Supplementary Information

Fabrication of superhydrophobic fiber fabric/epoxy composites coating on aluminum substrate with long-lived wear resistance

Huaiyuan Wang*, Rui Wang, Ruifeng Tao, Yixing Zhu, Chongjiang Lv, Yanji Zhu

College of Chemistry and Chemical Engineering, Northeast Petroleum University, Daqing, China

S1. Curing reaction mechanism of epoxy resin

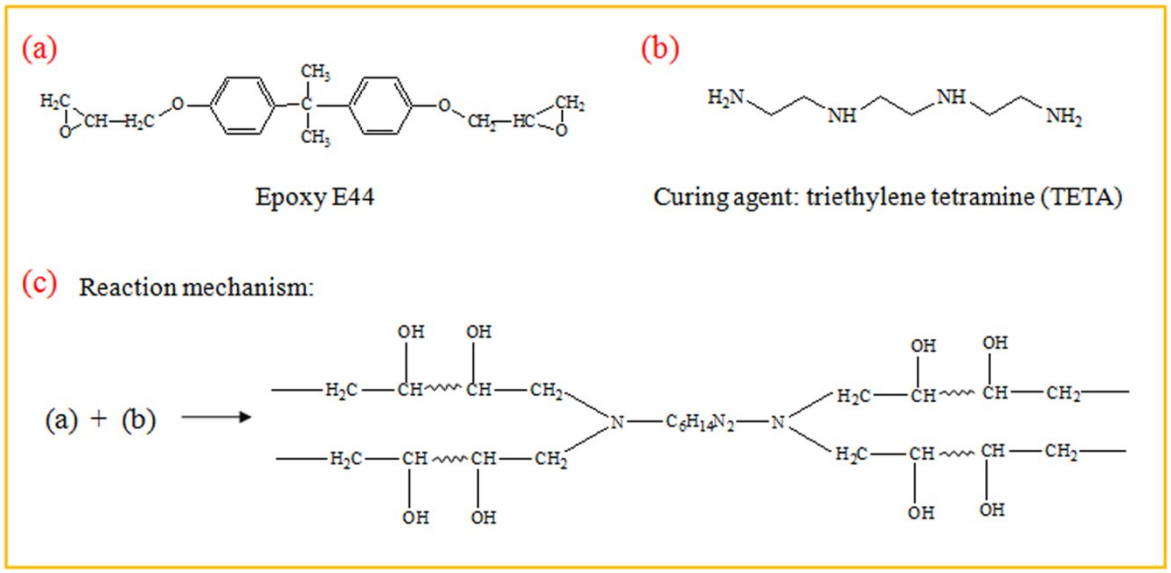

Fig. S1. Chemical structures of Epoxy E44 (a) and curing agent TETA (b) and the mechanism of curing reaction (c).

S2. Evaluation of tribological robustness

* Corresponding author. Tel: +86 4596504738; fax: +86 4596503083.
E-mail address: wanghyjiji@163.com.

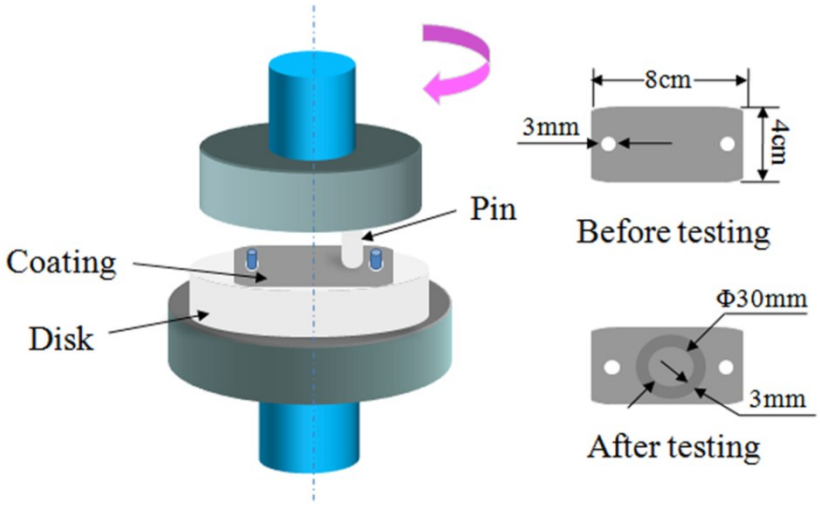

Fig. S2. Schematic diagram of the pin-on-disk friction tests.

