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Condensation enhancement using Liquid Impregnated Surfaces SUSHANT ANAND, ADAM PAXSON, RAJEEV DHIMAN, J. DAVID SMITH, KRIPA VARANASI, Massachusetts Institute of Technology, VARANASI GROUP TEAM — Controlling the surface morphology of a low surface energy solid surface by imparting nano/micro-textures leads to water droplets existing in a Cassie-Baxter state characterized by minimal pinning of droplets, resulting in extremely low adhesion and low roll-off angles. These benefits are diminished during condensation as droplets form in the Wenzel state, causing high adhesion and extremely low shedding rates. Here we show that condensing on a hybrid surface comprised of a rough solid surface and an encapsulating liquid immiscible to water results in shedding of droplets much smaller than capillary length of water. It is shown that such hybrid surfaces have high nucleation capability usually associated with hydrophilic surfaces. The spreading coefficient of encapsulating liquid on water plays a crucial role during the condensation process. The surface morphology of the solid fraction of the hybrid surface needs to be adapted to stabilize encapsulating liquid on its surface and reduce contact between the solid surface and condensing droplets. This can be achieved by imparting nano/micro-textures on the surface.

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