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Surfactant droplets on hydrophobic microstructures[1] PEICHUN AMY TSAI, NADIA SHARDT, MASOUD B. BIGDELI, JANET ELLIOTT, University of Alberta — Surfactantsamphiphilic moleculescan easily adsorb at interfaces. Their presence can destroy the useful, gas-trapping (CassieBaxter, CB) wetting state of a drop sitting on a superhydrophobic surface. Here, we examine how surfactants alter the wetting state and contact angle of aqueous drops on hydrophobic microstructures of different surface roughness (r) and solid fraction (ϕ). Experimentally, at low surfactant concentrations (C_s), some drops attain a homogeneous wetting state (Wenzel, W), while other drops are in the CB state. In contrast, all of our high C_s drops attain the Wenzel state. To explain this observed transition, we develop a thermodynamic free energy analysis and find that, theoretically, for our surfaces the W state is always thermodynamically preferred, while the CB state is metastable at low C, consistent with experimental results. We further provide a beneficial blueprint for stable CB, gas-trapping states for applications exploiting superhydrophobicity.

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