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Dynamic Wetting Regimes in Droplet Impact on Micropatterned Surfaces ARASH AZIMI, PING HE, Lamar University — The main objective of this study is to explore the dynamic behavior of a droplet impact at low Weber (We) numbers on hydrophobic micropatterned surfaces and to obtain insight into all possible dynamic wetting regimes. A series of continuum simulations has been conducted for a 1 μL water droplet at $We < 30$ on micropatterned surfaces, whose roughness size is on the order of 25 μm. We examined three surfaces with different solid area fractions of $\phi = 0.04, 0.0443, 0.0625$ but with a similar surface roughness ratio ($r \approx 1.75$), so that their static wetting states are all Cassie-dominant. In total, we find 6 different dynamic wetting regimes, i.e., Cassie, Cassie rebound, temporary penetration rebound, Wenzel, Wenzel to Cassie, and Wenzel rebound. For the surfaces with a smaller ϕ, more possible wetting regimes have been observed, and hence, the final wetting state is dependent on the initial impact velocity. Moreover, the regime boundaries have been evaluated in terms of We and ϕ. Our results show that at a given impact velocity, the solid microstructure plays an important role in impact dynamics and determines the final wetting state.

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