Electronic Supplementary Material (ESI) for Nanoscale.

Supplementary Information

An anti-UV superhydrophobic material with photocatalysis, self-cleaning, self-healing and oil/water separation functions

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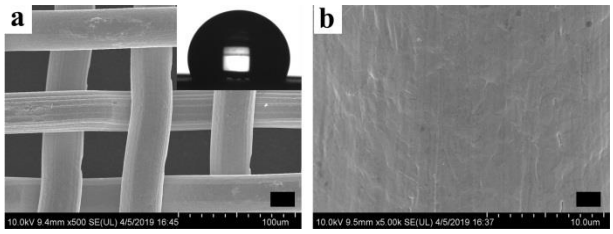


Fig. S1 (a-b) SEM images of fresh copper mesh, (d) is the enlarged view of (c). The inset (a) is WCA of fresh mesh. Scale bar: 20 μm (a), 2 μm (b).

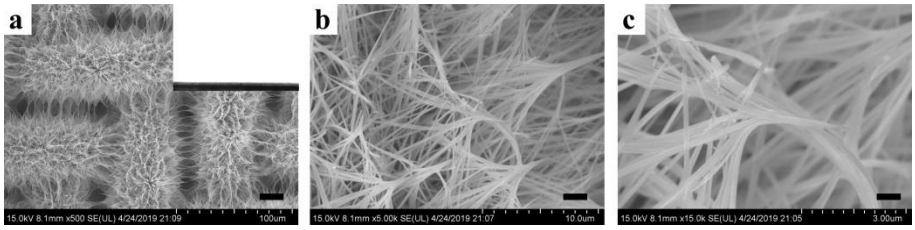


Fig. S2 (a) SEM images of copper mesh after alkaline oxidation, (b) is the enlarged view of (a), (c) is the enlarged view of (b). The inset (a) is WCA of oxidized copper mesh. Scale bar: 20 μm (a), 2 μm (b), 0.6 μm (c).

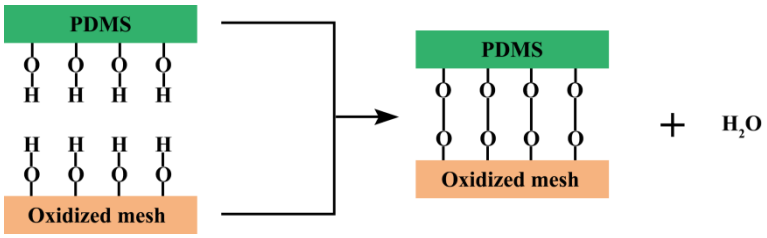


Fig. S3 Hydroxyl group in PDMS was in full contact with copper hydroxide on such mesh to hydrolyze and form covalent bonds, so PDMS was introduced on the Cu mesh.

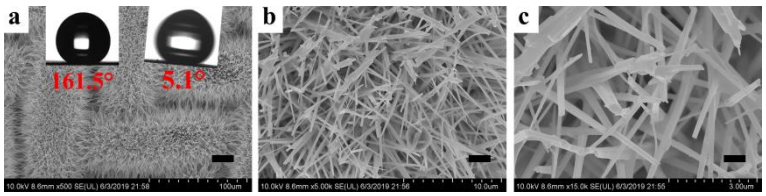
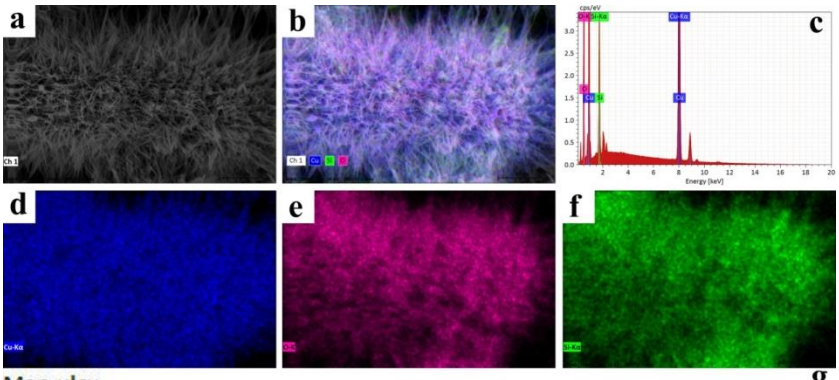


Fig. S4 (a-c) SEM images of PDMS@COM, (b) is the enlarged view of (a), (c) is the enlarged view of (b). The inset (a) is WCA of 161.5 °and RA of 5.1 °on PDMS treated copper mesh. Scale bar: 20 μm (a), 2 μm (b), 0.6 μm (c).



