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Orientation Dependence of Jumping Droplet Condensation AUSTIN BERRIER, JONATHAN BOREYKO, Virginia Tech, NATURE-INSPIRED FLUIDS AND INTERFACES TEAM — On nanostructured superhydrophobic surfaces, microscopic condensate exhibits out-of-plane jumping that minimizes the average droplet size for maximal phase-change heat transfer. This jumping-droplet phenomenon occurs independently of gravity and is due to surface energy being partially converted to kinetic energy upon coalescence events. Although the initial departure of the jumping droplets is independent of gravity, the subsequent trajectories exhibit a dependence upon the orientation of the substrate. The drop size distribution of jumping-droplet condensation growing on a superhydrophobic substrate was characterized for both horizontal and vertical surface orientations. With the horizontal orientation, jumping condensate returns to the substrate by gravity. While this can result in chain reactions with other droplets to trigger further jumping events, eventually the rebounding droplets become too large to jump and are stuck on the surface. In contrast, droplets jumping off a vertically oriented surface do not return to the substrate. For this reason, the maximum droplet diameters during condensation growth were found to be significantly larger on the horizontally oriented superhydrophobic surface than on the vertical orientation.

Austin Berrier
Virginia Tech

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