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PORTFOLIO

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A bouncing droplet on an inclined hydrophobic surface

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Abstract A trajectory of a water droplet of volume 0.4 μL impacting and bouncing on the hydrophobic surface (143°) inclined with 12° is presented. The photograph was taken with a 35 mm format digital SLR camera in a long-time exposure of 2.5 s illuminated with a couple of continuous point lighting. Also, a selected comparison is shown for snapshots of a bouncing millimetric droplet, having volume of 10 μL, inclined angle of 15° and contact angle of 147°, during the first impact between the experimental results which were recorded with a high-speed camera at 1,222 frames/s and the 3D computation (using a Volume-of-Fluid method on 330 × 70 × 35 computational grids with $dt = 1.0 \times 10^{-4}$ s) which was carried out with FLUENT software. At the impact the droplet is found to deform and then dissipate the energy due to the surface tension.

Figure 1 shows a deionised (DI) water droplet of volume $V_B = 0.4$ μL on a superhydrophobic surface whose contact angle is $\theta_c = 143°$. A trajectory of the DI water droplet impacting and bouncing on the hydrophobic surface inclined with $\theta_f = 12°$ is shown in Fig. 2. The photograph was taken with a 35 mm format digital SLR camera in a long-time exposure of 2.5 s illuminated with a couple of continuous point lighting. Figure 3 shows a selected comparison of snapshots of a bouncing millimetric droplet, having $V_B = 10$ μL, $\theta_f = 15°$ and $\theta_c = 147°$, during the first impact between the experimental results which were recorded with a high-speed camera at 1,222 frames/s and the 3D computation (using a volume-of-fluid method on 330 × 70 × 35 computational grids with $\Delta t = 1.0 \times 10^{-4}$ s) which was carried out with FLUENT™ software. At the impact the droplet is found to deform and then dissipate the energy due to the surface tension.

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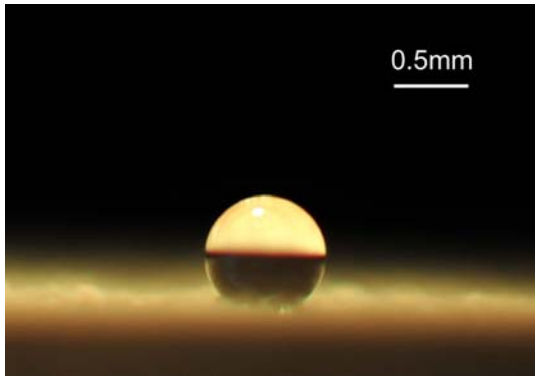

Fig. 1 A droplet of $V_B = 0.4$ μL on a hydrophobic ($\theta_c = 143°$) surface

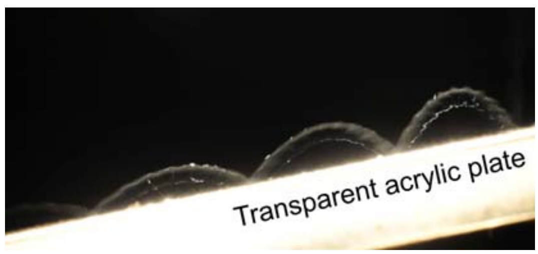

Fig. 2 Trajectory of a droplet ($V_B = 0.4$ μL) impacting and bouncing on an inclined ($\theta_f = 12°$) hydrophobic ($\theta_c = 143°$) surface

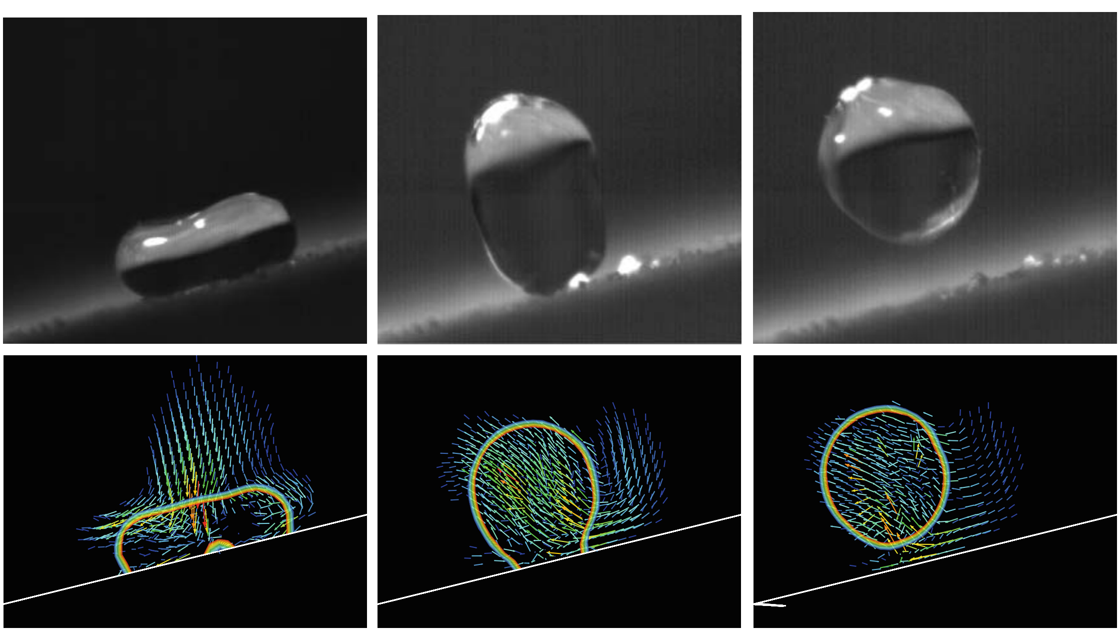

Fig. 3 Selected snapshots of a millimetric droplet ($V_B = 10$ μL) impacting and bouncing on an inclined ($\theta_f = 15°$) hydrophobic ($\theta_c = 147°$) surface during the first impact. The time progresses from left to right. *Top* experiment, *bottom* 3D computation (longitudinal cross-sections are shown together with some vector plots)