Electronic Supplementary Material (ESI) for RSC Advances

ELECTRONIC SUPPORTING INFORMATION

Rabbit Hair Regenerative Superhydrophobicity

Xiangyu Yin, Daoai Wang, Bo Yu* and Feng Zhou*

Experimental

Materials: The animal fibrous hairs from Rex rabbit are used in this work (RFHs, the average length of RFHs are about 1.8 cm and the density of about 1×10^4 mm^{-2}). They are commonly used for garment manufacturing. All the samples were cut into 3 cm×1.5 cm. Perfluorooctyl acid (PFA) was obtained from Sigma–Aldrich and used as received. All other chemicals used in this work were analytical grade and used as received. Deionized water was used throughout the experiments.

Fabrication of regenerative superhydrophobic RFHs: Firstly, all of the specimens were degreased by the mixed solvent of ether-ethanol (1:1, v/v), and then rinsed with deionized water for three times, dried at atmosphere (20 °C, relative humidity 30%) before use. To impart superhydrophobicity onto the materials, the processed RFHs were placed tightly over perfluorooctyl acid (PFA) solution (2 mg/mL) to ensure that the top of RFHs just touch the solution for several mins to rapidly load PFA into them. The above process was repeated three times. After that, the as-prepared RFHs were rinsed twice with acetone to remove the superfluous PFA and dried at ambient temperature.

Instrumentation: The sample surfaces were observed by field emission scanning electron microscopy (SEM, JSM–6701F, Japan) at 5 kV. Contact angles (CAs) were acquired using a DSA-100 optical contact-angle meter (Kruss Company, Ltd, Germany) at ambient temperature (20 °C) by injecting 5 μL of testing liquids onto the samples, and the CA values were determined automatically using the Laplace–Young fitting algorithm. Average CA values were obtained by measuring the sample at five different positions, and images were captured with a digital camera (Sony, Ltd., Japan). Chemical composition information about the samples were obtained by X–ray

Photoelectron Spectroscopy (XPS), the measurement was carried out on an ESCALAB 250xi spectrometer (Thermon Scientific, USA) using Al Kα radiation. The binding energies were referenced to the C 1s line at 284.8 eV from adventitious carbon. The oxygen plasma treatment was used to facilitate failure of superamphiphobicity, which was carried out by an oxygen plasma instrument (Diener electronic, 15 German). The PFA-RFHs were treated for 30 seconds with power of 98 W. Such plasma treatment could make the surface completely superhydrophilic (contact angle 0°).

