Electronic Supplementary Material (ESI) for Soft Matter.

Supporting Information

Lateral actuation of an organic droplet on conjugated polymer electrodes via imbalanced interfacial tensions

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1. Schematic of experimental setup.

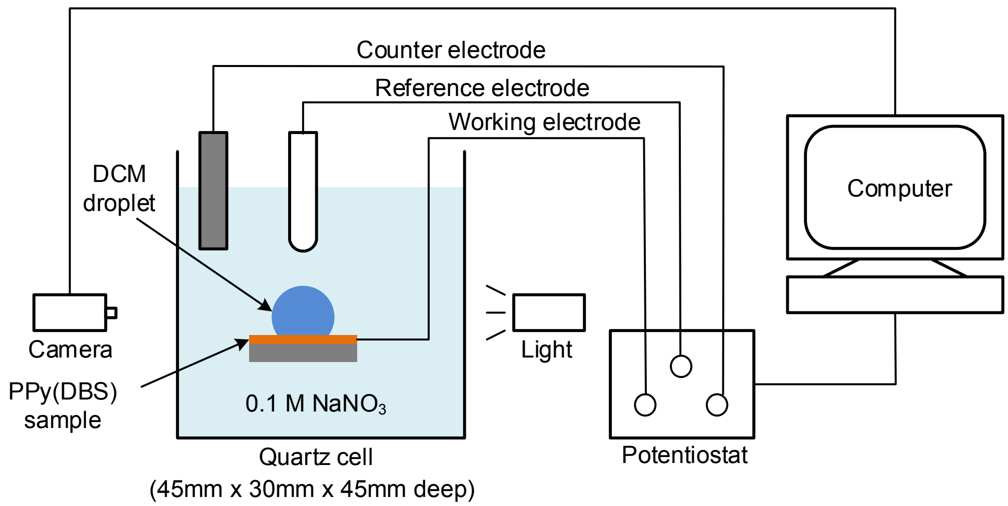

Fig. S1 Schematic of the experimental setup. The PPy(DBS) samples were placed in a quartz cell filled with 0.1 M $NaNO_3$. A copper tape was used as the counter electrode, and a saturated calomel electrode (SCE) was used as the reference electrode. The voltage was applied by using a potentiostat. The organic droplet was monitored through the camera of the goniometer.

2. **Calculation of the interfacial tension of a flattened sessile droplet.**

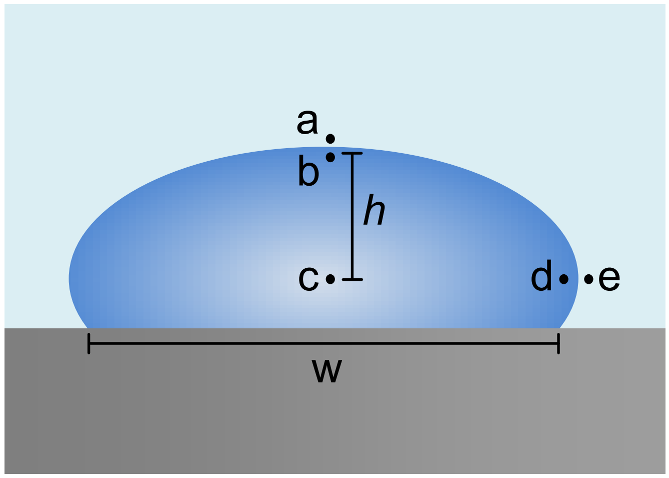

Fig. S2 Schematic of the cross-section view of a flattened droplet on a substrate. *a* and *b* indicate the outside and inside of the vertex of a droplet. *d* and *e* indicate the inside and outside of the point where the radius of droplet is maximal. *c* is in the droplet and at the same height as *d*. *h* is the distance between points *b* and *c*. *w* is the width of the droplet.

In Fig. S2, the following equations can be formulated for hydrostatic pressures,

$$P_{\mathrm{a}} + \Delta P_{\mathrm{ab}} = P_{\mathrm{b}} \qquad \text{(S1)}$$

$$P_{\mathrm{b}} + \Delta P_{\mathrm{bc}} = P_{\mathrm{c}} \qquad \text{(S2)}$$

$$P_{\mathrm{c}} = P_{\mathrm{d}} \qquad \text{(S3)}$$

$$P_{\mathrm{d}} - \Delta P_{\mathrm{de}} = P_{\mathrm{e}} \qquad \text{(S4)}$$

$$P_{\mathrm{e}} - \Delta P_{\mathrm{ae}} = P_{\mathrm{a}}, \qquad \text{(S5)}$$

where *P* represents the pressure at the indicated positions. ΔP_{ab} and ΔP_{de} are the Laplace pressures due to the surface curvature. Adding Equation S1 to Equation S5 results in

$$\Delta P_{ab} + \Delta P_{bc} = \Delta P_{de} + \Delta P_{ae} \qquad \text{(S6)}$$

or

$$\Delta P_{bc} - \Delta P_{ae} = \Delta P_{de} - \Delta P_{ab}\,, \qquad \text{(S7)}$$

in which

$$\Delta P_{bc} - \Delta P_{ae} = \Delta \rho g h \qquad \text{(S8)}$$

$$\Delta P_{de} = \gamma_{L\_O}\left(\frac{1}{R_{d1}} + \frac{1}{R_{d2}}\right) \qquad \text{(S9)}$$

$$\Delta P_{ab} = \gamma_{L\_O}\left(\frac{1}{R_{b1}} + \frac{1}{R_{b2}}\right), \qquad \text{(S10)}$$

where $\Delta \rho$ is the density difference between a droplet (e.g., DCM) and surrounding medium (i.e., 0.1 M $NaNO_3$), *g* is the constant acceleration due to gravity, *h* is the height difference between position *b* and *c*, γ_{L_O} is the interfacial tension of the droplet and surrounding medium. R_{d1} and R_{d2} are the principal radii of curvature at position *d*, and R_{b1} and R_{b2} are the principal radii of curvature at position *b*. Substituting Equation S8 to S10 into Equation S7 results in

$$\Delta \rho g h = \gamma_{L\_O}\left(\frac{1}{R_{d1}} + \frac{1}{R_{d2}} - \frac{1}{R_{b1}} - \frac{1}{R_{b2}}\right). \qquad \text{(S11)}$$

Thus, the interfacial tension between a droplet and the surrounding medium can be computed according to the droplet shape as

$$\gamma_{L\_O} = \frac{\Delta \rho g h}{\left(\frac{1}{R_{d1}} + \frac{1}{R_{d2}} - \frac{1}{R_{b1}} - \frac{1}{R_{b2}}\right)}. \qquad \text{(S12)}$$

According to Equation S12, the interfacial tension of the flattened droplet shown in Fig. 2b-ii is calculated as 0.27 $mN \cdot m^{-1}$.