Electronic Supplementary Material (ESI) for Soft Matter.

Supplementary Information

On the shape of a droplet in a wedge: new insight from electrowetting.

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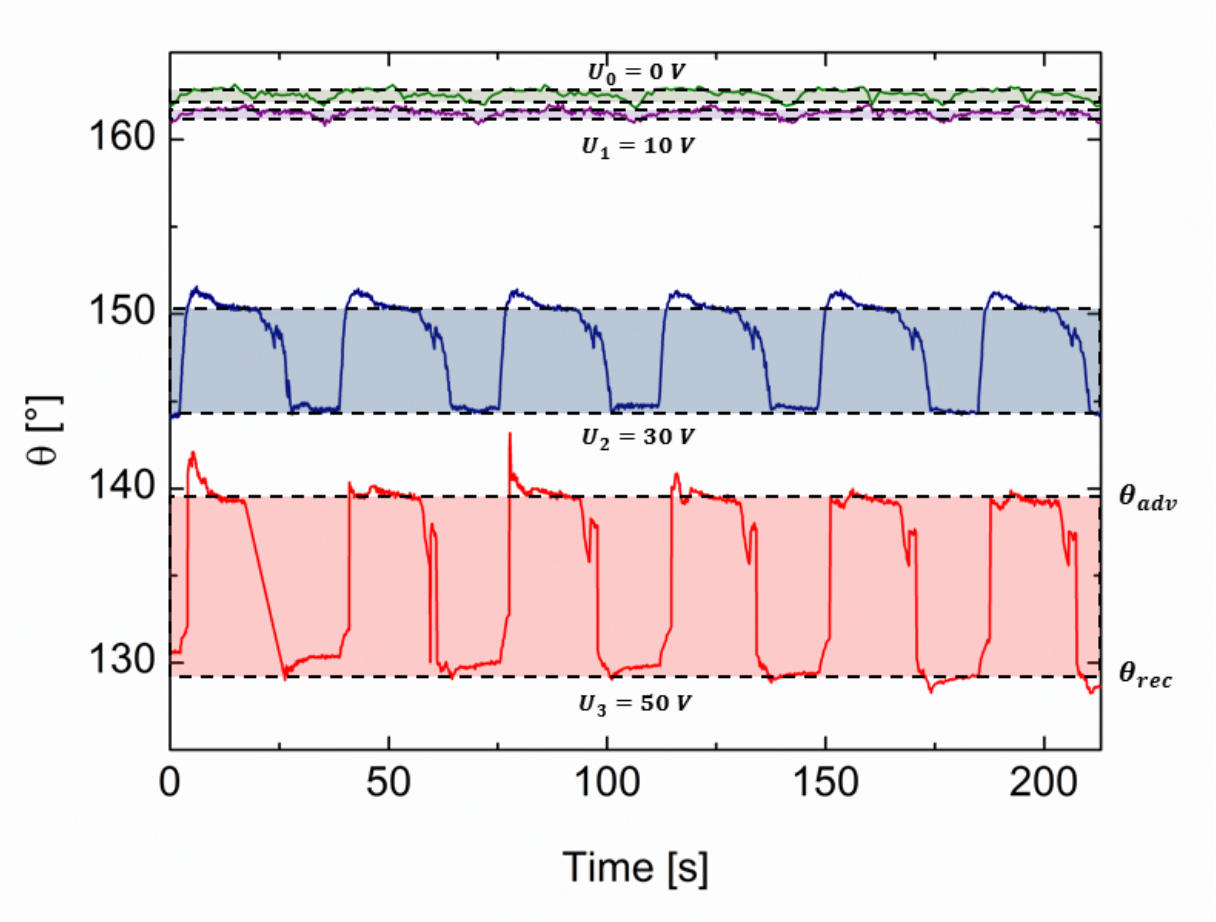
S1. Contact angle hysteresis measurements

We conduct Advancing Receding Contact Angle (ARCA) measurements in order to extract the contact angle hysteresis (CAH) for water droplets on the substrate inside the oil environment. The advancing and receding contact angles are measured using sessile drop mode in OCA 20 (Dataphysics Inc.). The ARCA measurements are conducted at four different voltages within the same range in which we do the wedge experiments. Without applying any voltage the Young angle is 163°, and we observe a small CAH as low as 1 degree (green curve). When a low AC voltage is applied, we observe suppressed CAH (purple line showing less that one degree CAH at 10V). This can be explained by the induced vibration at the contact line which facilitates the depinning of the droplet and decreases the hysteresis effects [1]. However, as we further increase the voltage, we observe a systematic increase of the CAH. Because of the increase in Maxwell stress at higher voltages, we suppose that the oil layer between the water droplet and the substrate becomes thinner. Therefore less lubrication results in larger contact angle hysteresis on the substrate.



Supplementary Figure 1 | ARCA Measurements on the substrates. Contact angles are measured for a water droplet on the Teflon coated ITO substrates at 0 V (green), 10 V (purple), 30 V (blue), and 50 V (red) as a few effective voltages in the experiments, corresponding to approximately 1°, 0.5°, 6°, and 10° CAH respectively.

[Movie S1]

Movie S1 | Droplet morphology change in a wedge due to wettability variation. Typical behavior of a water droplet in a wedge geometry while its contact angle is changing by electrowetting. The volume of the droplet is 4 µL and the wedge opening angle is 20°. AC electrowetting in the range of 0-100 V results in a contact angle change between 163° and 136°. As a consequence, the droplet moves vertically.

1S. Li, F. and F. Mugele, *How to make sticky surfaces slippery: Contact angle hysteresis in electrowetting with alternating voltage.* Applied Physics Letters, 2008. **92**(24): p. 244108.