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Numerical study of liquid film rupture after droplet spreading on a superhydrophilic surface YISEN GUO, YONGSHENG LIAN, University of Louisville — When a droplet impacts onto a solid surface, different outcomes can be observed, such as rebound, spreading and splashing. We present numerical simulation results on liquid film rupture after spreading of a droplet impact on a smooth superhydrophilic surface. The Navier-Stokes equations are solved using the variable density pressure projection method and the moment-of-fluid method is used to track the droplet interface. A superhydrophilic or superwetting surface has strong affinity to liquid and we assume the contact angle between solid and liquid is almost zero degree. The droplet spreading and film rupture process occurs in two stages: the droplet first spreads onto the surface and flattens into a thin film as it reaches the maximum diameter, then the film rim becomes unstable and the film rupture initiates from the rim toward the center gradually until the entire film breaks up into secondary droplets. The duration of the film rupture stage is much shorter than the spreading stage. The simulation result is compared with experiment and good agreement is achieved. We investigate the film thickness evolution during spreading and the effect of surface wettability on film rupture.

Yongsheng Lian
University of Louisville

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