Electronic Supplementary Information

Robust and Durable Self-Healing Superhydrophobic Polymer‐Coated MWCNT Film for Highly Efficient Emulsion Separation

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S1 Surface structure of the MWCNT film

S1.1 Images and the flexibility of the film on the MCE filter membrane.

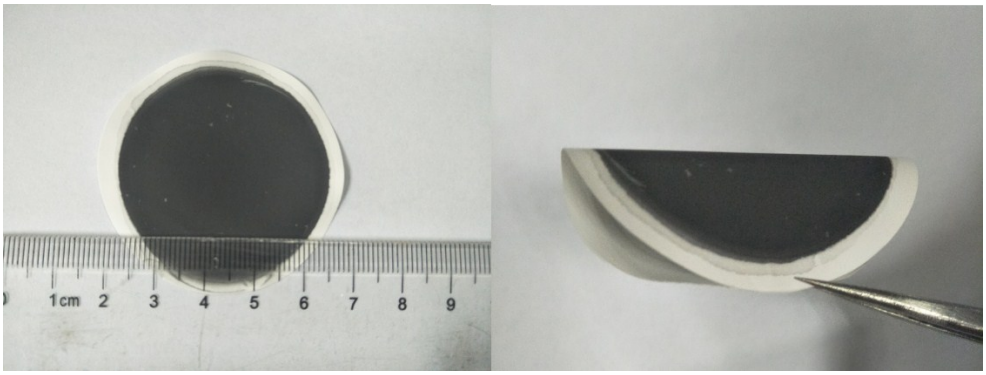

Figure S1. Images and the flexibility of the film on the MCE filter membrane.

S1.2 The cross-sectional SEM images of the film placed on a copper mesh.

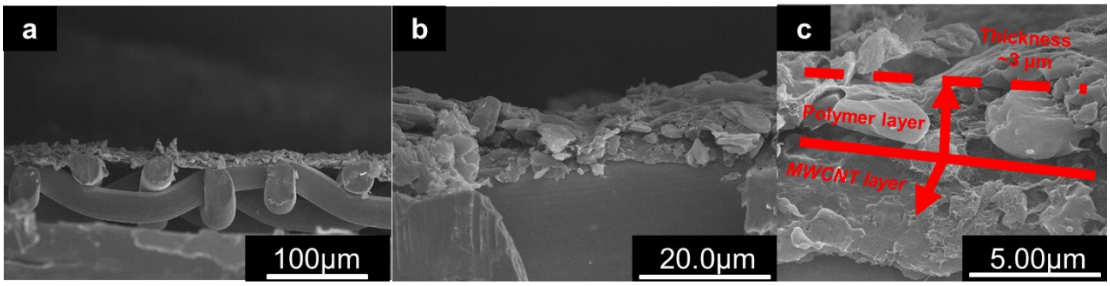

Figure S2. The cross-sectional SEM images of the film placed on a copper mesh. (a-c) are at different resolutions, and (c) shows the thickness of polymer layer.

S1.3 SEM images of raw MCE filter membrane and WMCNT film without PDVB coating.