Map.xlsx

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Element	At. No.	Netto	Mass [%]	Mass Norm. [%]	Atom [%]	abs. error [%] (1 sigma)	rel. error [%] (1 sigma)
O	8	283764	19.58	24.05	52.59	2.13	10.88
Si	14	249271	6.56	8.06	10.04	0.30	4.65
Cu	29	773978	55.25	67.88	37.37	1.50	2.71
		Sum	**81.40**	**100.00**	**100.00**		

Fig. S5 (a-f) EDS analysis on the PDMS-treated copper mesh. It showed Cu and Si were well distrusted on the surface, introducing PDMS was grafted on copper mesh. (g) Elements content of O, Si, Cu were showed.

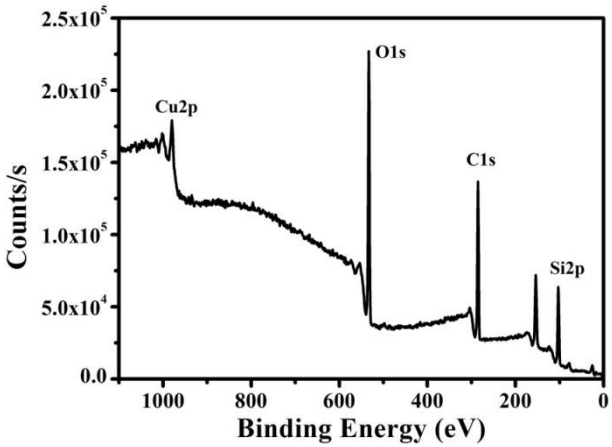

Fig. S6 (a) XPS data of PDMS-treated copper mesh. Si2p appeared at the binding energy of 98.5 eV, also indicating PDMS was grafted on the surface.

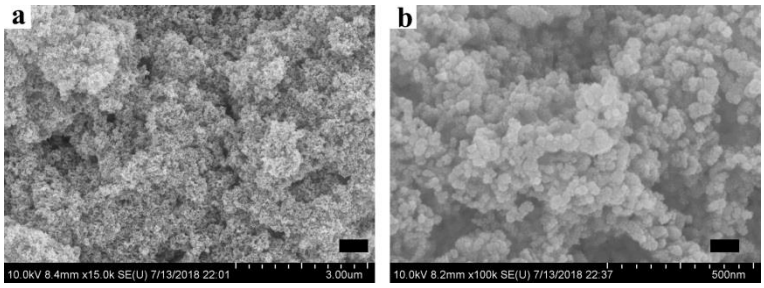

Fig. S7 (a) SEM images of P25 NPs, (b) is the enlarged view of (a). Scale bar: 0.6 μm (a), 200 nm (b).

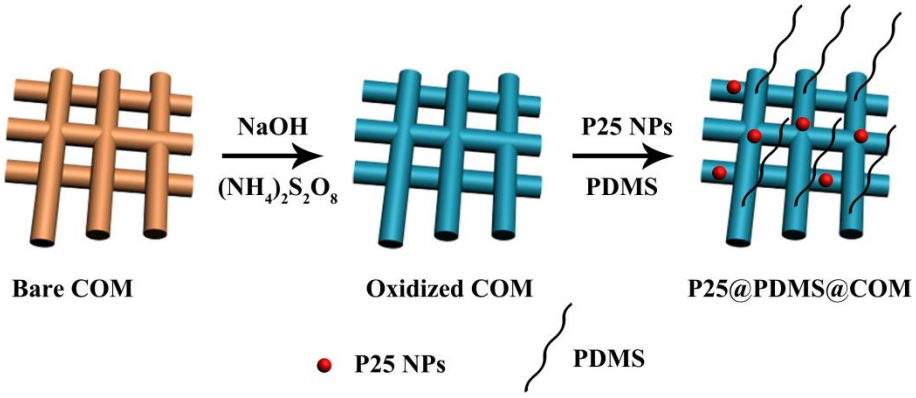

Fig. S8 Schematic fabrication of P25@PDMS@COM.

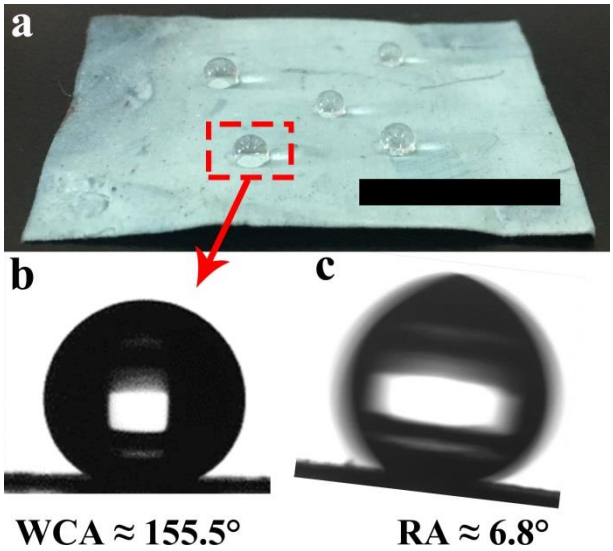

Fig. S9 (a) Optical image of P25@PDMS@COM is showed, where water drop keep in sphere on the surface. (b-c) The average WCA and RA of 155.5 ° and 6.8 ° were respectively found on such surface. Scale bar: 1 cm.

