Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Evaporation of particle-laden droplets on a superhydrophobic surface MASOUD BIGDELI, PEICHUN AMY TSAI, University of Alberta — We experimentally investigated the evaporation dynamics of water droplets suspended with minute particles of varying concentrations on a superhydrophobic surface. The contact angle, diameter, and height of the droplets decreased during the evaporation process. For pure water, the droplet went through a wetting transition from a partial wetting (Cassie-Baxter), with a large contact angle ($> 140°$), to completely wetting (Wenzel) state, with a small contact angle. Unlike pure water, the nanofluid droplets maintain high contact angles ($> 100°$) during evaporation. We found that the contact line was pinned, and an increase (10%) in the weight fraction of nanoparticles led to a remarkable 40% decrease in the total drying time. The nanofluid droplets left donut-shaped drying patterns. In these final drying structures, a shrinkage of the droplet height and base diameter was observed for nanofluids with lower concentrations. The results show that droplet evaporation rate and deposit pattern depend on the concentration of nanoparticles, implying the crucial influences of water evaporation and particle migration dynamics and time-scales.

Peichun Amy Tsai
University of Alberta

Date submitted: 30 Jul 2016 Electronic form version 1.4