Electronic Supplementary Material (ESI) for Chemical Communications

Electronic Supplementary Information

Robust transparent and anti-fingerprint superhydrophobic film

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Experimental Section

Materials

The stainless steel was purchased from market Named sus201 with 1Cr17. All stainless steel samples were sequentially cleaned with absolute ethanol and deionized water several times under supersonic stirring to remove any contaminants. Modifier 1H, 1H, 1H, 1H–perfluorodecane thiol (97%) was obtained from Aldrich. Aniline, ammonium persulfate (APS), perchloric acid ($HClO_4$) and other reagents were all A. R. grade and used as received without further purification.

Fabrication of superhydrophobic coatings

The robust transparent and superhydrophobic coatings on the stainless steel substrates were prepared by a dilute polymerization method in the presence of $HClO_4$, using as dopant. Typically, 0.0279 g (10 mM) aniline was dissolved into 15 ml of $HClO_4$ solution (0.03 mol) under supersonic stirring at 0～5 ℃ for 3 min to form uniform and transparent solution. Then 15 ml of an freezing aqueous solution of APS (0.0067 M) was added into the above mixture and the reaction was allowed to proceed under stirring at 0～5 ℃ for 10 h. In this case, the molar ratio of aniline to APS was 1.5:1. The resulting coatings on the substrates were washed with deionized water several times to remove adherent ions and polyaniline, and finally were dried under a vacuum at 60 ℃ for 6 h. The as-dried stainless steel substrates with a thin film of PANI nanofibers were immersed in 5 µl of 1H, 1H, 1H, 1H–perfluorodecane thiol dissolved in 10 ml anhydrous ethanol for 24 h at room temperature to obtain superhydrophobic surfaces. The coatings on the substrates then were thoroughly cleaned with anhydrous ethanol to remove any residual thiol and dried in a drying oven.

Characterizations

The morphology of PANI coatings were obtained on a field emission scanning electron microscope (FESEM, Hitachi S4800) with Au-sputtered specimens. X-ray photoelectron spectroscopy (XPS) measurement was carried out on an ESCALAB 250Xi. The water contact angle was measured with a 5 µl droplet of distilled water at ambient temperature with a DSA100 contact angle (CA) meter (Kruss Company, Germany). Each angle reported here was obtained by measuring five different sites of the same sample. The optical images were taken by a DSC-HX200 camera and Olympus optical microscope (BX51).

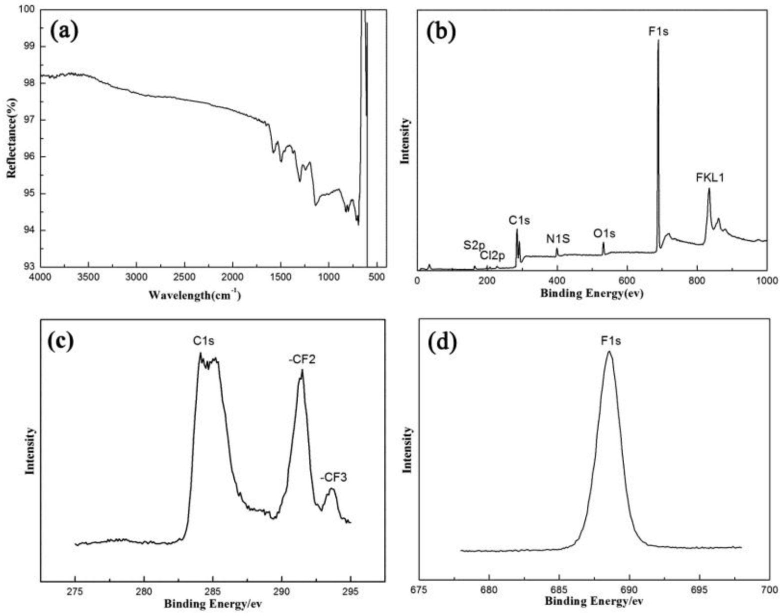

Fig S1. FT–IR reflectance spectrum of PANI nanofibers on the stainless steels (a). XPS scans of PANI nanofibers on stainless steel after modification (b-d): (b) survey spectrum; (c) C1s spectrum; (d) F1s spectrum.

