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Wenzel to Cassie transition for droplet impingement[1] CRISTIAN CLAVIJO, JULIE CROCKETT, DANIEL MAYNES, Brigham Young University — Advantages posed by self-cleaning, superhydrophobic surfaces quickly diminish as the liquid penetrates gas-filled cavities resulting in the so-called Wenzel state. To prevent penetration, surfaces must exhibit nanoscale features since penetrating pressure increases significantly for decreasing feature size. However, certain applications require microscale roughness such as those seeking to relax the no-slip condition and thus penetration reversal in microscale features remains of interest. Unfortunately, recent efforts to accomplish such reversal are complicated or locally-disruptive to the flow such as electrically-tunable surfaces and boiling. Here, we show that a Wenzel-to-Cassie transition is possible with a modest surface temperature increase. Dynamics are discussed for a water droplet impinging (We=100) on a wide range of superhydrophobic surfaces with features varying in height from 4 microns to 18 microns and separation distance of 8 microns to 16 microns. Results reveal that dewetting rates increase with increasing feature height and temperature up to 30 mL/s. A first order model is constructed to validate our hypothesis that surface tension and triple line dissipation are the two dominating forces during dewetting. Good agreement is found between the model and experimental results.

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