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Investigation of a Single Droplet Impact onto a Liquid Film with Given Horizontal Velocity

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Abstract

The dynamics of a single droplet impact onto a liquid film is numerically studied in this work. A two-dimensional droplet is initially placed above a liquid film and falls freely under gravity together with a given horizontal velocity. To conduct numerical simulations, a hybrid method is adopted, in which the flow field is solved by using the lattice Boltzmann method and the interface is captured by solving the Cahn-Hilliard equation directly. At a fixed value of density ratio of droplet to ambient fluid (ρ^*), the effects of Bond number (Bo), Weber number (We) and dimensionless liquid film thickness (H^*) are systematically investigated. Based on the results achieved, it is found that the behavior of resultant splash structure after droplet impact is greatly affected by Bo, We and H^*. By increasing Bo and We, a higher right jet can be generated, but it has an opposite influence on the left jet. Moreover, there exists a

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