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Droplets evaporation on chemically patterned surfaces

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The evaporation of fluids on the different patterned surfaces is omnipresent in nature. A comprehensive study of the evaporation process coupling with the wetting effect through modeling will give us a complete understanding of the underlying mechanisms and help us construct a digital twin, enabling us to control the whole system. The poster is divided into two parts. Firstly, based on the idea of minimum surface, a theoretical model is established to describe the three-dimensional droplet shape with straight edges and sharp corners on a polygon-patterned substrate in quasi-equilibrium state. This kind of setup is widely used in droplet sampling for high-throughput screening of live cells and chemical reactions. We relate the volume of the shaped-droplet to its height, aiming to address the challenge of measuring the volume of evaporation droplets with usual experimental techniques. The proposed model is compared with phase-field simulation and experiments. Secondly, a Cahn-Hilliard phase field model is utilized to describe the diffusion dominated evaporation process of multi droplets. Through this model, we investigate the effect of the key parameters including the humidity, volume, droplet position/distance/numbers, liquid type/concentration etc. on the evaporation process. Our aim is to identify an optimal condition for culturing cells and sample preparation on Droplet Microarray (DMA) through the digital twin system.

Category

Solid State (Experiment)

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