

Supporting Information

A Superhydrophilic and Underwater Superoleophobic Chitosan-TiO₂ Composite Membrane for Fast Oil-in-Water Emulsions Separation

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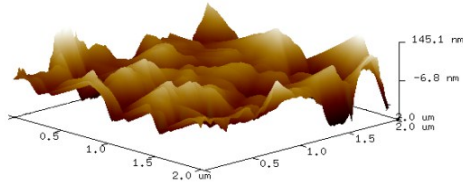
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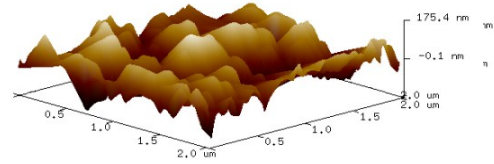


Fig. S1 The vacuum-driven filtration device used in this work.

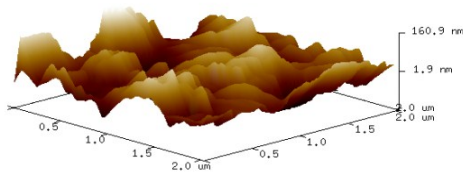
(a)



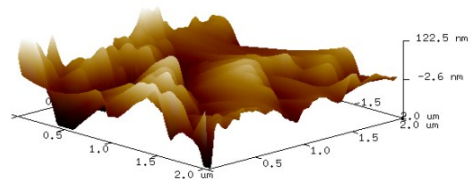
(b)



(c)



(d)



(e)

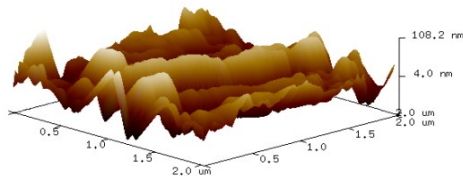


Fig. S2 AFM images of different membranes: (a) pristine cellulose acetate membrane, (b) CS-modified membrane, (c) CST (3:1) membrane, (d) CST (3:4) membrane, and (e) CST (3:7) membrane.

