

Electronic Supplementary Information (ESI)

Janus Polymer Membranes Prepared by Single-Side Polydopamine

Deposition for Dye Adsorption and Fine Bubble Aeration

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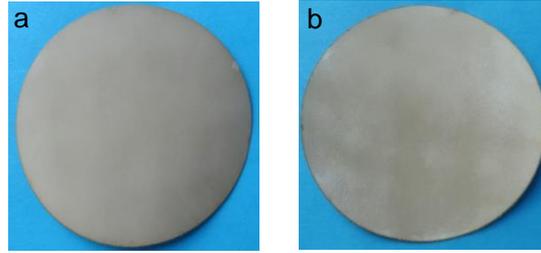


Fig. S1 Photographs of the top surface (a) and bottom surface (b) of N-66 membrane modified with solutions containing 30% ethanol.

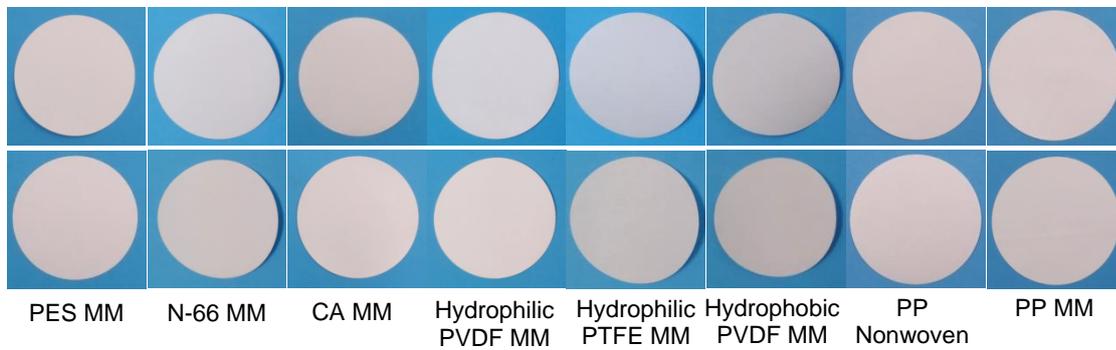


Fig. S2 Photographs of nascent microporous membranes (MM). The first row shows top surfaces and the second row shows bottom surfaces.

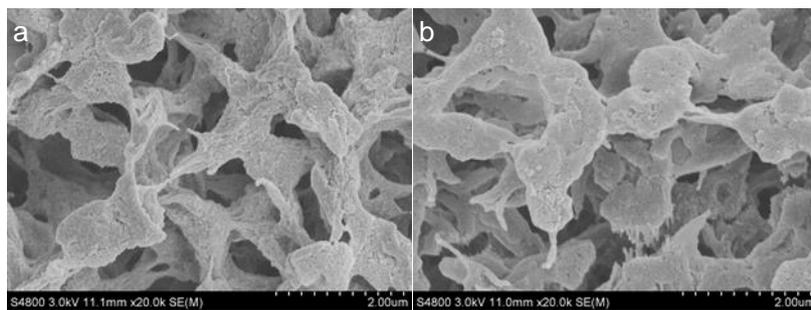


Fig. S3 SEM images of the top surfaces of hydrophobic PVDF MM before (a) and after (b) modification with PDA. The Janus membrane was firstly sprayed by solution A for 10 s and then by solution B for 10 s, and this modification process was repeated for 10 times.

