Supporting Information

Title: Facile preparation of a superamphiphilic nitrocellulose membrane enabling on-demand and energy-efficient separation oil/water mixtures and emulsions by prewetting

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Keywords: Superamphiphilic, underliquid dual superlyophobicity, nitrocellulose membrane, oil/water separation, prewetting, surface coating method

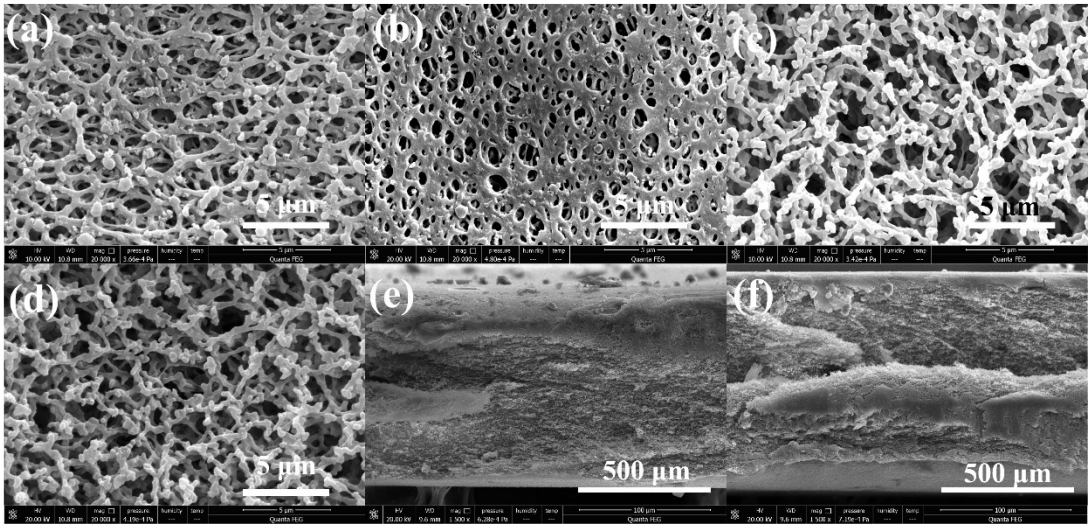

Figure S1. SEM images of (a)the original NCM (b)the prepared NCM with pore size of 0.22 μm and (c) the original NCM (d)the prepared NCM with pore size of 0.45 μm. SEM section images of (e)the original NCM and (f)the prepared NCM.

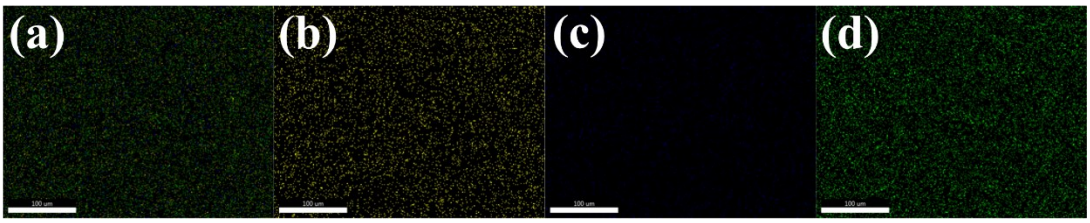

Figure S2. (a) C, N, and O elements distribution EDS mapping images of the surface of the original NCM, (b)-(d) element distribution EDS mapping images of C, N, and O, respectively.

Samples	Elements		
	C (wt%)	N (wt%)	O (wt%)
Original NCM	23.5	14.5	62
Modified NCM	24.4	16.4	59.2

Table S1. The weight ratios of elements based on EDX analysis.

Samples	Relative element content			
	C (%)	N (%)	O (%)	N/C
Original NCM	68.35	4.3	62	0.06
Modified NCM	75.42	8.16	16.42	0.11

Table S2. The atomic ratios of elements based on XPS analysis.

