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Convection to Sessile Droplets on Superhydrophobic Surfaces DANIEL MAYNES, ROBB HAYS, JULIE CROCKETT, Brigham Young University — We report results from an investigation of the thermal convection to liquid droplets on heated horizontal superhydrophobic (SH) surfaces. We consider the transient response to droplets, initially at ambient temperature, as they are placed on heated SH surfaces at constant temperature. For comparative purpose we also consider the same scenario with smooth hydrophobic surfaces. The temporally varying droplet and surface temperatures were measured with an IR camera and a thermocouple, respectively. The droplets were also imaged with two CCD cameras and the time for the droplet to completely evaporate was monitored. For surface temperatures greater than the saturation temperature, high-speed video of the droplets was also acquired. Experiments were conducted over a range of surface temperatures varying from 40 to 215 C. The results show radically different behavior in the convection for the surface types considered. At all temperatures the total droplet evaporation time on the SH surfaces was significantly greater than on the smooth hydrophobic surface. At temperatures elevated above the saturation temperature the droplets on the SH surfaces remained at bulk temperatures significantly lower than the saturation temperature. Further, the droplets on the SH surfaces exhibited Leidenfrost-like behavior at surface temperatures far below the typical Leidenfrost point. Analysis of the data reveals overall heat transfer coefficients that decrease as the degree of superhydrophobicity increases.

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