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Computation of Super-Hydrophobic States and Stability[1]
YONGKANG CHEN, Portland State University, DANNY BOLLEDDULA, RYAN JENSON, MARK WEISLOGEL — Super-hydrophobic fluid phenomena have been the focus of an increasing number of research investigations over the past decade. Perhaps the greatest achievements recently have come by way of the highly controlled surfaces that can be produced using any one of a number of rapidly expanding surface microfabrication techniques. In this work we present a numerical approach to systematically probe both the states and stability of certain (super- or ultra-) hydrophobic surfaces as they depend on surface porosity, specific surface feature size and geometry, and fluid properties such as 'equilibrium' contact angle and surface tension. Drop stability in terms of critical roll-off angles, advancing and receding contact angles (hysteresis), Bond number, and effective contact angle is computed and used as a measure of 'super-hydrophobicity.' Both Wenzel and Cassie hydrophobic states are analyzed by the numerical method.

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