S3. Surface wettability of the prepared coating

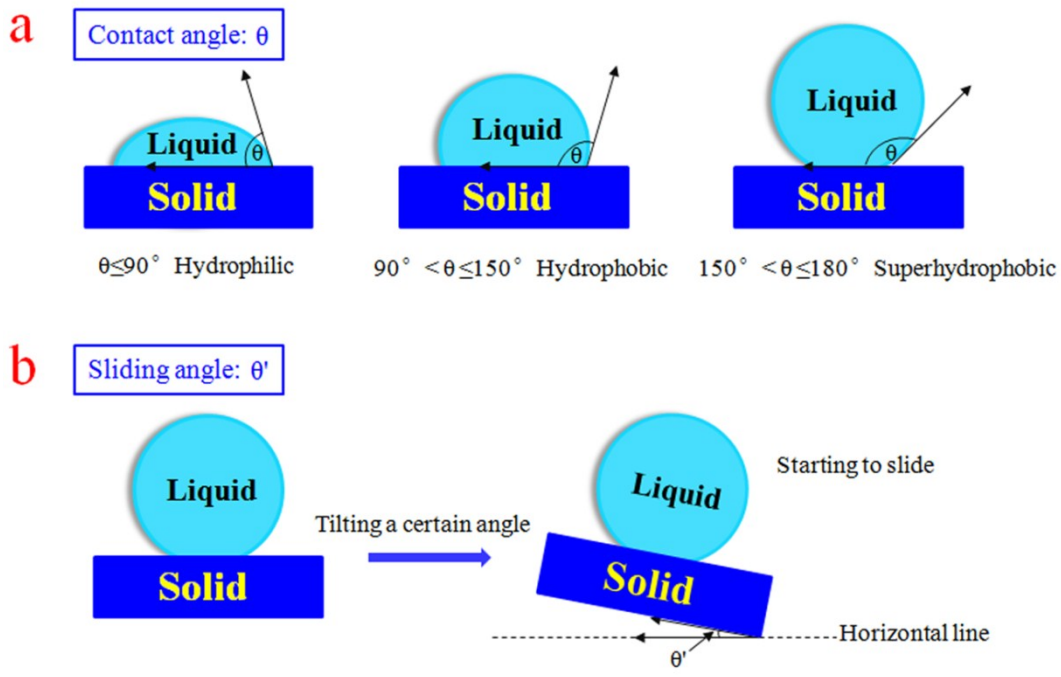

Fig. S3. Schematic diagrams of contact angle (a) and sliding angle (b).

S4. Adhesive property of the final supehydrophobic coating

The adhesive property of the final supehydrophobic coating is conducted referring to ASTM standard D3359-02 cross cut tape test. The coating is scribbled into 1×1 mm gridding using a sculpting knife, and then adhesive tape is pressed and pulled to separate coating from the scored surface (Fig. S4a and b). It can be seen that notable traces are not detected on the adhesive tapes. Moreover, to investigate the adhesion of the coating to substrate, scratch test is carried out by the sculpting knife along the vertical line. The optical image of the fracture surface indicates that the superhydrophobic coating has excellent adhesion without any stripping phenomenon, as shown in Fig. S4c and d. This is mainly due to the strong adhesive force of the cured epoxy resin, bonding the coating and substrate together firmly.

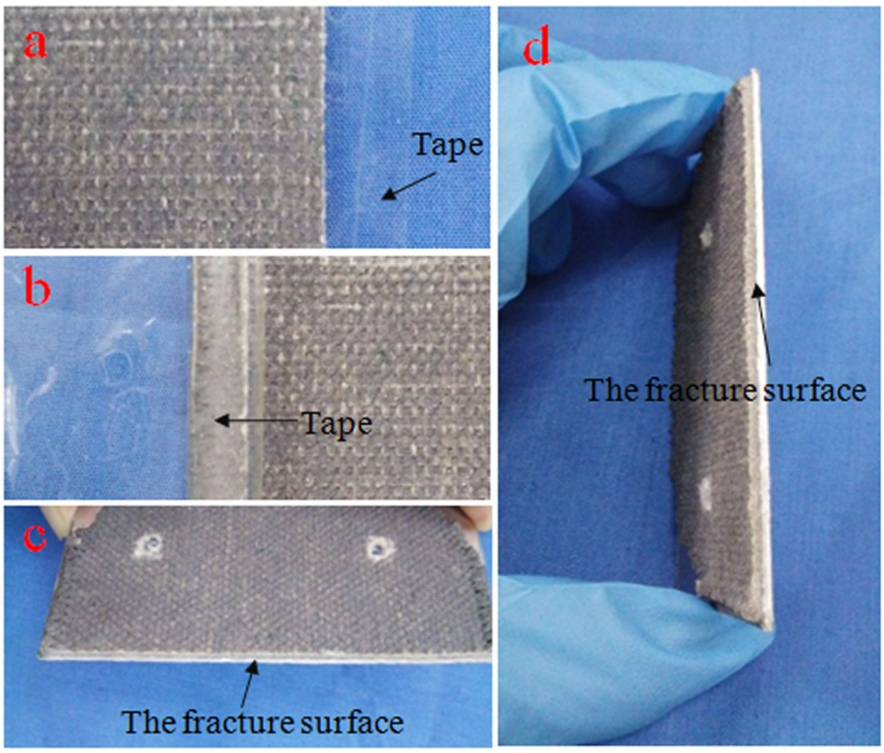

Fig. S4. Optical images of the final supehydrophobic coating (with 25% PU) after the cross cut tape test (a, b) and scratch test (c, d).

S5. Effect of epoxy solution compositions

Table S1 Sample number and the corresponding composition of the epoxy solution.

Sample number	Epoxy solution compositions		
	PFA (35 wt.%)	Hydrophobic silica (3 wt.%)	PU (25 wt.%)
S-1	✓		
S-2	✓	✓	
S-3	✓		✓
S-4		✓	
S-5		✓	✓
S-6	✓	✓	✓

Table S2 Experimental results of the fiber fabric/epoxy composites coatings with different epoxy solution compositions.

Sample number	Contact angle	Wear resistance (150 kilo cycles) Chemical resistance	
		Wear rate ($\times 10^{-13}$ $m^3/N \cdot m$)	CA based on pH
S-1	142.0±2.0°	7.15±0.80	140.0±2.5°
S-2	154.2±0.9°	6.98±0.80	152.6±1.2°
S-3	140.0±2.5°	1.25±0.16	137.5±2.8°
S-4	102.0±4.0°	7.26±0.85	96.5±8.0°
S-5	99.0±4.5°	1.60±0.20	92.0±10.0°
S-6	153.5±1.0°	0.64±0.10	151.5±1.5°