

Levitating droplet over a moving wall: mechanism and position control

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When a droplet is deposited onto a moving wall, the droplet can steadily levitate (Ref. 1). An air film between the moving wall and the levitating droplet plays an important role in the steady levitation since lubrication pressure generated inside the air film sustains the droplet's weight. We investigate the steady air film in order to clarify the mechanism of the droplet levitation over the moving wall. First, we discuss whether lubrication theory can be basically applied to the air film for the calculation of lubrication pressure. Pressure distributions and flow fields inside the air film are computed by numerical simulations under two kinds of governing equations. These results verify that lubrication theory can be applied due to negligible inertia force inside the air film. Next, we consider a typical process of determining the steady shape of the air film based on the local pressure balance at the droplet's bottom. In addition, we used our figures to control the position of the droplets as shown in Figure 1. We systematically investigate the mechanism of this method.

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REFERENCES:

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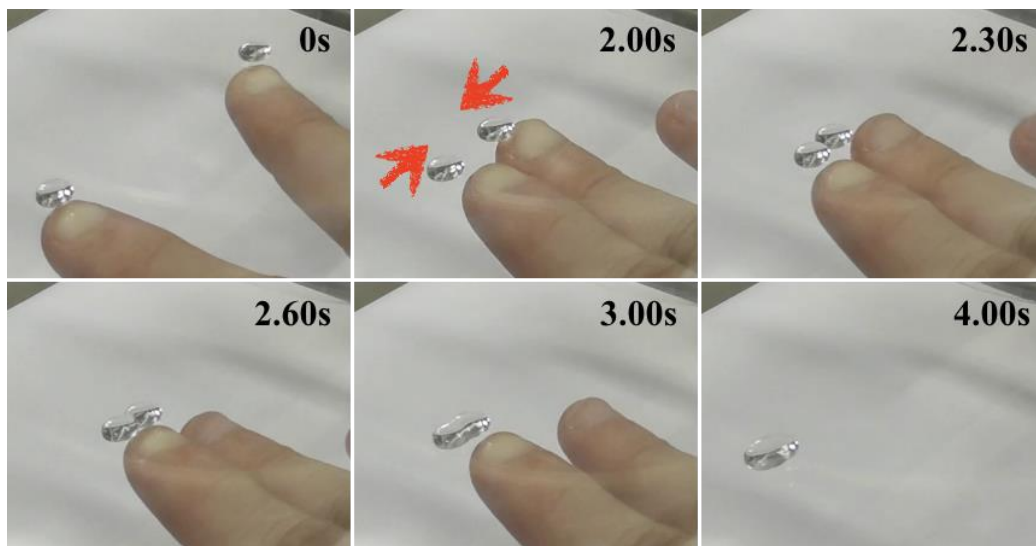


Figure 1. Position control of levitating droplets by fingers.