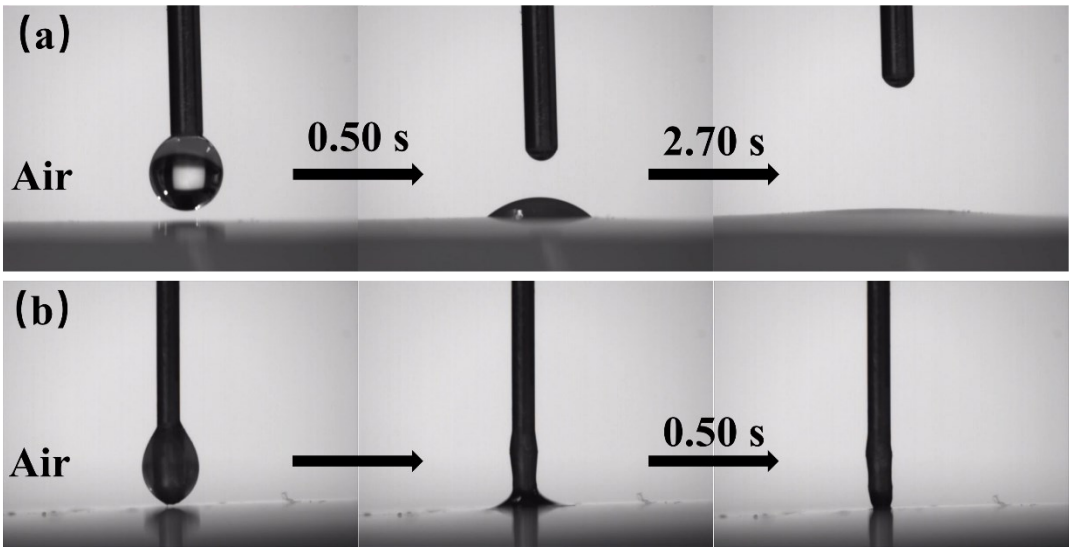

Figure S3. Wettability of the modified NCM toward (a) water in air; (b) oil (dichloromethane) in air.

