the flow determines whether the growing droplets switch from an initial constant contact angle mode to a subsequent constant contact radius mode. Good agreement is achieved between the experimental results and our theoretical model that describes the dependence of the final droplet size on Pe.

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Date submitted: 03 Aug 2016 Electronic form version 1.4