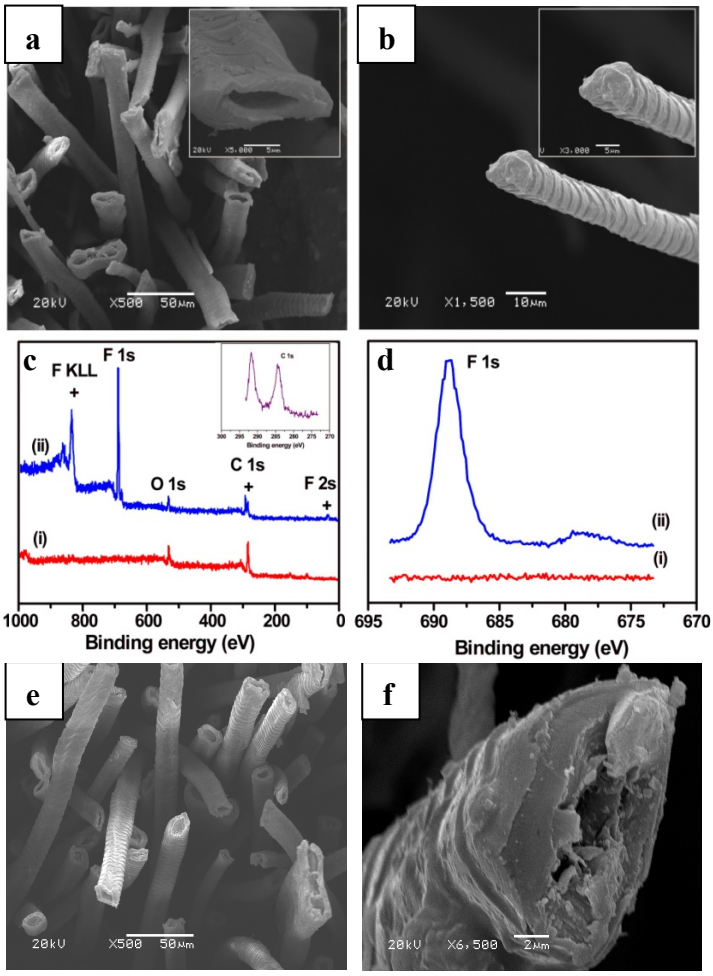

Fig. S1 SEM images and XPS spectra of unloaded and loaded RFHs. SEM images of RFHs (a) and RFH–PFA (b). The insets are the detailed top views of the RFHs, scale bar = 5 μm. XPS full survey spectra (c) and XPS spectra of RFHs in the F1s level regions (d) of RFHs (i) and RFHs–PFA (ii). The inset shows the XPS spectra of RFHs–PFA in the C1s level regions. (e) and (f) SEM images of the root of RFH–PFA.

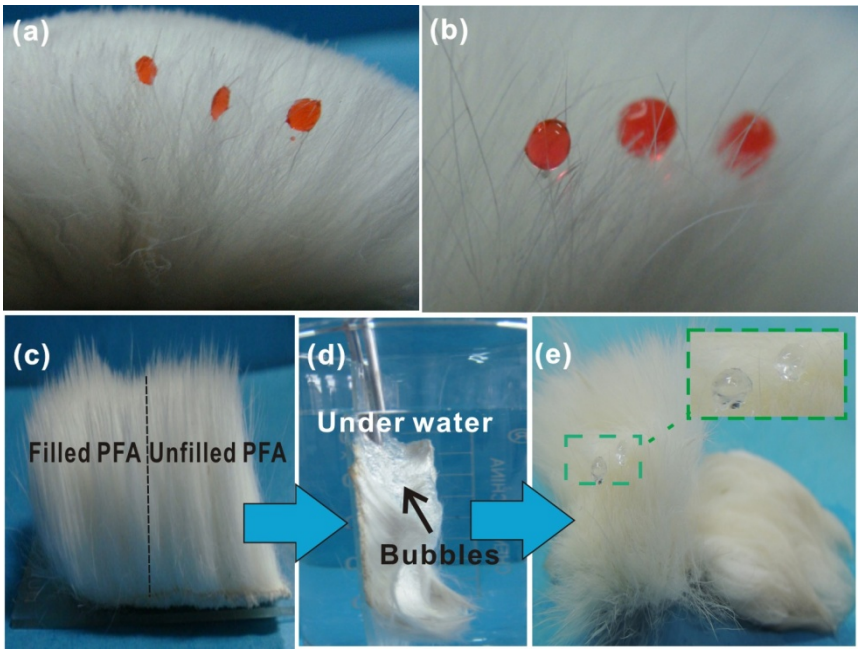

Fig. S2 Images of water droplets on different clover PHFs. Water droplets (stained with red ink for clear indication) sitting on an RFHs (a) and RFHs–PFA surface (b). (c) Image of the one-side-superhydrophobized RFHs–PFA. (d) Image of the one-side-superhydrophobized RFHs immersed in water by an external force. (e) Water droplet sitting on a superhydrophobic side and a completely wet hydrophilic surface.

Tab. S1 Surface chemical composition of PFA-modified RFHs before, after the plasma treatment and the regeneration.

Samples	Atomic concentration (%) of samples			
	C	O	N	F
PFA-RFHs	31.77	20.22	3.86	44.15
Oxygen Plasma-treated PFA-RFHs	40.08	25.33	3.92	30.67
Restored RFHs-PFA	36.07	24.48	3.62	35.83