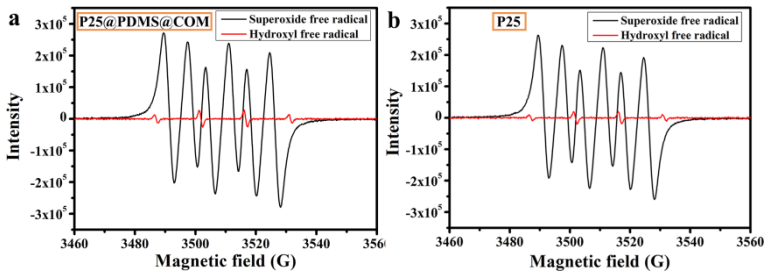

Fig. S10 Superoxide free and hydroxyl free radicals were abounded on P25@PDMS@COM and fluorosilane-treated P25 NPs, which could decomposed the organic matters.

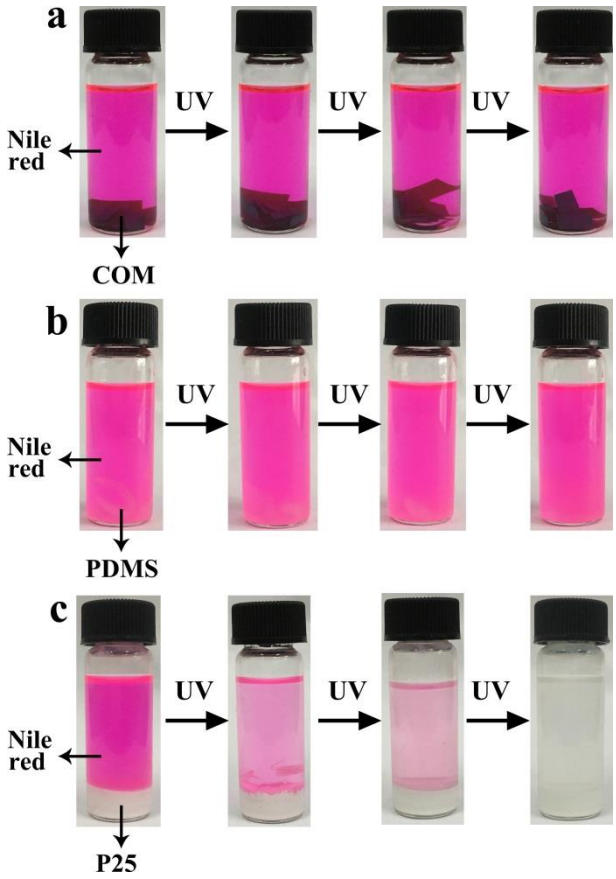

Fig. S11 Nile red in ethanol was respectively placed in presence of 0.25 g of COM (a), PDMS (b), P25 (c) under UV illumination. The red dye could not be decomposed by COM and PDMS but P25.

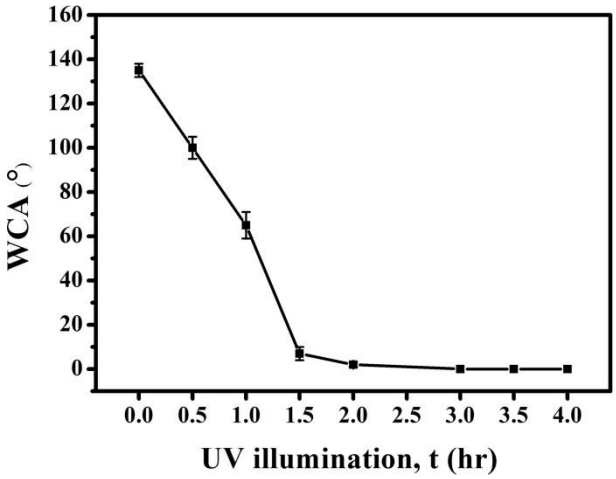

Fig. S12 As for fluorosilane-treated P25 NPs, the high hydrophobicity would change into superhydrophilicity under UV irradiation.