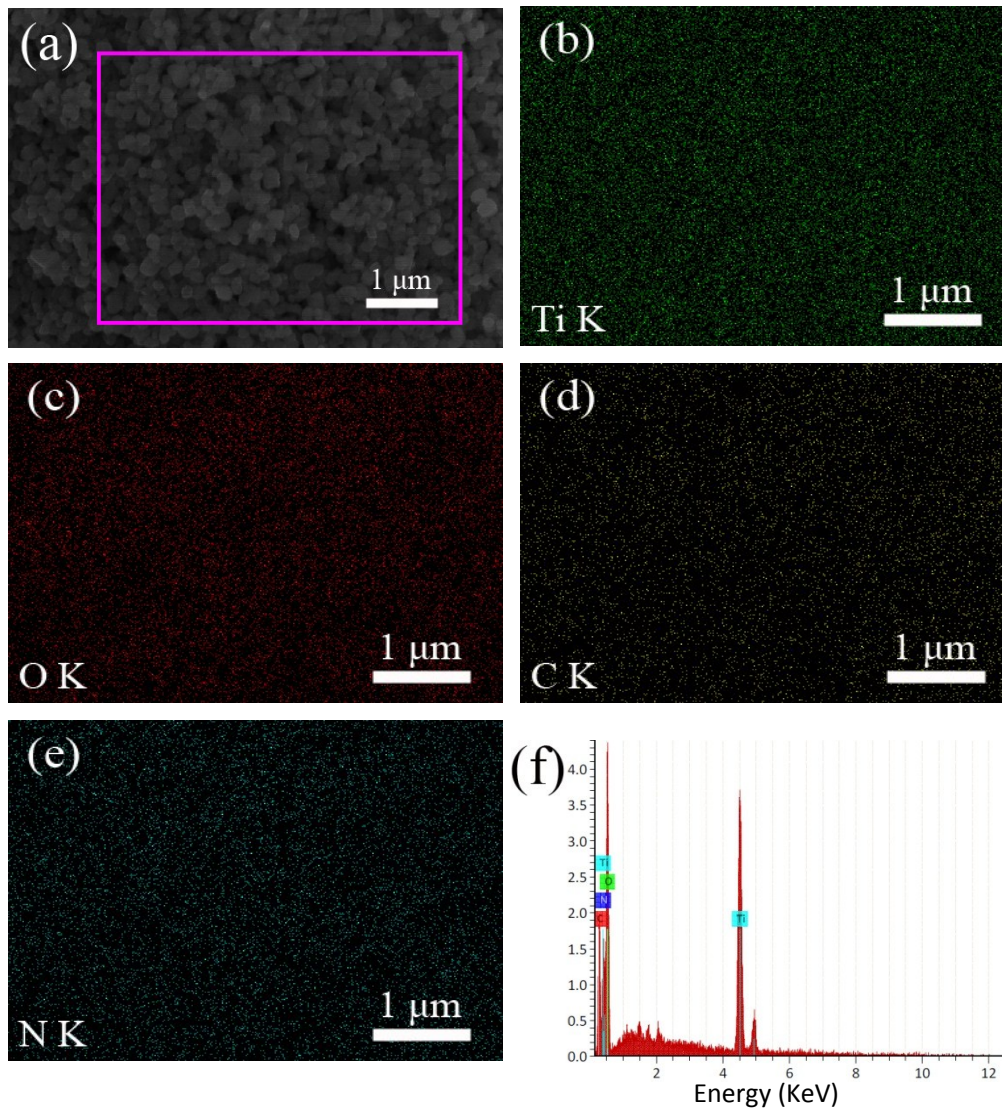


Fig. S3 SEM image (a) and corresponding EDS mapping images of (b) Ti, (c) O, (d) C, (e) N, and (f) EDS spectrum of the CST (3:4) membrane

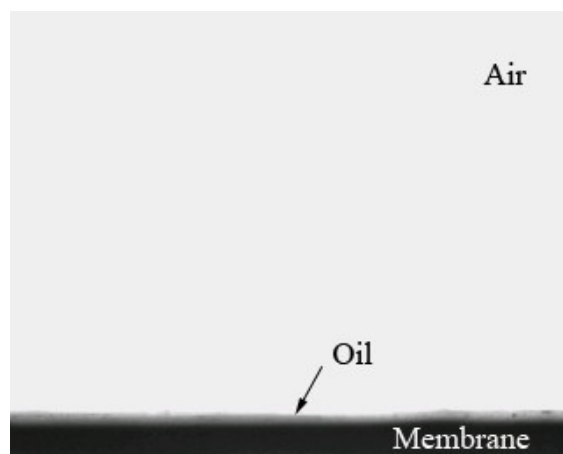


Fig. S4 Photograph of an oil droplet (1,2-dichloroethane) in air on the CST (3:4) membrane surface.

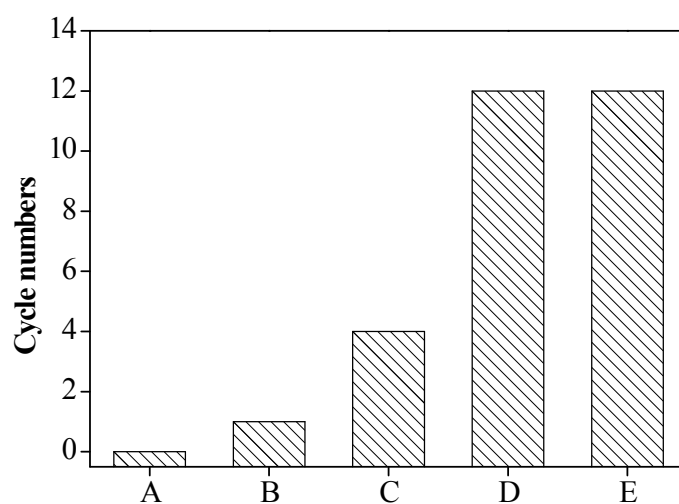


Fig. S5 Oil/water separation cycle numbers of different modified membranes for hexadecane-in-water emulsion: A - pristine cellulose acetate membrane, B - CS modified membrane, C - CST (3:1) membrane, D - CST (3:4) membrane, and E - CST (3:7) membrane.

