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DROPLET REBOUND PHENOMENON UNDER SUDDEN DECREASE OF GRAVITY

Abstract

The physical process of droplet spreading or wetting on solid surface plays very important role in many industrial applications. On the other hand, for space applications, original static droplet on a flat surface under normal gravity would cause movement when gravity was suddenly decreased due to interfacial recoil. If the recoil is sufficiently strong, the drop would rebound, detachment, bouncing up. Abundant of fluid dynamic characteristics are included in this process which is a novelty and typical fundamental phenomenon in microgravity physics of fluids, and it is very meaningful to reveal the basic law of fluid dynamics. In this study, a liquid drop rebounds on a flat surface caused by sudden decrease of gravity is simulated with Level Set method. The results show that a series of movements of the droplet like rebounding, detachment, bouncing up, oscillation and transformation will be produced by surface recoil after certain degree of sudden decrease of gravity. For the droplet of same size, the ability of rebound is increased and velocity of rising up becomes faster with the increase of gravity falling. The tendency of rebound is increased with the larger of the size when gravity is decreased the same level. No detachment is even occurred for small droplets. Among the droplets detached, the detachment time linearly proportioned with time is extended with the larger of the droplet. However, during rising up, the frequency of surface transformation and oscillation is gradually decreased with the larger of the droplet, the amplitude acts the opposite. Suratman number plays important role in the process of droplet rebound.