

FIG. 1.

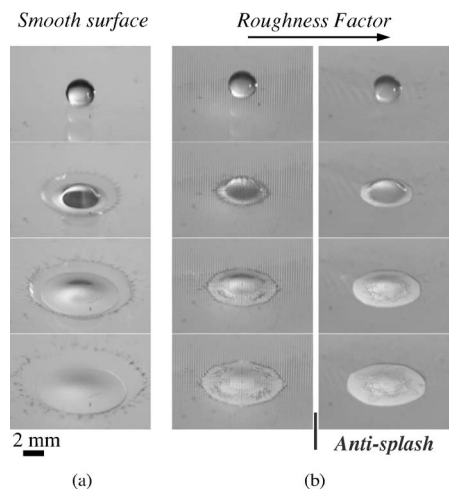


FIG. 2.

Splash and anti-splash: Observation and design

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We experiment with releasing ethanol droplets, from a specific height, onto both flexible and rigid surfaces. The study of the resulting impact and splashing provides new insights into the mechanisms of the short time-scale dynamics.

Tuning and even suppressing a splash can be achieved by the use of elastic membranes with controlled tension. Under certain experimental conditions, i.e., droplet size and velocity of impact, for which a splash occurs after the impact of a droplet on a Petri dish [Fig. 1(a)], striking changes in the response occur when elastic membranes are used: as the film tension is decreased, the ability of the membrane to deflect during the impact increases until the complete suppression of the splash [Fig. 1(b)].

We also use soft-lithography techniques to manufacture topographically microdecorated surfaces which consist of micropillars arranged on a square lattice with various lattice parameters. The use of these substrates allows us to alter the impact dynamics and, in particular, to achieve the tuning of a splash until the complete inhibition of the ejection of matter during the impact (Fig. 2).

Rapidly moving the target surface is another way to control a splash. When the drop impacts a stationary surface, it splashes uniformly [Fig. 3(a)]. However, when the target surface moves (here a rotating disk is used), the splash is enhanced in the direction opposed to the motion and attenuated in the direction of motion [Fig. 3(b)]. When a droplet impacts an inclined surface, asymmetric splashing is also observed (Fig. 4). In this example, a drop impacts a solid, smooth, and dry surface slightly above the splashing threshold. Above a critical inclination, splashing becomes suppressed only on the upward side [Fig. 4(b)]. From the experiments presented above, we expect to better understand the fundamental physics of splashing.

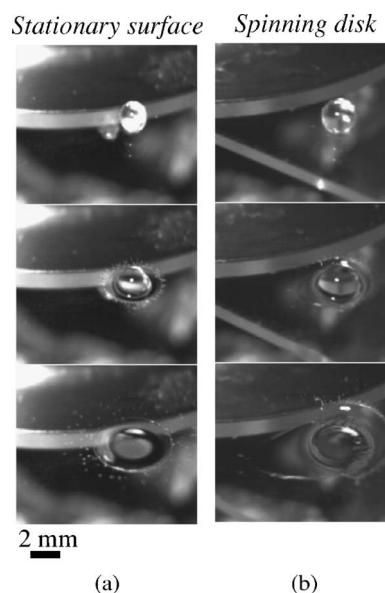


FIG. 3.

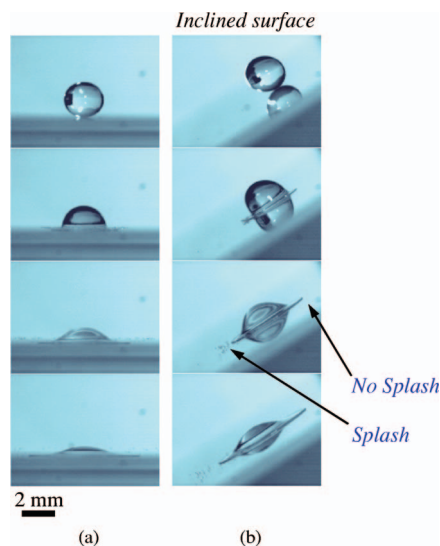


FIG. 4.