Electronic Supplementary Material (ESI) for Soft Matter

Supporting Information

A novel fluorinated polyimide surfaces with Petal Effect produced by electrospinning

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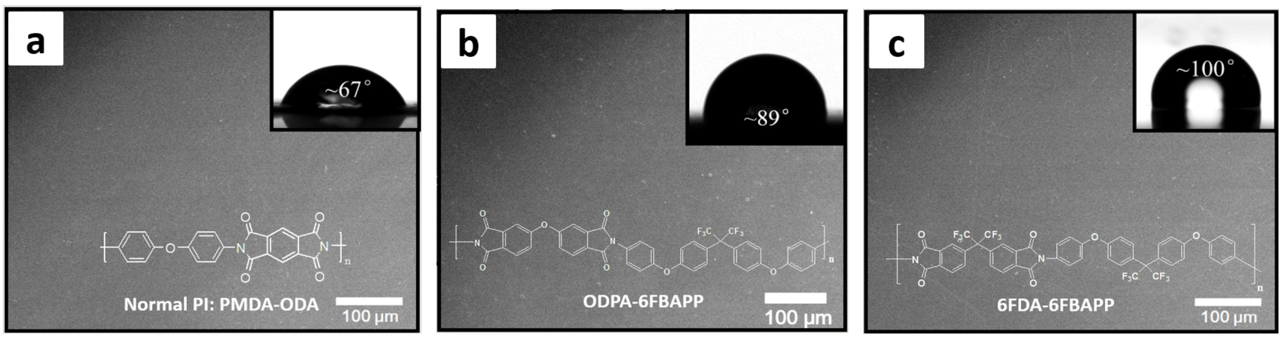

Figure S1. Water contact angles on casted normal PI(PMDA-ODA), ODPA-6FBAPP and 6FDA-6FBAPP films. On normal PI, the intrinsic CA is about 67^o, which is weak hydrophobic. On the ODPA-6FBAPP film, owing to the introduction of $–CF_3$, the intrinsic CA was increased to about 89°. On the 6FDA-6FBAPP film, the intrinsic CA was further enhanced to 100^o due to the extra load of $–CF_3$. The hydrophobicity of 6FDA-6FBAPPPI was further enhanced, as a result, the superhydrophobicity of PI is easier to achieve.

The mechanism of the adhesion test, using a dynamic contact angle detector (DCAD) [S1-S3]

