

Abstract Submitted  
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**Controlling phase change: Drying-up under water or staying wet during boiling**<sup>1</sup> PAUL JONES, ADRIAN KIRN, Department of Mechanical Engineering, Northwestern University, DENNIS RICH, Illinois Math and Science Academy, ASHLEY ELLIOT, NEELESH PATANKAR, Department of Mechanical Engineering, Northwestern University — Rough textured surfaces may be used to manipulate the phase of water. Textured surfaces that are hydrophobic are capable of keeping surfaces dry when submerged under water. In particular, surfaces with conical geometry may be used to de-wet while under water. These surfaces, with nanometer-scale roughness spacing, act to stabilize the vapor phase of water, even when liquid is the thermodynamically favorable phase. Textured surfaces that are hydrophilic are useful for the reverse phenomenon of keeping surfaces wet under conditions for boiling. Here, the presence of vapor is expected, which is contrary to our results. This approach for stabilizing the liquid phase of water may be generalized to other phase transformations of water. We use molecular dynamics simulations to demonstrate stabilizing the vapor and liquid phases of water adjacent to textured surfaces that do not rely upon trapped air. This work aims to help organize the types of geometries that will wet, and those that will de-wet once ambient pressure subsides.

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