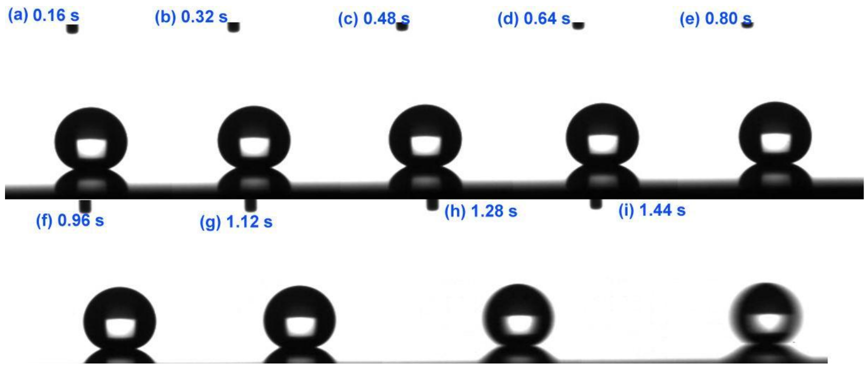

Fig S2. The optical images from (a) to (i) showing the superhydrobic surface having a small sliding angle, close to 0°.

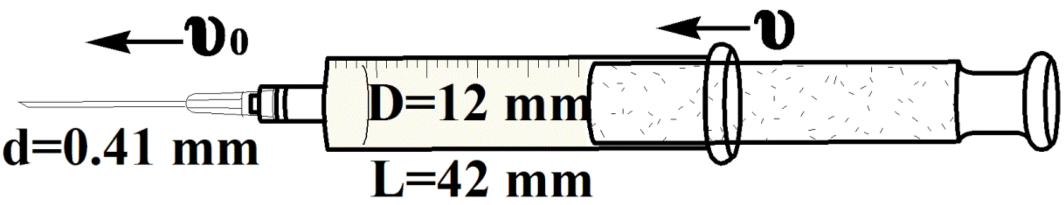

Fig S3. The detailed information of syringe used in the water impact detection. υ and $υ_0$ represent the artificial extrusion speed and jet speed of the water; d (d=0.41 mm) and D (D=12 mm) represent the inner diameters of the needle tubing and the work drum; L is the length of the water in the syringe.

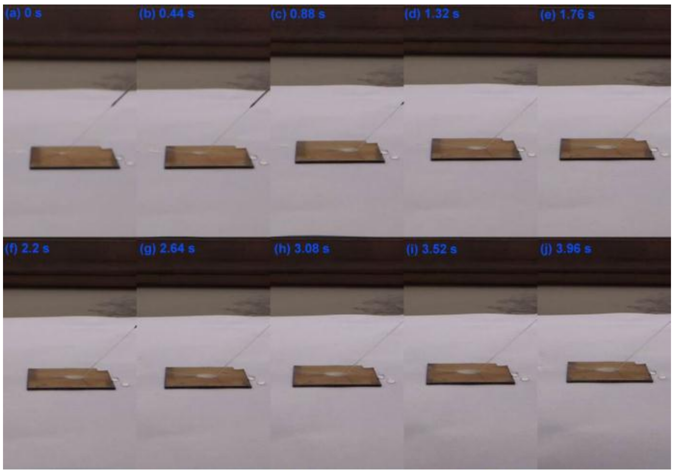

Fig S4. The Optical images (a)-(j) of water droplets impacting again the superhydrophobic surface with high speed, showing the surface with nanostructures robust.

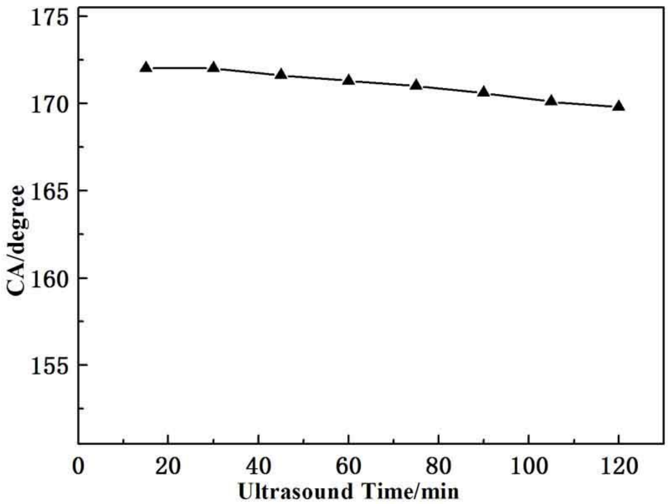

Fig S5. The effect of the supersonic time on the contact angles of the superhydrophobic surfaces.