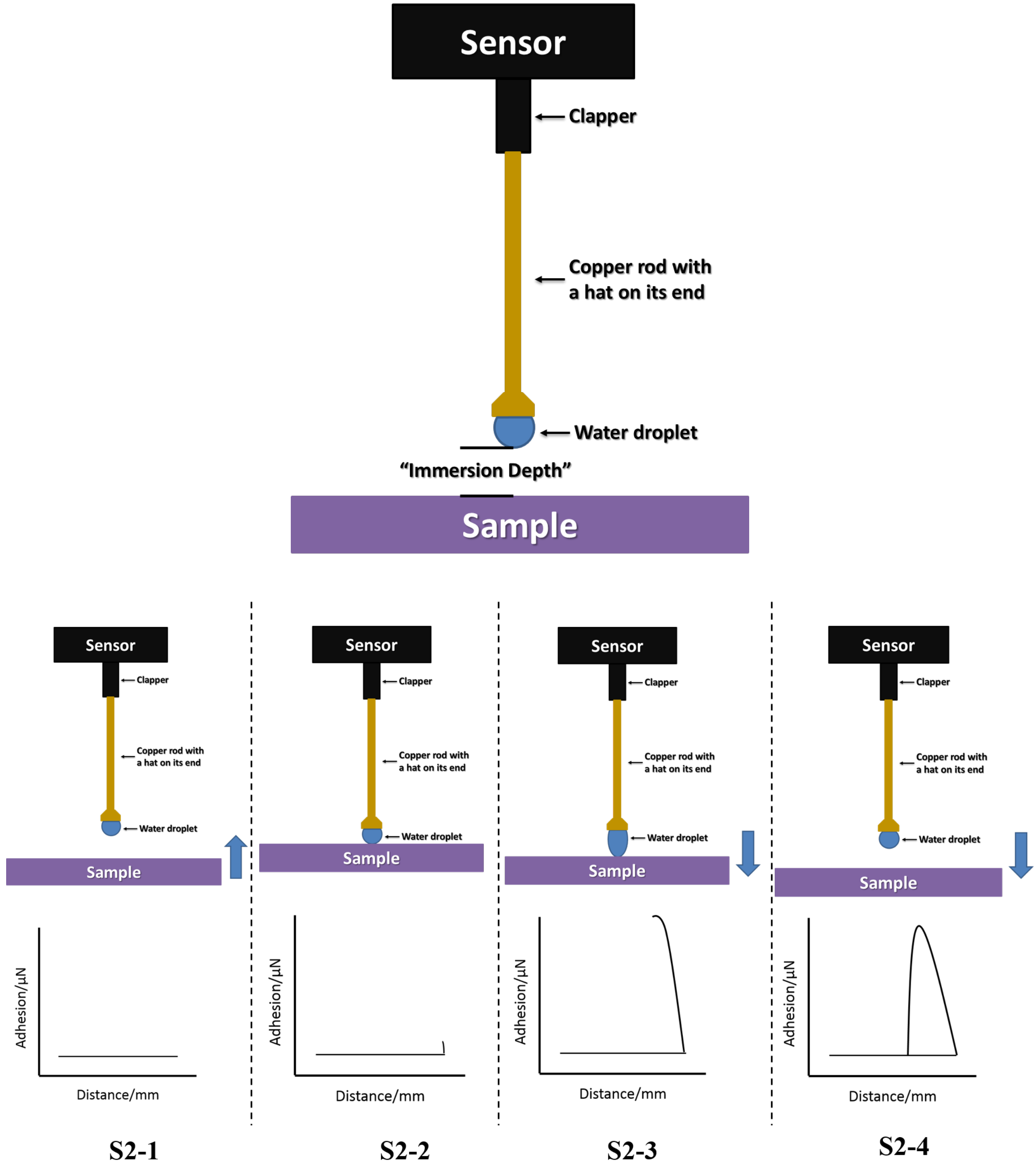

Figure S2. A brief chart of the components of the DCAD and the four main steps during the adhesion tests, as well as the typical curves corresponding to the very steps

The detector is actully an adapted micro balance. The basic components of the device are briefly illustrated in Figure S2. Before the adhesion test, a copper rod with a copper hat on its end was clapped onto the sensor. A certain amount of water was add onto the hat. After this, the sensor's reading was cleared. Because water can easily wet copper and the adhesion between water and copper was way larger than the one between water and the superhydrophobic "Petal Effect" surface, the water droplet could remain staying on the hat during the whole testing process.

Before the test begins, a proper "immersion depth" should be set. It refers to the distance between the very bottom of the droplet and the very upper surface of the sample. Then the target sample was mounted onto the accompanying base of the DCAD. The whole adhesion test could be broken down into four main steps, shown in Figure S2-1~S2-4, respectively. I): After the test began, the base was lifted steadily, closinging to the droplet at some certain speed. At this moment, the movement of the base and the forces that the sensor sensed would be recorded as Disrance (x) and Adhesion (y), respectively. The rising process was called as advancing circle. In the advancing circle, there was no contact between the droplet and the sample, so the readings were all zeroes, as shown as the black dotline in Figure 2. II): When the base's moving distance reached the value of the pre-set immersion depth, the upper surface should exactly touch the droplet and started to descend and the sensor started to give readings. III): The descending process was called the receding circle. In the receding circle, the interactions between the surface and water was trying to pull the droplet off from the rod, and the sensor sensed the interactions as the interfacial adhesion. As the sample descended, the adhesion caused larger deformation of the water droplet, leading to the increasement of the sensor's reading, until the water detached from the surface. IV): Then a sharp fall could be observed. Once again the sensor felt nothing till the end of the test. The whole receding circle was tipically shown as the red dotline in figure 2. At last, the peak value of the receding circle was the maximum adhesion that the sample surface could generate.

A movie of the adhesion test was given in the surpporting materials.

References

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