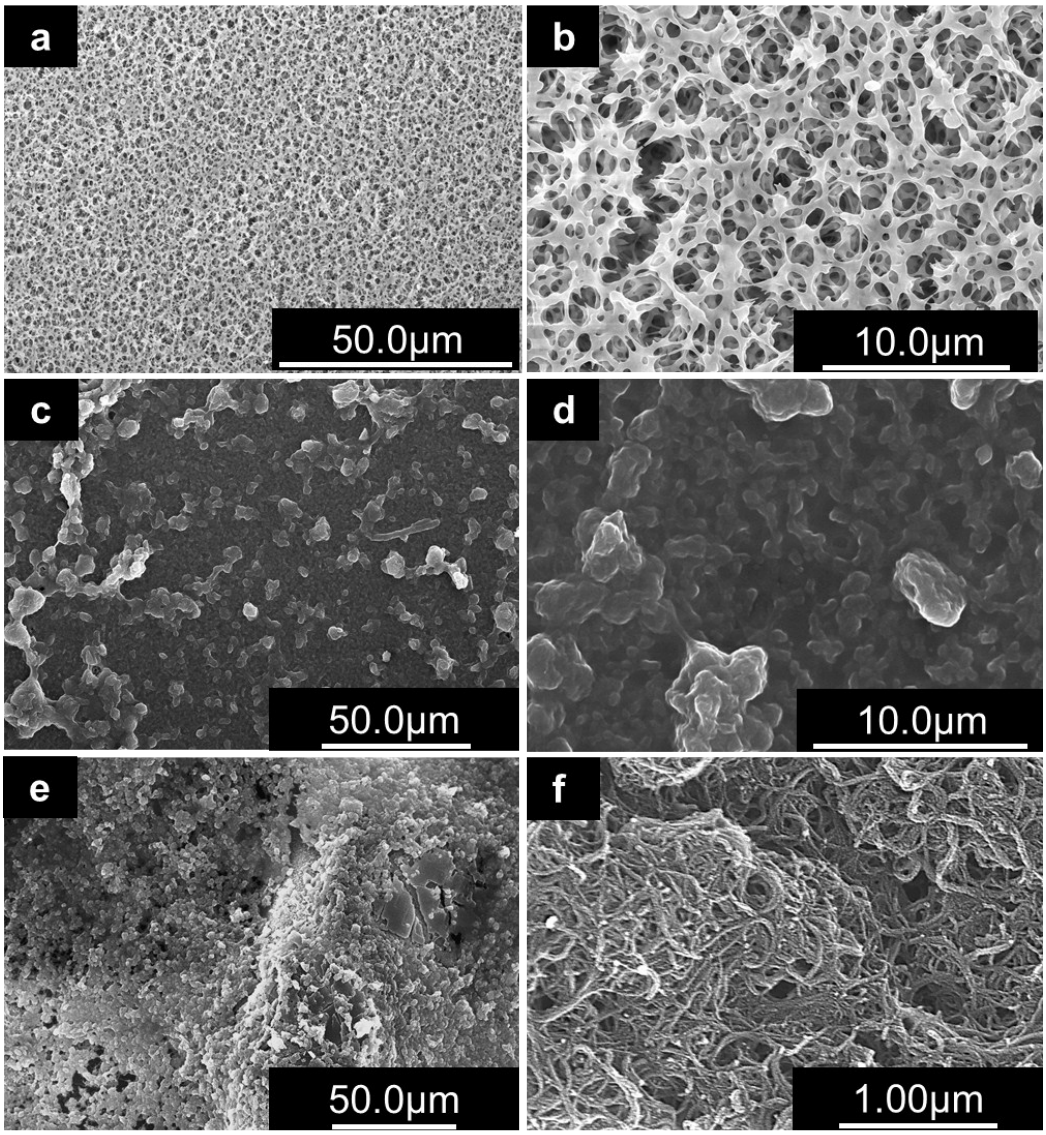

Figure S3. SEM images of (a) and (b) raw MCE filter membrane, (c-f) WMCNT film without PDVB coating.

S2 Energy dispersive spectra (EDS) elemental mapping image

S2.1 EDS elemental mapping images of the WMCNT film.