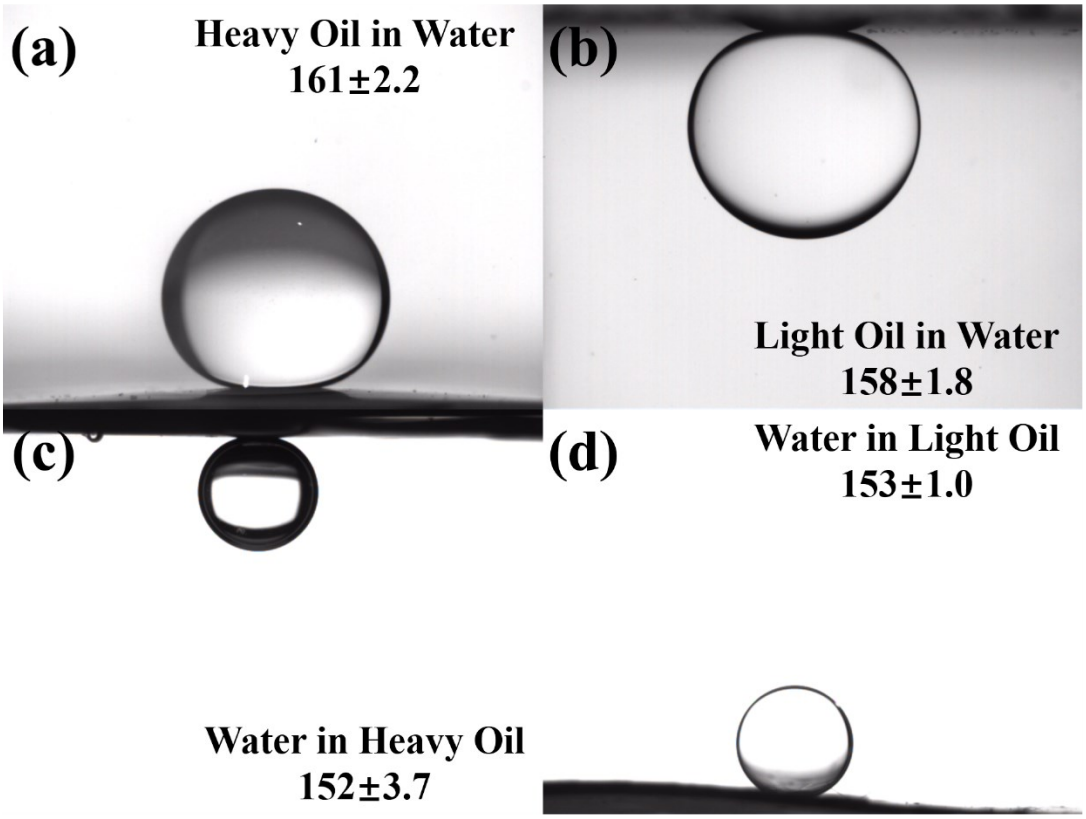

Figure S4. Static contact angle measurements for the modified. WCA in oil (a) and (b); OCA in water (c) and (d).

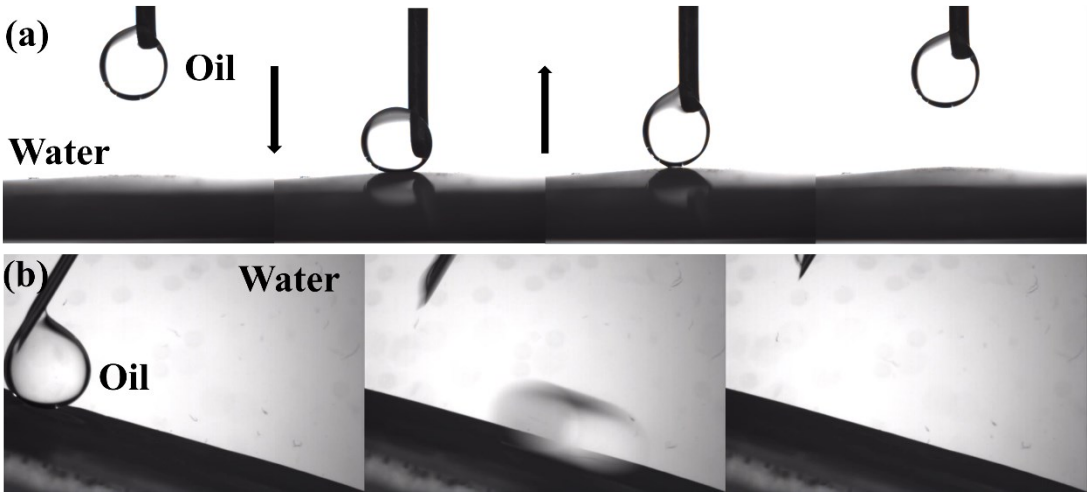

Figure S5. (a)-(b) Anti-oil fouling property and low adhesive performance of the surface under water. Oil could not foul the surface at all.