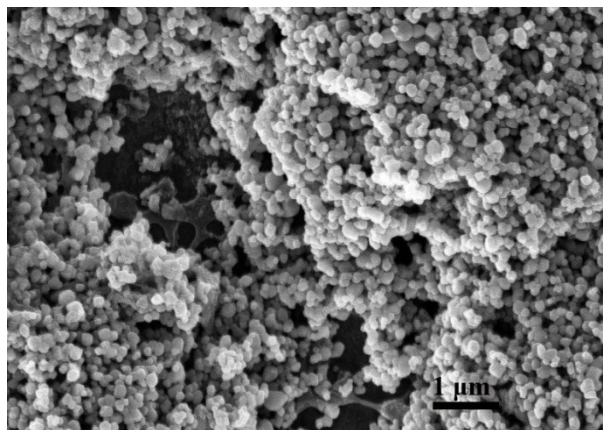


Fig. S6 SEM images of the CST (3:4) membrane after 10 separation cycles for hexadecane-in-water emulsion.

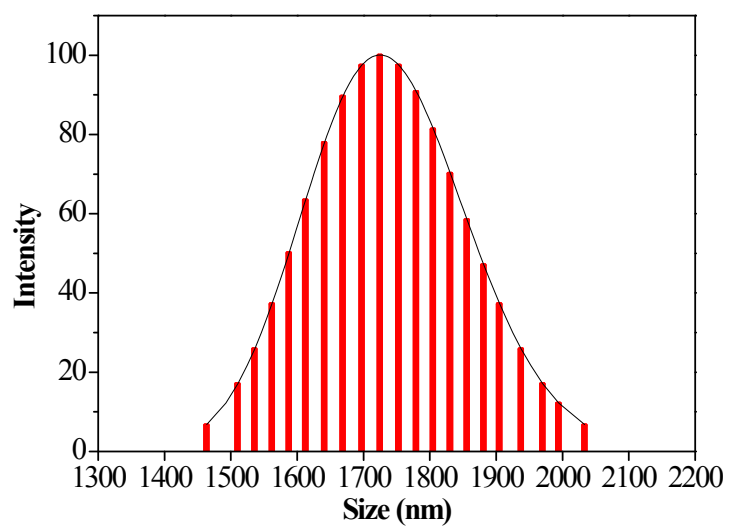


Fig. S7 Oil droplet size distribution of the hexadecane-in-water emulsion stabilized by SDS was examined by DLS measurement.

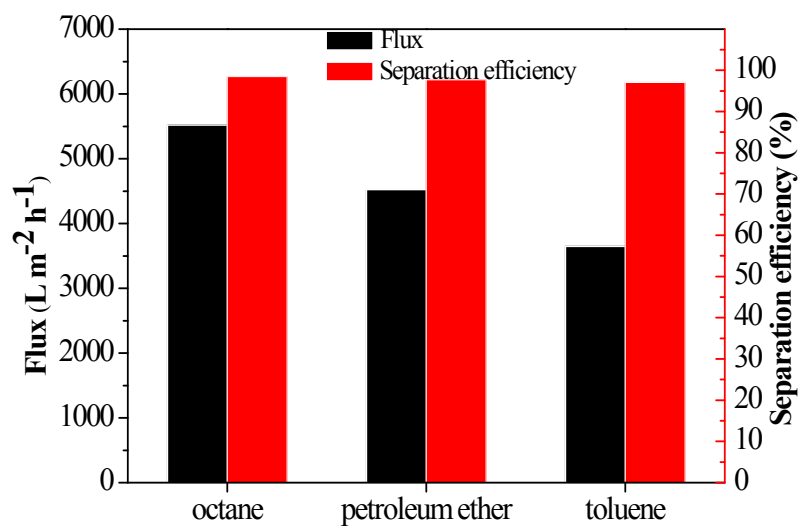


Fig. S8 Flux and separation efficiencies of the CST (3:4) membrane for different oil-in-water emulsions.

