# Electronic supplementary information

## Robust superhydrophobic surfaces with mechanical durability and easy repairability

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### Experimental details

### Formation of superhydrophobic Ag film on the copper sheet.

The superhydrophobic Ag film was fabricated by the galvanic deposition, followed by perfluorodecanethiol coating. Briefly, the copper sheets were ultrasonically cleaned with acetone and deionized water sequentially and immersed into an aqueous solution of 0.02 M $AgNO_3$ solution for 30 s. The copper sheets were then taken out from the solution and rinsed with deionized water, followed by drying under nitrogen. The as-prepared sample surfaces were immersed into a 1mM ethanol solution of *1H*, *1H, 2H, 2H*-perfluorodecanethiol for 1 min. Subsequently, the copper sheets were rinsed by ethanol and then placed to dry in an oven for 30 min at 100 $^{o}$C to obtain a superhydrophobic surface.

### Friction test

The friction test was studied using a ball-on-plate tribometer (UMT-2MT tribometer

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(CETR)) under reciprocating motion. A commercially available steel ball with the diameter of 5 mm and surface finish of 0.02 μm rms (root-mean-square) were used as the stationary upper counterparts, whereas the tested sample was mounted onto the flat base and driven to slide reciprocally. The test conditions were as follows: stroke length = 0.5 cm, working frequency = 5 Hz, temperature = 23 °C, and relative humidity = 45%.

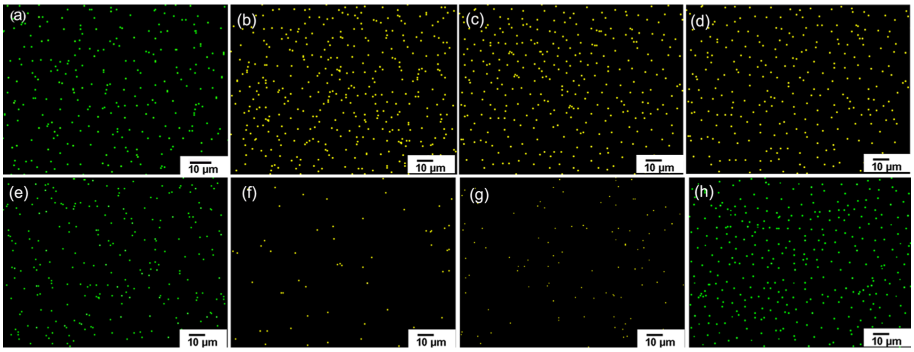


**Figure S1.** EDX fluorine elemental mapping for the structured metal/polymer composite surface (a) before and after (b) one, (c) five, and (d) ten abrasion cycles; and for the structured Ag film on the copper sheet before and after one abrasion cycle (e, f). Figure (g, h) are the EDX fluorine elemental mapping for (g) the structured metal/polymer composite surface after a long abrasion time and (h) the regenerated surface created by repeating the Ag deposition and fluorination process.

**Table S1. Atomic concentration of the surfaces before abrasion test, after abrasion test, and after regeneration process. The content of elements on the Surface was characterized by XPS analysis.**

| Treatment | Surface concentration (atom %) | | | | | |
|---|---|---|---|---|---|---|
| | C | O | F | S | Cu | Ag |
| As-prepared | 22.50 | 10.27 | 39.36 | 2.09 | 7.01 | 18.87 |
| Abraded 1× | 21.19 | 11.3 | 39.23 | 2.01 | 7.06 | 19.21 |
| Abraded 5× | 23.16 | 14.34 | 37.82 | 1.89 | 7.23 | 15.56 |
| Abraded 10× | 25.68 | 14.89 | 36.11 | 1.77 | 8.11 | 12.85 |
| After a long abrasion | 20.14 | 33.28 | 23.72 | 1.33 | 13.85 | 7.68 |
| After being restored | 24.34 | 11.75 | 40.07 | 2.16 | 6.36 | 17.32 |

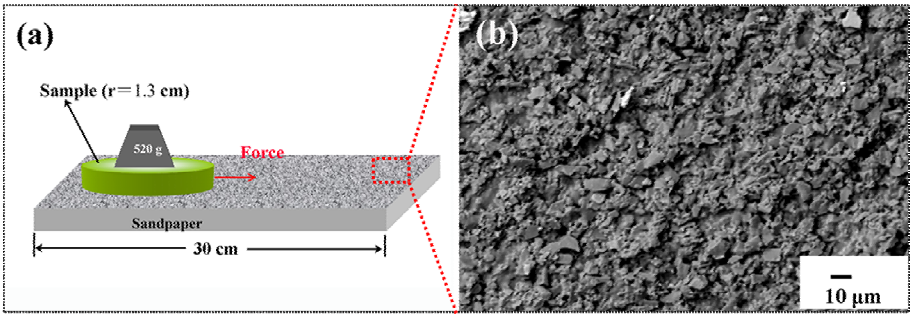


**Figure S2.** (a) Schematic illustration of the methodology of the scratch test. (b) SEM image of the sandpaper.

Figure S2 illustrates the methodology of the scratch test: 1500-mesh sandpaper served as an abrasion surface, with the superhydrophobic surface to be tested facing this abrasion material. While a pressure (10 KPa) was applied to the superhydrophobic surface, the surface was dragged in one direction with a speed and abrasion length of 3 cm/s and 30 cm, respectively.

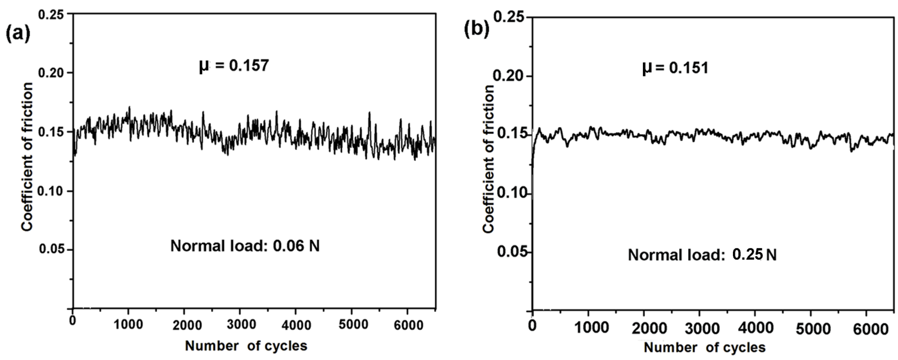


**Figure S3.** Coefficient of friction as a function of number of friction cycles as a function of number of friction cycles with the load for 0.06N (a) and 0.25N (b), respectively.

**Videos**

Video 1 highlights the created Ag/polymer surface remained its superhydrophobicity after being touched by fingers; Video 2 highlights the mechanical durability of the metal/polymer surface.