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Transition States for Submerged Superhydrophobic Surfaces: Partially-Pinned Air-Water Interface[1] HOOMAN TAFRESHI[2], AHMED HEMEDA, Virginia Commonwealth University, VCU TEAM — The pressure at which a superhydrophobic surface transitions from the Cassie state to the Wenzel state is often referred to as the critical pressure. Our mathematical simulations have shown that the Cassie-to-Wenzel transition is a gradual process that takes place over a range of pressures as oppose to an event that happens at a certain pressure. During the transition period, the air-water interface may go through a series pinned, partially-pinned, and de-pinned states that depend on the geometry of the surface asperities. This in turn indicates that the drag-reduction effect produced by a submerged superhydrophobic surface can vary with the hydrostatic pressure, and is highly dependent on sharpness of the surface asperities. The study reported here reviews our recent discoveries in simulating the wetted area and drag reduction effect of superhydrophobic surfaces with different microstructures.

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