Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

A Flexible $Ti_3C_2T_x$ (MXene)/Paper Membrane for Efficient Oil/Water Separation

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S1: XRD Pattern

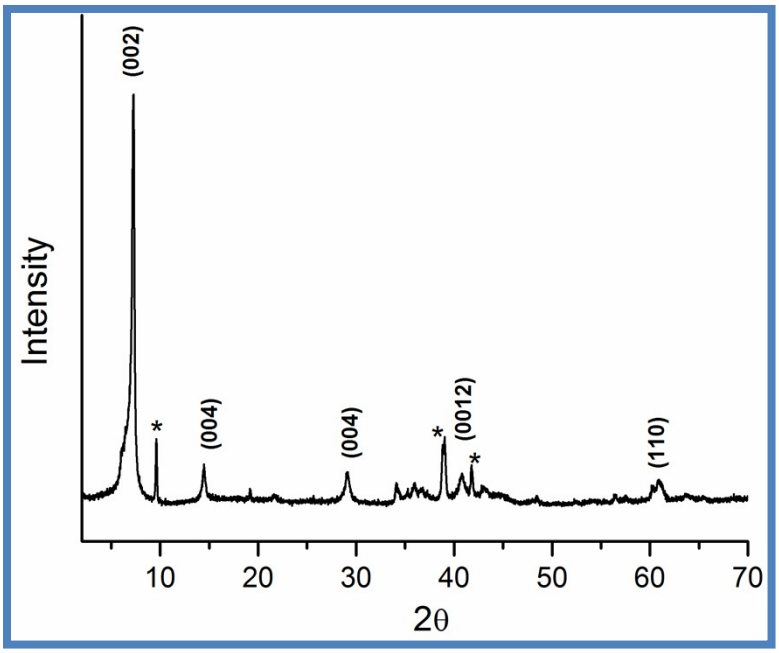

Figure S1: XRD pattern of raw $Ti_3C_2T_x$ MXene, (*) represent traces of Ti_3AlC_2.

X-ray diffraction (XRD) analysis of the $Ti_3C_2T_x$ MXene nanoflakes was carried out using a Rigaku Ultima IV multipurpose X-ray diffractometer equipped with Cu Ka radiation and a fixed monochromator. A typical X-ray diffraction (XRD) spectra of $Ti_3C_2T_x$ MXene produced by LiF/ HCl etching is shown in Figure S1. The sharp and intense peak located at 2θ values of 7.2 can be assigned to the (002) plane of $Ti_3C_2T_x$ MXene.

S2: Emulsified Oil-Water Droplet size and distribution

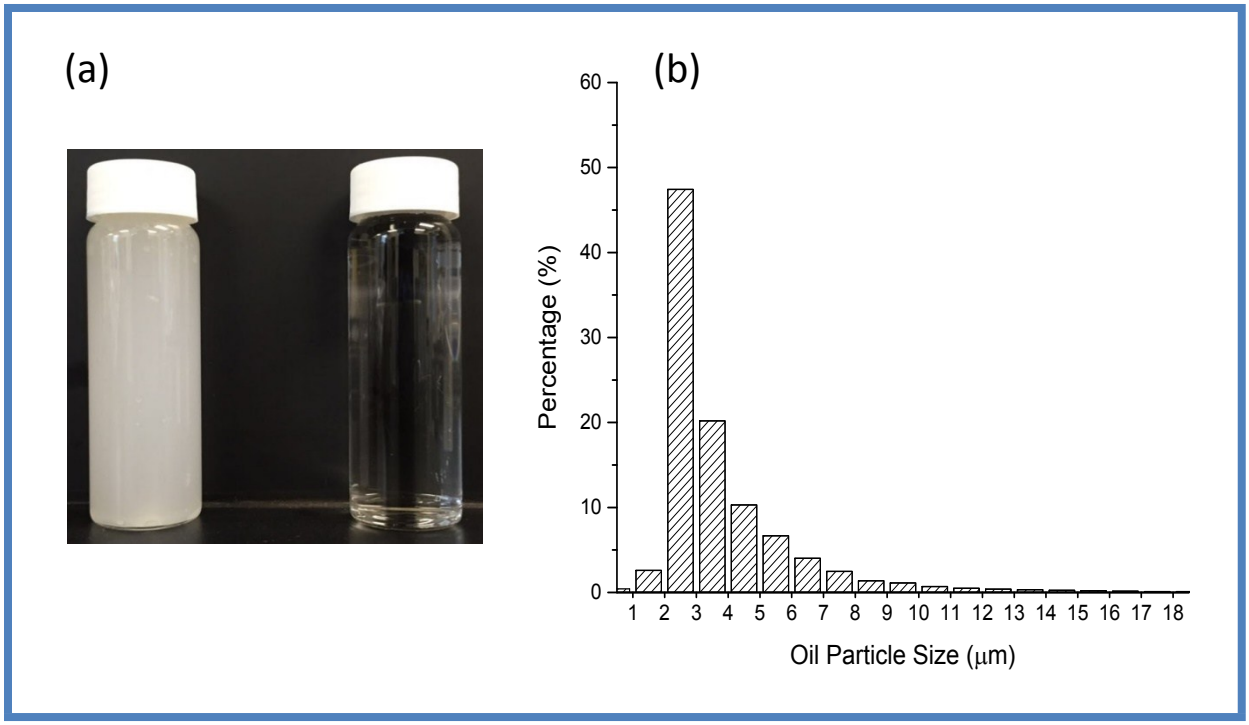

Figure S2: Digital photo of the oil-in-water emulsion before and after the treatment using MXene composite membrane (b) Size distribution of oil droplets in the emulsified feed water

As shown in the Figure S2(a), a massive difference in the water quality can be observed between the feed and filtrate of the MXene composite membrane. The treated water is visibly clear as the oil droplets were successfully removed using the developed membrane. The distribution of the oil droplets in the oil-water emulsion feed measured using using JORIN-ViPA B HiFlow (Leicestershire, UK) visual process analyzer is shown in Figure S2(b). Statistical analyses of the oil droplets distribution profile showed that the mean oil droplet size was 3.92 μm while d_{50} and d_{90} were 2.99 μm and 6.57 μm respectively.

S3: Measurement of water contact angle and underwater oil contact angle of the membrane at different MXene loading

As can be seen in Table 1, the water contact angle readings increased slightly with the increase of MXene loading (measured at two seconds after the deposition of water droplet on the surface of the composite membrane), while sunflower oil contact angle readings decreased slightly with the increase of MXene loading.

Table 1: Water Contact Angle and Underwater Oil Contact Angle of the Membrane at different Mxene Loading

Mxene mass (mg)	Water Contact Angle (º)	Underwater Oil Contact Angle (º)
0	0	141.5 ± 0.8
0.2	0	140.1 ± 2.3
0.4	0	137.0 ± 0.6
0.6	5.5 ± 1.6	134.5 ± 1.7
0.8	9.3 ± 2.3	130.2 ± 0.4