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The effects of surface roughness on the contact line friction coefficients of water droplets on micro\nano-patterned surfaces JIANGTAO CHENG, University of North Texas — We report the effects of surface roughness on contact line friction coefficient (CLFC) of water droplets on micro- and nano-patterned surfaces. Both advancing and receding CLFCs have been measured on smooth, one-tier (with micropillars), and two-tier (with CNTs grown on micropillars) surfaces. In comparison with smooth surface, superhydrophobic surfaces can decrease both the advancing and receding CLFCs by more than 10 times. However, droplets on one-tier surfaces exhibit different dynamic behaviors in advancing and receding movements. We investigated the Wenzel-Cassie state transition on micropillar structures and found that the receding motion of a droplet on micropillars is dominated by the Wenzel model with significant receding contact line pinning, which leads to higher receding CLFC. However, rolling mechanism of liquid particles near the advancing contact line controls the advancing motion of a droplet on micropillars. There is a high tendency for an advancing droplet to exhibit Cassie-type behavior on one-tier surfaces and hence advancing CLFC is considerably mitigated. On two-tier superhydrophobic surfaces, it is the Cassie–Baxter behavior that dominates both the advancing and receding contact line motions giving rise to less friction coefficients.

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