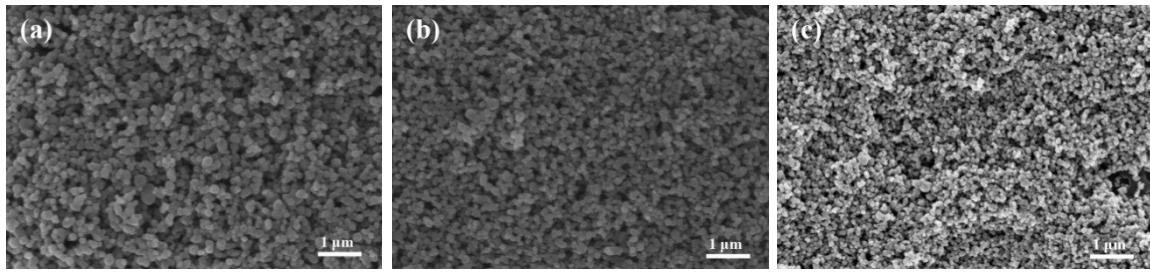


Fig. S9 SEM images of the CST (3:4) membrane after immersing in different solutions (pH=1, pH=13 and 5% NaCl)

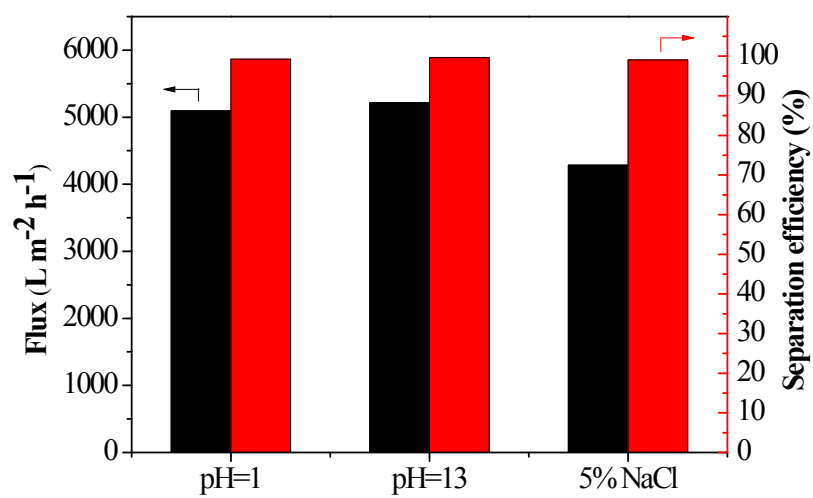


Fig. S10 Flux and separation efficiencies of the CST (3:4) membrane for hexadecane-in-corrosive liquid emulsions with pH of 1, 13, and 5% NaCl.

Table S1. Element contents of different membranes by XPS

Membranes	C (At. %)	N (At. %)	Ti (At. %)	O (At. %)
pristine cellulose acetate membrane	59.79	0	0	40.21
CS modified membrane	60.9	1.18	0	37.92
CST (3:1) membrane	54.6	0.91	4.87	39.62
CST (3:4) membrane	37.85	1.16	14.45	46.54
CST (3:7) membrane	27.68	0.73	19.78	51.81

Table S2. Summary of different membranes for oil/water separation.

Materials	Emulsion	Flux (L m ⁻² h ⁻¹)	Separation efficiency (%)	Ref
Propargyl-poly (ethylene glycols)(pro-PEG)	Soybean oil/water emulsion	120	99.7	34
Graphene, TiO ₂	Toluene-in-water emulsion	84	99.92	35
Polysulfone (PSf), polyvinylpyrrolidone (PVP), polyethylene glycol (PEG)	Crude oil-in-water emulsion	113	98.9	36
Grapheme oxide (GO)	Machine oil-in-water emulsion	667	98.7	37
Dopamine hydrochloride (DA),(3-aminopropyl)triethoxy-sain(KH550), TiO ₂	SDS/n-hexadecane/H ₂ O emulsion	605	99.34	38
Chitosan, TiO ₂	Hexadecane-in-water emulsion	6002.5	99.77	This work