Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Droplet Nucleation and Condensation on a Hydrophilic Surface. SHAHAB BAYANI AHANGAR, JEFFREY ALLEN, Michigan Technological University, SEONG HYUK LEE, Chung-Ang University, CHANG KYOUNG CHOI, Michigan Technological University — Dropwise condensation is a ubiquitous phenomenon in nature. Dropwise condensation has the potential to improve the efficiency of condensing surfaces and reduce the maintenance costs of systems. However, efforts to design and fabricate surfaces that can sustain long-term dropwise condensation have not been successful. The main reason is that the nucleation physics, which are key to understanding degradation, behind dropwise condensation are not fully understood; thus, researchers have mostly relied on a trial and error approach for developing new surfaces. In this work, a series of fundamental experiments were done to identify the governing mechanism of dropwise condensation on smooth hydrophilic surfaces by probing the solid-vapor interface during phase-change. The results evaluate the existence and structure of the thin film and initial nuclei that develop during condensation. The adsorption kinetics theory is used to improve understanding of the dropwise condensation mechanism during droplet formation at the onset of condensation.

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Date submitted: 01 Aug 2019 Electronic form version 1.4