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Drop bouncing dynamics on draining films: the influence of the entrained air layer[1] ZIWEN HE, AUSTIN TAYLOR, HUY TRAN, MIN Y. PACK, Baylor University — The characteristic deposition morphology of single droplet impact on smooth liquid films is contingent upon the Weber number (We), the balance of inertial and surface tension effects. We demonstrate previously unexplored dynamics between droplets impacting super-thin films described by the ratio of the liquid film thickness, H, to droplets with diameter, D when H/D <0.1. Besides bouncing, delayed merging and early merging cases, a new phenomenon which we call 'contact bouncing' associated with droplet impacting thin liquid film of the same substance at moderate to low normal We = 5 ˜20 is identified on the draining film (0.004 <H/D <0.085) such that the droplets can rebound with negligible mass losses even if the air layer between the droplet and liquid film has been ruptured. To analyze the mechanism of 'contact bouncing', we posit that the ability for the droplet to bounce on the draining film is related to the mobility of the liquid film, and the entrained air layer purged by the liquid film initiates the occurrence of the contact. Moreover, normal impact speed as well as the liquid film thickness is presented in the phase diagram including bouncing contact bouncing, delayed merging and early merging regimes.

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