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**Condensed droplet jumping: Capillary to inertial energy transfer** RYAN ENRIGHT, Bell Labs Ireland, Alcatel-Lucent, NENAD MILJKOVIC, Massachusetts Institute of Technology, MICHAEL MORRIS, CRANN, University College Cork, EVELYN WANG, Massachusetts Institute of Technology — When condensed droplets coalesce on a superhydrophobic nanostructured surface, the resulting droplet can jump from the surface due to the release of excess surface energy. This behavior has been shown to follow a simple inertial-capillary scaling. However, questions remain regarding the nature of the energy conversion process linking the excess surface energy of the system before coalescence and the kinetic energy of the jumping droplet. Furthermore, the primary energy dissipation mechanisms limiting this jumping behavior remain relatively unexplored. In this work, we present new experimental data from a two-camera setup capturing the trajectory of jumping droplets on nanostructured surfaces with a characteristic surface roughness length scale on the order of 10 nm. Coupled with a model developed to capture the main details of the bridging flow during coalescence, our findings suggest that: 1. the excess surface energy available for jumping is a fraction of that suggested by simple scaling due to incomplete energy transfer, 2. internal viscous dissipation is not a limiting factor on the jumping process at droplet sizes on the order of 10  $\mu\text{m}$  and 3. jumping performance is strongly affected by forces associated with the external flow and fields around the droplet. This work suggests bounds on the heat transfer performance of superhydrophobic condensation surfaces.

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