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Creating Superhydrophobic Mild Steel Surfaces for Water Proofing and Oil-water Separation

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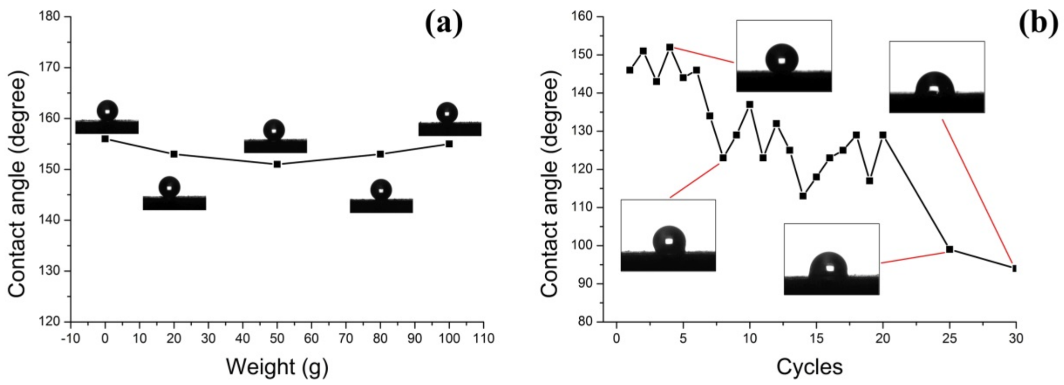

Fig. S1. (a) Water contact angles after weight load abrasion tests, the weights were 0, 20, 50, 80 and 100 g, respectively. (b) Water contact angles after circles of mechanical abrasion tests, cycles are from 1 to 30.

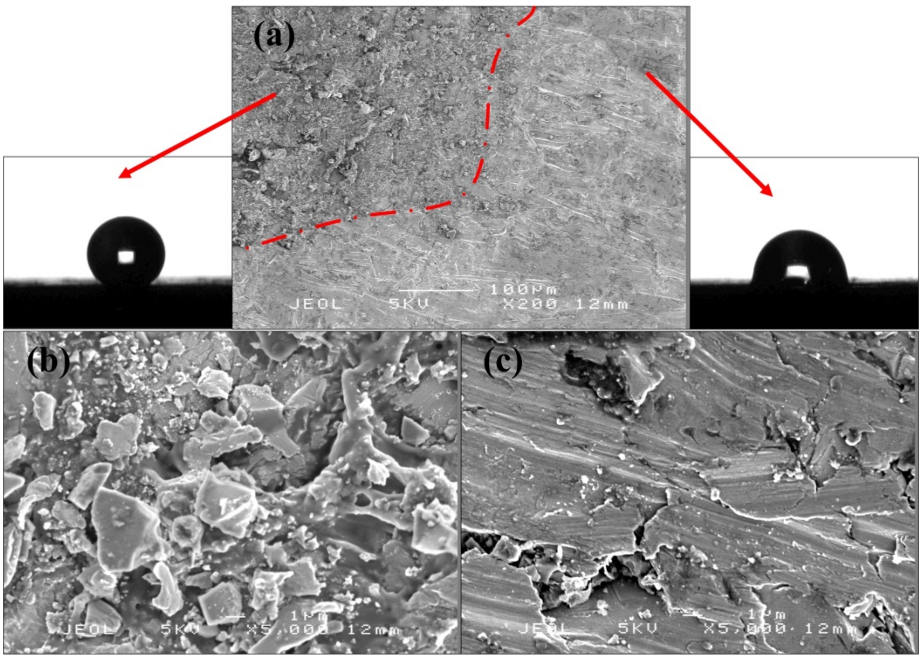

Fig. S2. SEM images of the steel surface after the 30-cycle mechanical abrasion tests. (a) In 200 X, it is seen that some higher parts were scratched while lower parts were protected, resulting in some areas of the sample still showed hydrophobicity. In 5000 X, (b) the micro structures were protected by higher parts in the hydrophobic area; (c) the structures were damaged in higher parts.

Table. S1. Velocity of oil penetration. Velocity of oil penetration (g/s) = oil collection mass (g)/ Oil collection time (s). The average in this paper is 0.3348 g/s.

Round	Oil collection mass (g)	Oil collection time (s)	Velocity of oil penetration (g/s)
1	10.91	39	0.2797
2	13.36	38	0.3515
3	15.19	46	0.3302
4	14.59	42	0.3473
5	11.8	42	0.2809
6	15.05	45	0.3344
7	14.35	39	0.3679
8	15.85	41	0.3865

Movie 1 shows the water droplets dropped on both flat end and curved side of the treated mild steel cylinder.

Movie 2 shows the water bouncing test both on the treated and untreated mild steel plate, respectively.

Movie 3 shows water droplet bouncing on the treated surface at the impacting velocity of 2.4 m/s (from a height of 30 cm).

Movie 4 shows water droplet bouncing on the treated surface at the impacting velocity of 3.1 m/s (from a height of 50 cm).

Movie 5 shows water droplet bouncing on the treated surface at the impacting velocity of 3.4 m/s (from a height of 60 cm).

Movie 6 shows water droplet bouncing on the treated surface at the impacting velocity of 4.4 m/s (from a height of 100 cm). The first droplet was dropped on the filter paper without splash for comparison; the second droplet was broken into pieces when impacting the treated steel surface, which was still not wetted by the droplet.

Movie 7 shows the robustness test of the treated steel surface. The treated steel surface could stay water proofing after abrasion, indicating this method is effective to fabricate superhydrophobic mild steel surfaces.

Movie 8 shows an oil-water separation video with our system.