

Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Electric field enhanced dropwise condensation on hydrophobic surfaces¹ DAVOOD BARATIAN, HARMEN HOEK, DIRK VAN DEN ENDE, FRIEDER MUGELE, University of Twente, PHYSICS OF COMPLEX FLUIDS TEAM — Dropwise condensation occurs when vapor condenses on a low surface energy surface, and the substrate is just partially wetted by the condensate. Dropwise condensation has attracted significant attention due to its reported superior heat transfer performance compared to filmwise condensation. Extensive research efforts are focused on how to promote, and enhance dropwise condensation by considering both physical and chemical factors. We have studied electrowetting-actuated condensation on hydrophobic surfaces, aiming for enhancement of heat transfer in dropwise condensation. The idea is to use suitably structured patterns of micro-electrodes that generate a heterogeneous electric field at the interface and thereby promote both the condensation itself and the shedding of condensed drops. Comforting the shedding of droplets on electrowetting-functionalized surfaces allows more condensing surface area for re-nucleation of small droplets, leading to higher condensation rates. Possible applications of this innovative concept include heat pipes for (micro) coolers in electronics as well as in more efficient heat exchangers.

¹We acknowledge financial support by the Dutch Technology Foundation STW, which is part of the Netherlands Organization for Scientific Research (NWO), within the VICI program.

Davood Baratian
University of Twente

Date submitted: 01 Aug 2016

Electronic form version 1.4