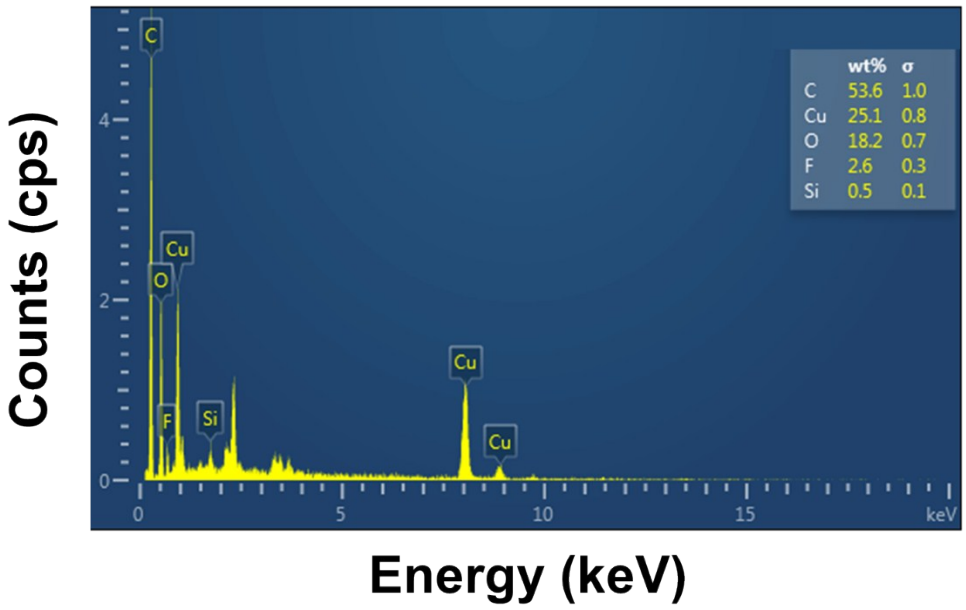

Figure S4. Energy dispersive spectra (EDS) image of WMCNT film.

S3 Study of the effect of different pore sizes on flux

S3.1 The effect of different pore sizes of MCE filter membrane on the flux.

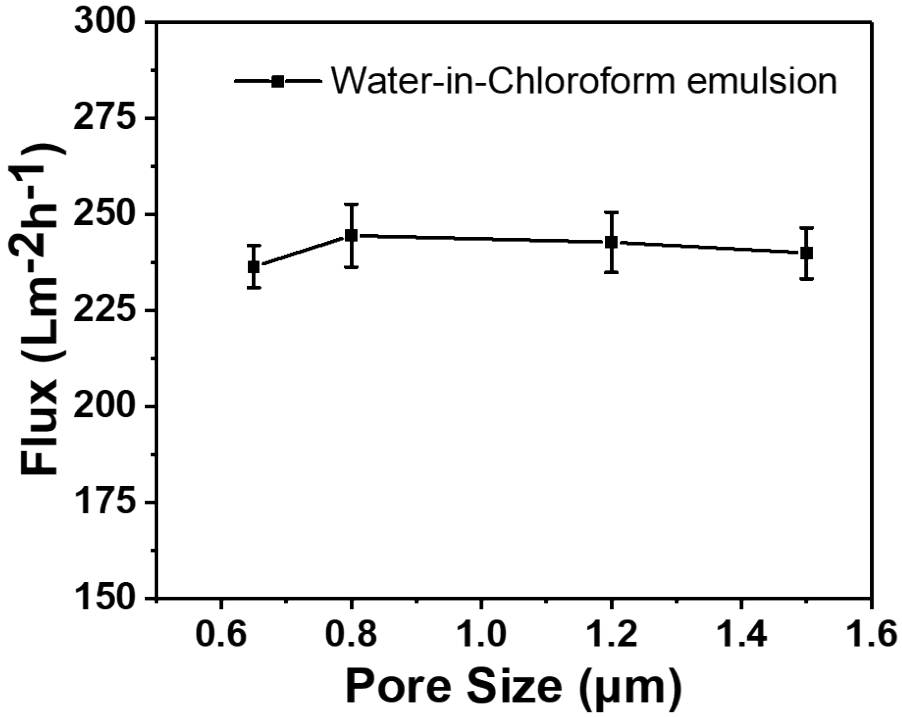

Figure S5. The effect of different pore sizes of MCE filter membrane on the flux.

We prepared MWCNT network films of different microscopic sizes by suction filtration of MWCNT suspension onto MCE membranes with different pore sizes and then washing off MCE membranes with acetone. By comparison, it was found that when the pore diameter of the MCE filter was 0.8 μm, the prepared membrane had the highest flux (Fig. S5).

S4 Optical images of three different emulsions and filtrate

S4.1 Optical images before and after emulsion separation.

