Supporting Information: Splashing threshold of oblique droplet impacts on surfaces of various wettability

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SUPPORTING FIGURE S1

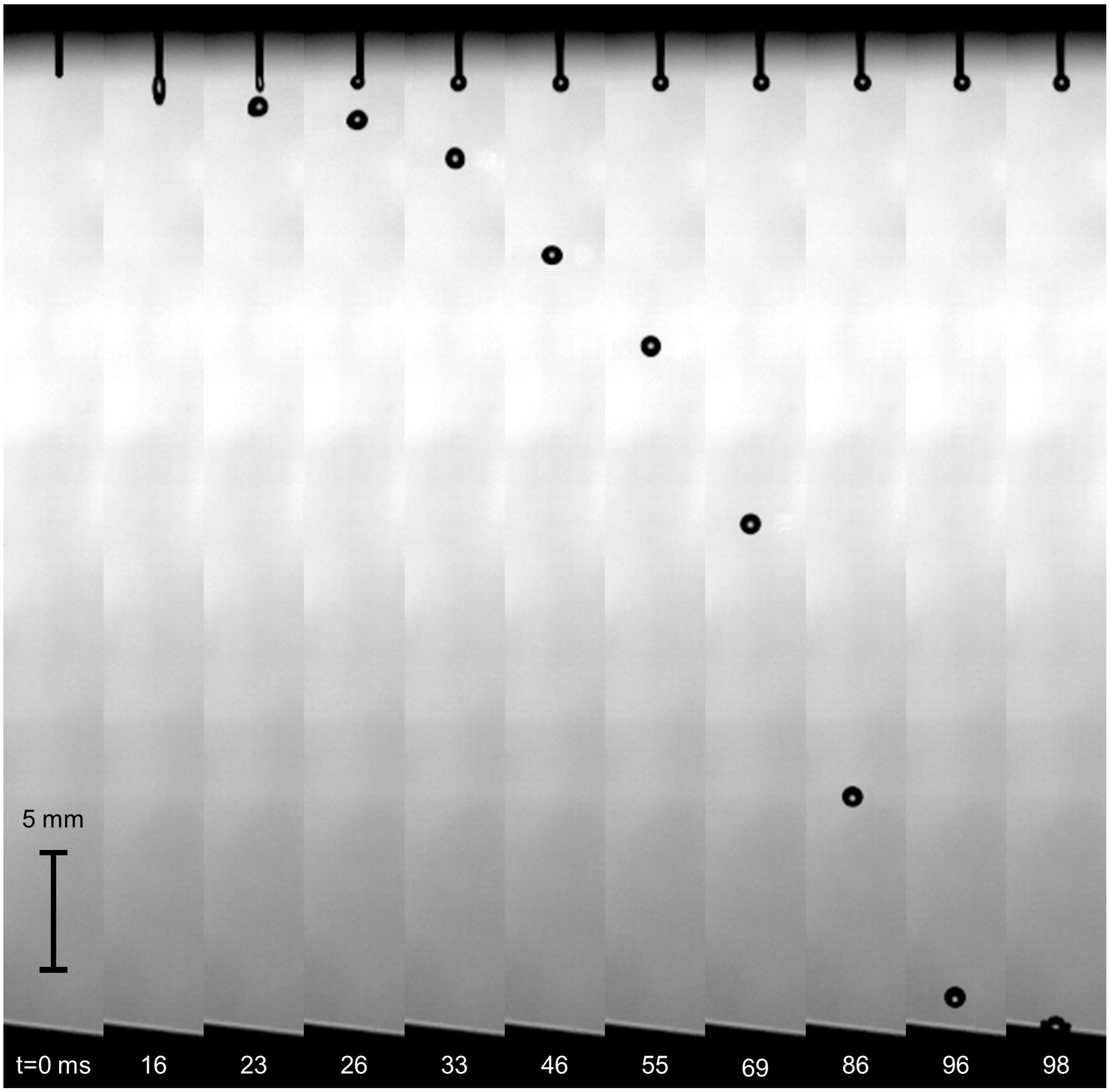

Figure S1. Snapshots of the formed droplet from the DOD generator during its fall. Although some oscillations occur immediately after detachment (t=23 to 46 ms), the droplet is spherical by the time it reaches the surface.

SUPPORTING NOTE 1. EXPLANATION OF THE SPLASHING THRESHOLD MODEL TRANSFORMATION INTO FIGURE 4

Where the model given by **Equation 7** takes the form of a straight line in **Figure 8**, its shape is curved in **Figure 4**, and comes to a gradient discontinuity at one point. This discontinuity corresponds to the normal splashing threshold, at which v_t=0 and v_n=v_{n0}. The exact surface tilt (α) and surface speed (v_s) at which this point occurs depends on the experimental setup, specifically the falling speed of the droplet (v_d). In an ideal drop impact experiment, the droplet could be suspended in mid-air, with v_d=0, in which case impacts would occur at a normal angle of incidence for a surface tilt of α=90°, as the surface travels laterally and makes contact with the droplet (see **Figure 1**). In our experiment, however, the droplets were falling downwards. In the case of the r-Al surface (which is shown with some additional information in **Figure S2** below), the falling velocity at the moment of impact was v_d=1.49 m/s. As per the introduction, the normal and tangential velocities can be stated as: $v_n = v_s Sin(\alpha) + v_d Cos(\alpha)$ and $v_t = v_s Cos(\alpha) - v_d Sin(\alpha)$. Solving, we find that for v_n=6.90 and v_t=0 (the normal splashing threshold on the r-Al surface), v_s=6.74 and α=77.5, which describes the discontinuity.