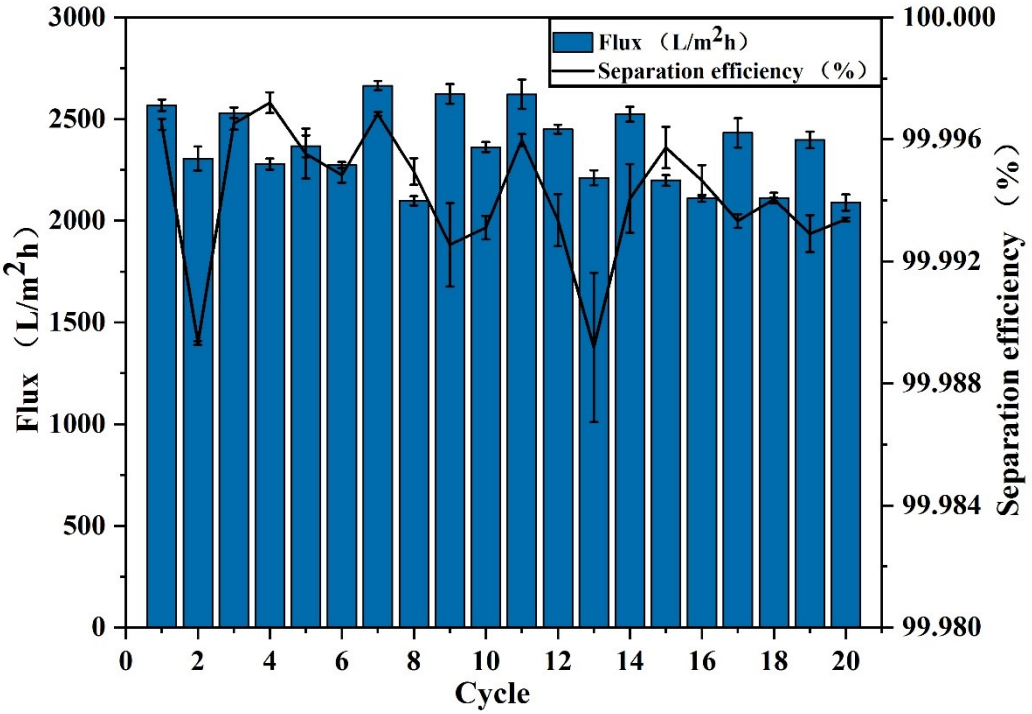

Figure S6. The xylene and water mixture's flux and separation efficiency of PDA-NC membrane with 20 cycles time.

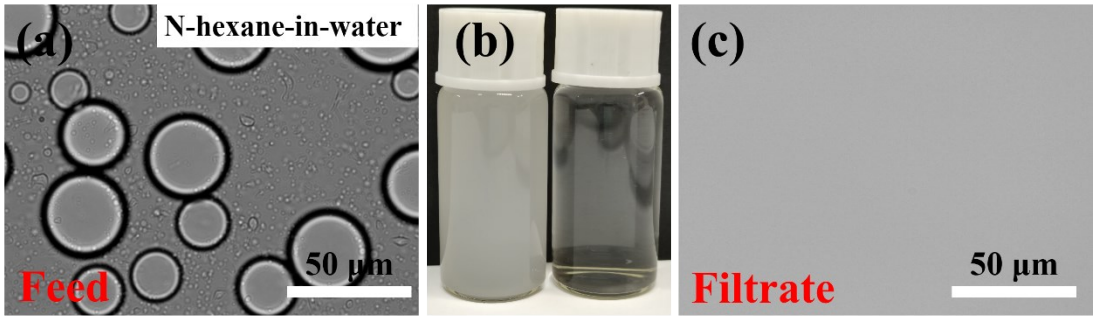

Figure S7. Optical microscope images of N/W emulsion (a) feed and (c) filtrate; (b) digital photo of before and after filtration of N/W emulsion.

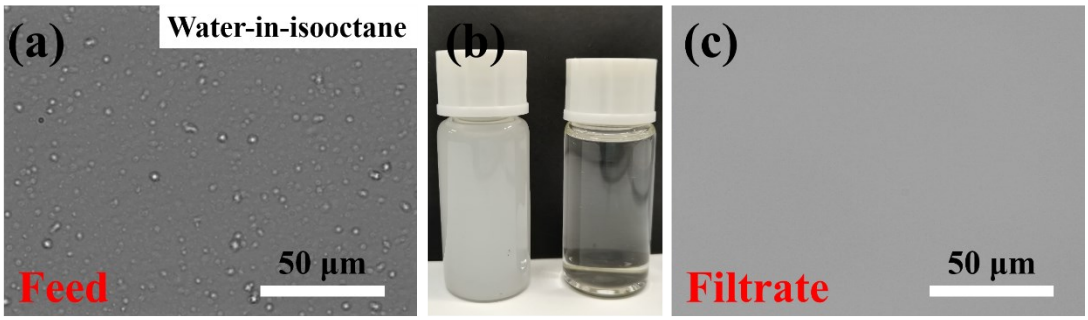

Figure S8. Optical microscope images of W/I emulsion (a) feed and (c) filtrate; (b) digital photo of before and after filtration of W/I emulsion.

