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A Tale of Two Droplets: Wetting Phenomena on Oil-infused Surfaces[1] PING HE, Lamar University, XIANMING DAI, University of Texas at Dallas — When a water droplet is in contact with an oil-infused substrate, the oil will climb up the droplet outer contour and form a wetting ridge resulting a hydrophilic or hydrophobic outlook that depends on the competition of three pair-wise surface tensions of water-air, oil-air and water-oil, respectively. The theory of predicting the equilibrium contact angle at different ratios between the droplet size and the oil film depth has been developed in the literature. However, modeling and simulating this dynamic wetting process is not reported in the research field. The main difficulty lies in the numerical representation of the surface tension forces at the tri-phase (water-oil-air) contact line. In this talk, the authors present a novel phase-field method that can accurately compute the tri-phase surface tension forces and precisely predict the equilibrium wetting conditions consistent with the theory. Moreover, the authors present an interesting study of two water droplets interacting on an oil film. The wetting ridges of the two droplets interfere with each other, and drive the droplet-to-droplet motion differed at various initial distances between the two droplets. This study is critically helpful towards understanding the underlying mechanisms in the ridge-ridge interactions.

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