Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Layers of Porous Superhydrophobic Surfaces for Robust Water Repellency FARZAD AHMADI, JONATHAN BOREYKO, Virginia Tech, NATURE-INSPIRED FLUIDS AND INTERFACES TEAM — In nature, birds exhibit multiple layers of superhydrophobic feathers that repel water. Inspired by bird feathers, we utilize porous superhydrophobic surfaces and compare the wetting and dewetting characteristics of a single surface to stacks of multiple surfaces. The superhydrophobic surfaces were submerged in water in a closed chamber. Pressurized gas was regulated to measure the critical pressure for the water to fully penetrate through the surfaces. In addition to using duck feathers, two-tier porous superhydrophobic surfaces were fabricated to serve as synthetic mimics with a controlled surface structure. The energy barrier for the wetting transition was modeled as a function of the number of layers and their orientations with respect to each other. Moreover, after partial impalement into a subset of the superhydrophobic layers, it was observed that a full dewetting transition was possible, which suggests that natural organisms can exploit their multiple layers to prevent irreversible wetting.

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Date submitted: 31 Jul 2015   Electronic form version 1.4