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Droplet Impingement Boiling on Heated Superhydrophobic Surfaces JULIE CROCKETT, CRISTIAN CLAVIJO, DANIEL MAYNES, Brigham Young University — When a droplet impinges on a solid surface at a temperature well above the saturation temperature, vaporization of the liquid begins immediately after contact. Different boiling regimes may result depending on the surface temperature and volatility of the liquid. The nucleate boiling regime is characterized by explosive atomization, which occurs when vapor bubbles burst causing an extravagant shower of small micro droplets as well as the well-known "sizzling" sound. In this work, we show that the vapor is surprisingly re-directed during impingement on a superhydrophobic surface such that atomization is completely suppressed. We hypothesize that this occurs because vapor escapes through the superhydrophobic interface such that the top of the droplet remains free of bursting vapor bubbles. We explore a wide range of surface patterning with feature spacing of 8 to 32 microns and solid area fractions of 10 to 50 percent; surface temperatures from 100 C to 400 C; and Weber numbers of 1 to 100. Atomization is found to decrease with increasing feature spacing and decreasing solid fraction, and vanishes completely for large spacing. It may be that large feature spacing promotes early transition to the Leidenfrost regime.

Julie Crockett
Brigham Young University

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