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Characterization of heat transfer from superhydrophobic substrates to water droplets ROBB HAYS, JULIE VANDERHOFF, DANIEL MAYNES, Brigham Young University — We report on measurements of thermal transport to solitary sessile water droplets placed on heated superhydrophobic substrates at constant temperature. Data was obtained by heating the substrates to specified constant temperatures and gently placing a single water droplet on the surface. The droplet was allowed to evaporate completely while two video cameras and one infrared camera captured images of the droplet. The images were post-processed to yield transient geometric and thermal information, including droplet volume, droplet-substrate contact area, and droplet temperature. The total evaporation time and transient and average convective heat transfer coefficients were determined from the measurements as a function of the substrate surface temperature and the superhydrophobic topography. Four different superhydrophobic surfaces were investigated: rib-patterned surfaces of 50%, 80%, and 93% cavity fraction and a post-patterned surface of 97% cavity fraction. Ribs and posts ranged in width from 3 to 30 μm and in height from 15 to 20 μm. Cavities between ribs or posts ranged in width from 30 to 37 μm. Results were also obtained for hydrophilic, smooth hydrophobic, and superhydrophilic substrates for comparison purposes. In general, the evaporation time and difference between the droplet and substrate temperatures are both much greater for the superhydrophobic surfaces compared to smooth surfaces.

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