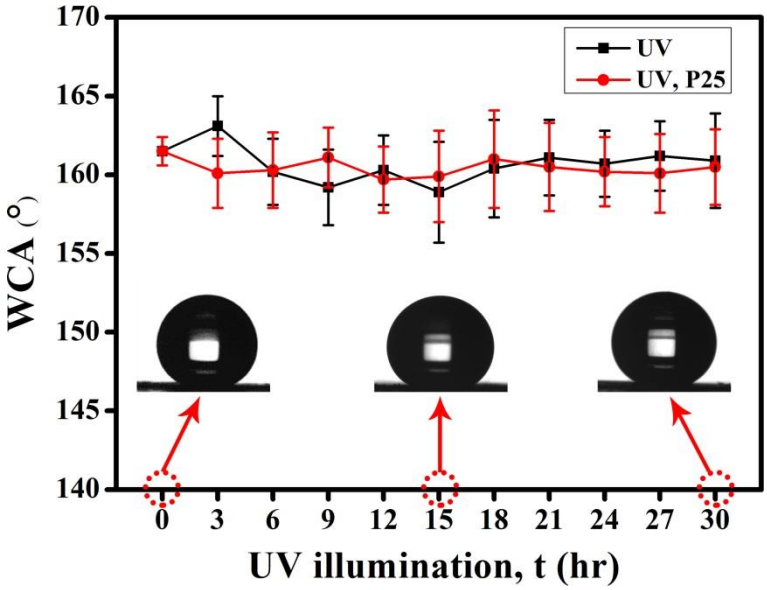

Fig. S13 Under UV light, superhydrophobicity was still kept on PDMS@COM surface. In presence of P25 under UV light, PDMS@COM also showed stable superhydrophobicity.

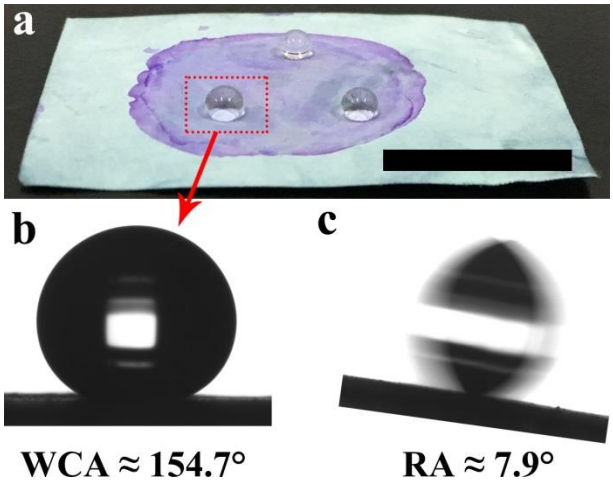

Fig. S14 On Nile red contaminated area (a), superhydrophobicity was still kept with the average WCA and RA of 154.7 °(b) and 7.9 °(c). Scale bar:1 cm.

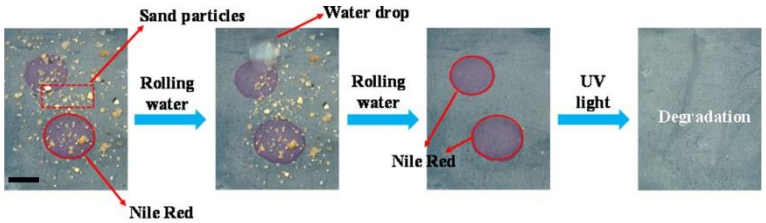

Fig. S15 (a) On Nile red contaminated P25@PDMS@COM, sand particles still could be removed away from such surface by rolling water. Then, Under UV light, the red dyes was decomposed with no obvious color.

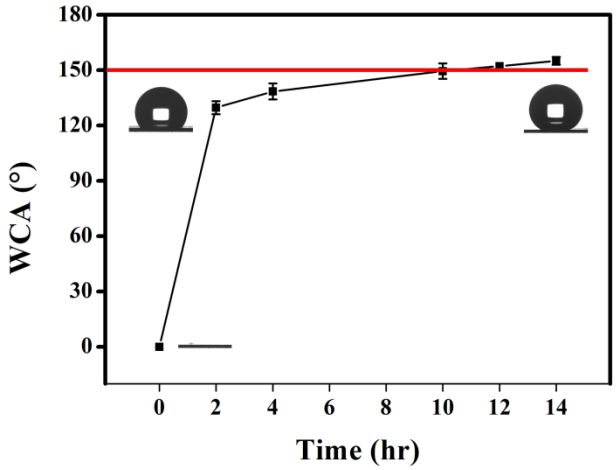

Fig. S15 For O_2 plasma-treated surface, it showed superhydrophophilicity with the WCA of nearly 0 °. Upon the extending period, the WCA got larger and regained the WCA > 150 °till to about 12 hr.

Movie S1. Sand particles were removed by rolling water on superhydrophobic P25@PDMS@COM.

Movie S2. Sand particles were removed by rolling water on Nile red contaminated superhydrophobic P25@PDMS@COM.

Movie S3. In superhydrophobic state, separation of DCM and water was found on our surface.

Movie S4. In superhydrophilic state, separation of n-hexane and water was observed on our surface, whereby the film should be first prewetted by water to form a water layer.