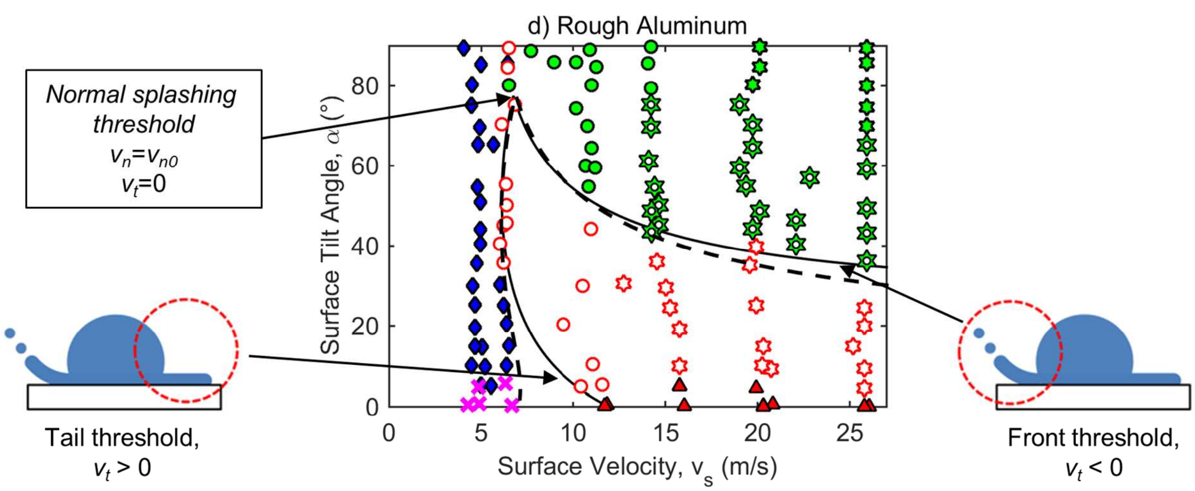

Figure S2. Explanation of the gradient discontinuity found in the model lines of Figure X.

Furthermore, as per the introduction, the tangential velocity is taken as being positive in value for the tail of the lamella, and negative for the front. This convention results in two different model lines: one descending from the discontinuity, representing the splashing threshold at the tail, and another line progressing mainly towards the right representing the threshold of the lamella's front.

SUPPORTING NOTE 2. SPREADING DYNAMICS ON DIFFERENT SURFCES

In order to find the effect of the surface on the value of *c* (**Equation 5)**, we compared the spreading dynamics of droplets impacting on each of our six surfaces. To ensure comparability, the impacts analyzed were all at similar Weber numbers, specifically: *We*=293 (s-PTFE), *We*=263 (s-Al), *We*=337 (r-PTFE), *We*=290 (r-Al), *We*=314 (t-PTFE), and *We*=308 (t-Al). **Figure S3** plots the dimensionless spread radius of the lamella, *R/D*, versus the dimensionless time, and confirms that *c* does not vary significantly among different surfaces.

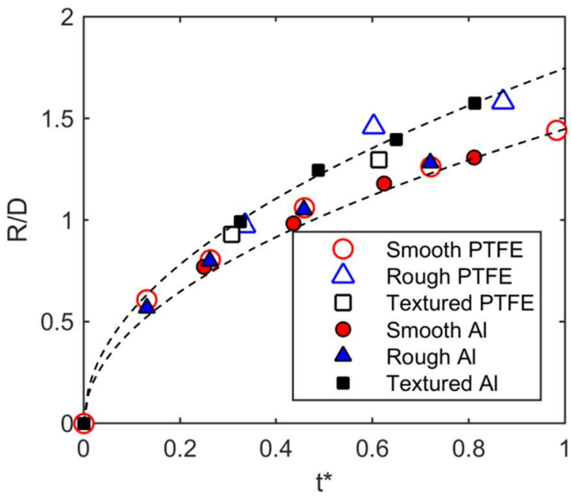

Figure S3. Spreading dynamics of droplets on each surface at We~300. The dashed lines represent the extremes of the observed values of the scaling factor, *c*=0.72 and *c*=0.87.

SUPPORTING FIGURE S4

Figure S4. Impact of one large and two small droplets on the t-PTFE surface. Where the two smaller droplets exhibited rebounding behaviour, the arrow at t^{*}=8.61 indicates the pinned droplet left behind from the larger droplet as a result of partial rebounding. The dimensionless time is given with respect to the large droplet, and the scale bar is 1 mm in length. v_n=1.81 m/s, v_t=0.10 m/s, D=0.95, 0.35, 0.33 mm.