Experimental Details

Sample Preparation The polypropylene (PP) substrate used in this work was directly obtained from a file jacket (No. 85781, SMEAD co.), and the polyvinylidene fluoride (PVDF) sheet was used as purchased (Kynar®, Westlake Chemical). The thickness of the PP and PVDF substrates are around 190 μm and 760 μm, respectively. The substrate was cut into 1.5 cm square and then sonicated in acetone and DI water for 5 min. After air dried, the substrate and a 20 μm-thick polycarbonate (PC) track-etched membrane (pore size=0.6, 1.2 and 3.0 μm, ISOPORE™, Millipore Inc.) were placed between two glass slides, where binder clips were applied to hold the pieces together. The casting process was then held by putting the sample set in a vacuum oven at 190°C for 10 min. The PC membrane was removed afterwards by peeling it off from the substrate to form the artificial hairy surface.

Sample Characterization The contact angle measurement was carried out at ambient temperature (~23°C) by Ramé-Hart goniometer model 100 equipped with an automated dispensing system and a 30 gauge flat-tipped needle. Water purified through Milli-Q system (ρ>18 MΩ-cm, Millipore Inc.) was used as the probe fluid. Sessile drop images were photographed by putting 4 μl water droplet onto at least 5 different areas of the sample. Images for advancing angle were recorded as follows: fluid was gradually added into the droplet, typically 0.05 μl at a time, and images were captured after the fluid introduced each time. The angle was determined specifically from the image frame before the movement of the liquid interface was observed. Receding angle determination was performed by the same process but withdrawing the fluid from the droplet instead. The angle values were analyzed by Drop-Snake analysis, a plug-in for the *ImageJ* software.[1] Videos were tapped by recording the activity on the computer screen via a program while operating the goniometer. Surface morphology was observed by scanning electron microscope (JSM6400, JEOL co.) at 10 kV with Au-Pd coating deposited.

Theoretical contact angles, $\theta_{C\text{-}B,}$ were calculated by using the Cassie-Baxter equation[2]:

$$\cos\theta_{C-B} = f_{s/l}(\cos\theta_{pp} + 1) - 1$$

where θ_{pp} is the contact angle measured on the uncast polypropylene sheet, which is 93° here, and $f_{s/l}$ is the area fraction of the droplet in contact with cast structure. Since the cast structure is not regular, the estimate of the actual fraction of contact area is a challenge. We estimated this number through analyzing the top-viewed SEM pictures by *ImageJ*. Since the emission of secondary electrons is higher at the tips, we assume the brightest regions showing on the SEM picture are those in contact with the droplet. Therefore by adjusting the threshold, a range of the contact area fraction could be determined by the software.

(1) Stalder, A.F.; Kulik, G.; Sage, D.; Barbieri, L.; Hoffmann, P. *Colloids Surf., A: Physicochem. Eng. Aspects* **2006**, *92-103*, 286.
The plug-in can be downloaded at http://bigwww.epfl.ch/demo/dropanalysis/.

(2) Cassie, A.B.D.; Baxter, S. *Trans. Faraday Soc.* **1944**, *40*, 546-551