Supplementary information

Selective separation of oil and water with special wettability mesh membranes

Defei Liu, Yuanlie Yu, Xin Chen, and Yuying Zheng*

S.1.1. Preparation of carbon nanoparticle coated stainless steel meshes

The stainless steel meshes were placed 1.5–1.8 cm above the wick, and soot was collected on the surface of the stainless steel wires. The collection time of the soot depended on the size of the stainless steel meshes and the desired layer thickness. For a 5 × 5 cm stainless steel mesh, the collection time was set to 5 min.

S.1.2. Preparation of SiO_2/carbon stainless steel meshes

We used a chemical vapor deposition method to form a more stable layer of SiO_2/carbon on the stainless steel meshes. In a typical process, the template of carbon nanoparticle coated stainless steel mesh was transferred to a desiccator. Two beakers were placed next to the sample: one was filled with 5 ml of aqueous ammonium hydroxide solution (28%) and the other was filled with 5 ml of TEOS. The desiccator was then sealed and pumped to reduce the pressure to about 250 mbar. After 1 min, the desiccator valve was slightly opened to release the vacuum. The deposition of TEOS lasted 12 h and SiO_2/carbon stainless steel meshes was obtained.

S.1.3 The superhydrophobic/superoleophilic modification of SiO_2/carbon stainless steel mesh with PFOTS

A PFOTS/methanol solution (0.015 wt%) was hydrolyzed by adding a threefold molar excess of water at room temperature. Then, the SiO_2/carbon stainless steel mesh was immersed into this hydrolyzed silane solution for 100 min. After removal from the solution, the sample was heat

treated at 80 °C for 2 h and the PFOTS modified SiO_2/carbon stainless steel mesh membrane was obtained.

S.1.4. The oleophobic/superhydrophilic modification of SiO_2/carbon stainless steel mesh with PDDA-PFO

The SiO_2/carbon stainless steel mesh was placed in a petri dish. 2 mL of PDDA (1 mg/ml) was homogeneously dropped onto the SiO_2/carbon stainless steel mesh. Then, 2 ml of Na-PFO (0.10 M) was quickly dropped onto the PDDA-wetted SiO_2/carbon stainless steel mesh. This procedure was repeated 3 times. The sample was then dried at 80 °C for 2 h and a PDDA-PFO modified SiO_2/carbon stainless steel mesh membrane.

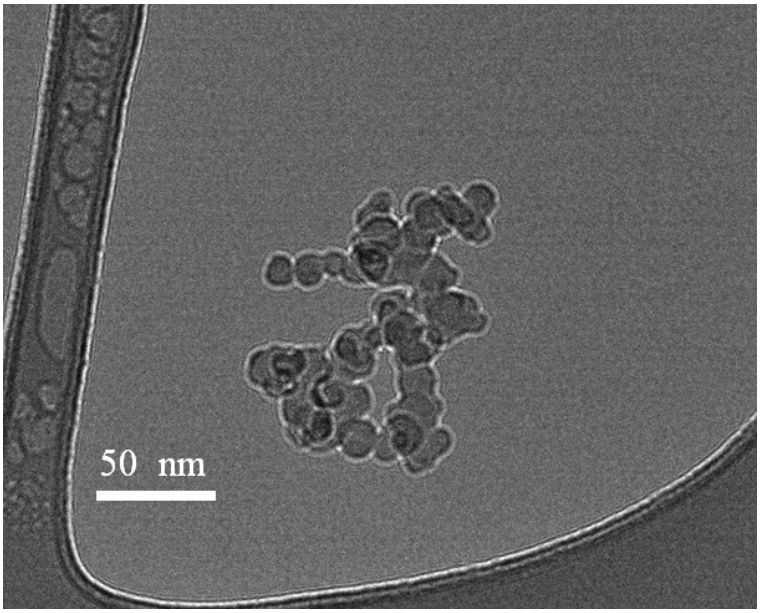

Fig.1S. TEM image of the carbon particles (particle size of 10 nm).

The carbon particles in Fig.1S was obtained from ultrasonic treatment of carbon nanoparticle coated mesh samples in ethanol solution.

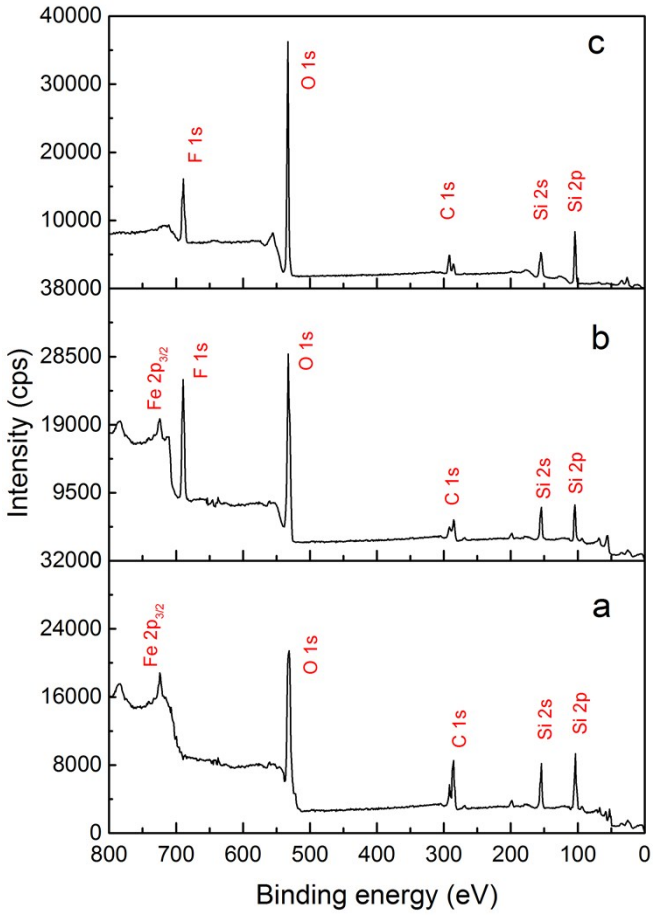

Fig.2S. XPS spectra of (a) SiO_2/carbon stainless steel mesh, (b) PFOTS modified SiO_2/carbon stainless steel mesh and (c) PDDA-PFO modified SiO_2/carbon stainless steel mesh.