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Droplet condensation and growth on nanotextured surfaces impregnated with an immiscible liquid SUSHANT ANAND, ADAM PAXSON, JONATHAN SMITH, RAJEEV DHIMAN, KRIPA VARANASI, Massachusetts Institute of Technology — For effective dropwise condensation, a surface that sheds droplets easily is desirable due to the enhancement in accompanying heat transfer. Incorporating nano-textures on the surface can enhance the droplet shedding or spreading. We demonstrate that droplet shedding can be further influenced by impregnating the nano-textured surface with a liquid which is immiscible with respect to the droplet. In this study, the dynamics of dropwise condensation on such immiscible liquid impregnated nano-textured surfaces have been investigated in pure quiescent water vapor conditions. Condensation experiments were conducted using an Environmental Scanning Electron Microscope by controlling the chamber water vapor pressure and substrate temperature. We show preferential sites for condensation and different modes under which droplets grow, depending upon the surface chemistry, surface texture, and the impregnating liquid properties. Concurrently, we show an evolution of apparent contact angles during the condensation process on the impregnated surfaces.

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