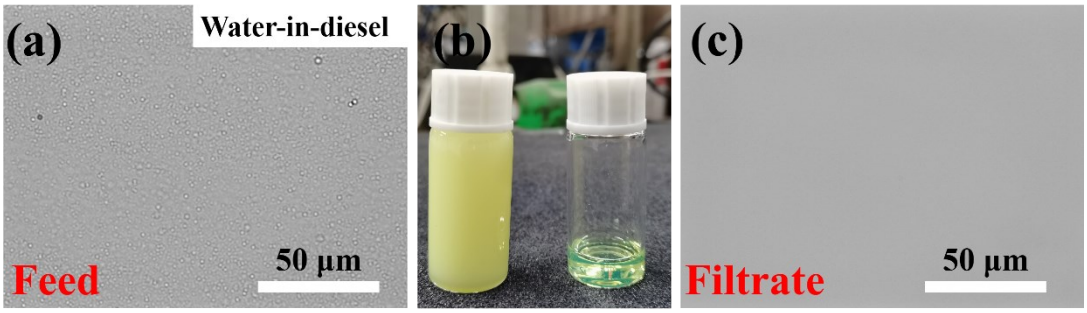

Figure S9. Optical microscope images of W/D emulsion (a) feed and (c) filtrate; (b) digital photo of before and after filtration of W/D emulsion.

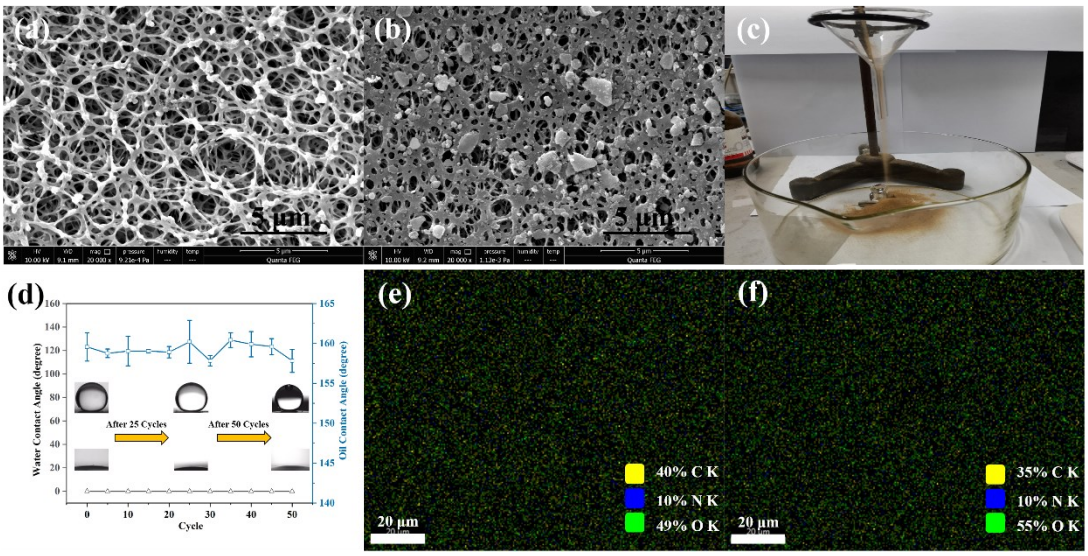

Figure S10. (a, b) SEM images of the PDA-modified NC membrane after the sand impingement for 50 cycles; (c) Photographs of the sand impingement process; (d) The water contact angle of the treated membrane in air and the oil contact angle of the treated membrane under water; (e, f) C, N, and O elements distribution EDS mapping images of the surface of the PDA-modified after the sand impingement for 50 cycles.

Movie S1. Video of underwater oil droplet sliding.

Movie S2. Underwater superoleophobic wetting behavior and low adhesive performance of PDA-modified NCM.

Movie S3. Separation process of the light oil and water mixture.

Movie S4. Separation process of the heavy oil and water mixture.