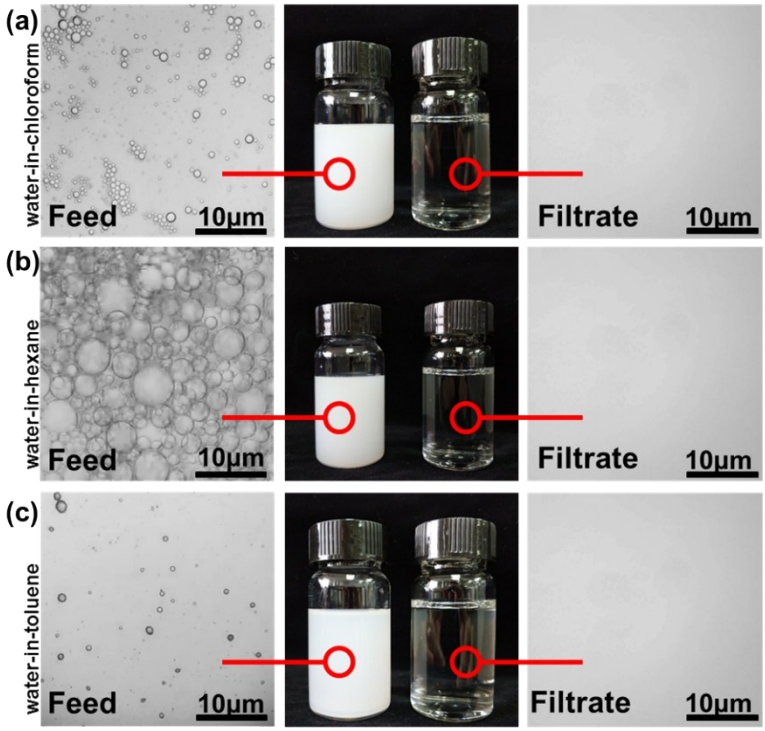

Figure S6. Optical images before and after emulsion separation. (a) Optical images of water-in-chloroform emulsion and filtrate, (b) Optical images of water-in-hexane emulsion and filtrate, (c) Optical images of water-in-toluene emulsion and filtrate.

S5 Properties of membrane after seawater immersion

S5.1 Measurement of contact angle, separation efficiency and flux.

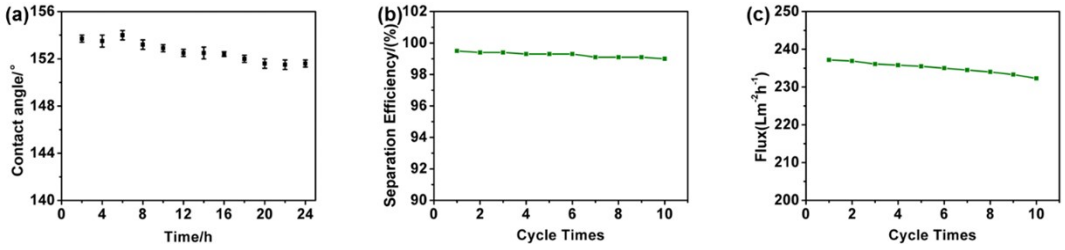

Figure S7. (a) Water contact angle of membrane after soaking for a period of time. The separation efficiency (b) and flux (c) in the oil/water emulsion separation cycle test.

The membrane was immersed in sodium chloride solution with a mass fraction of 3.5% for a period of time. Tests of its contact angle, flux and emulsion separation properties (cycle test with membrane soaked for 12 hours) show that the performance of membrane is still excellent in simulated sea water (Fig. S7).

S6 Pore sizes of MWCNT film wrapped by PDVB and POTS

S6.1 SEM images and pore sizes of MWCNT film surface wrapped by PDVB and POTS.

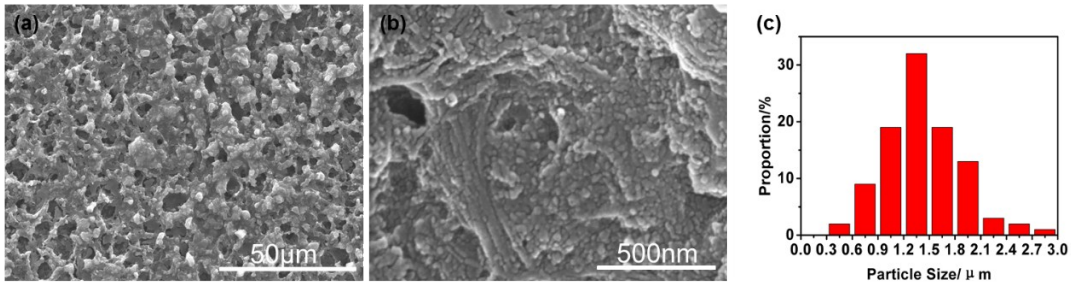

Figure S8. SEM images of MWCNT film surface wrapped by PDVB. (a-b) are at different resolutions. (c) Pore size distribution of MWCNT film wrapped by PDVB and POTS. The average size of the film is 1.26μm.