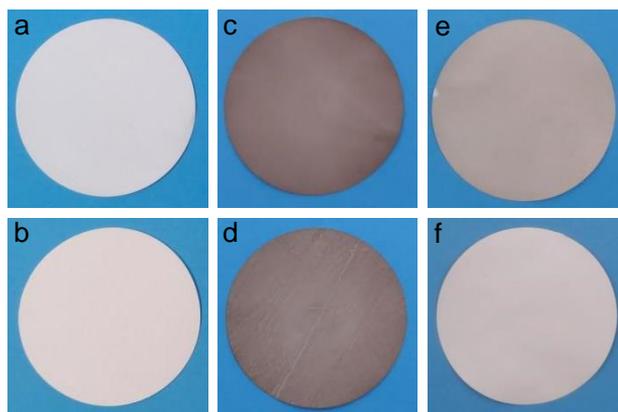


Fig. S4 Photographs of hydrophilic PVDF membranes before and after surface modification. (a,b) The nascent membrane, (c,d) the traditionally PDA/PSS-deposited membrane, and (e,f) the Janus membrane with deposited PDA/PSS on the top surface. Both top surfaces (a,c,e) and bottom surfaces (b,d,f) are compared. The traditionally PDA/PSS-deposited membrane was prepared by immersing in 20 mL aqueous solution containing 2 mg/mL DA and 2 mg/mL PSS for 5 h. To prepare the Janus membranes, PSS was added into solution B, and PVDF membranes were first sprayed by solution A for 10 s and then by solution B containing PSS/DA (1:1) for 10 s; such modification process was repeated for 2 times.

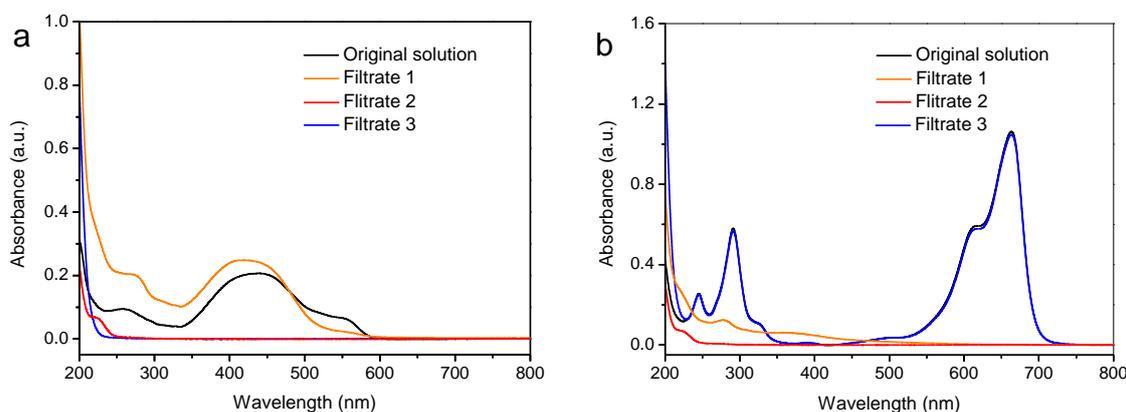


Fig. S5 UV-vis adsorption spectra of the original (a) Methyl Red sodium salt solution and (b) Methylene Blue solution, and their filtrates from different membranes. Filtrate 1: filtrate from traditionally PDA/PSS-deposited PVDF membrane; Filtrate 2: filtrate from Janus PVDF membrane; Filtrate 3: filtrate from nascent PVDF membrane.

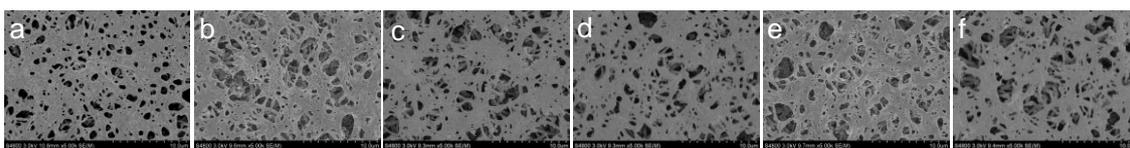


Fig. S6 SEM images of (a) the nascent hydrophilic PVDF microporous membrane and (b-f) the modified Janus membrane with different ratios of PSS to DA in solution B. (b) 0:1, (c) 1:2, (d) 1:1, (e) 2:1, (f) 4:1.

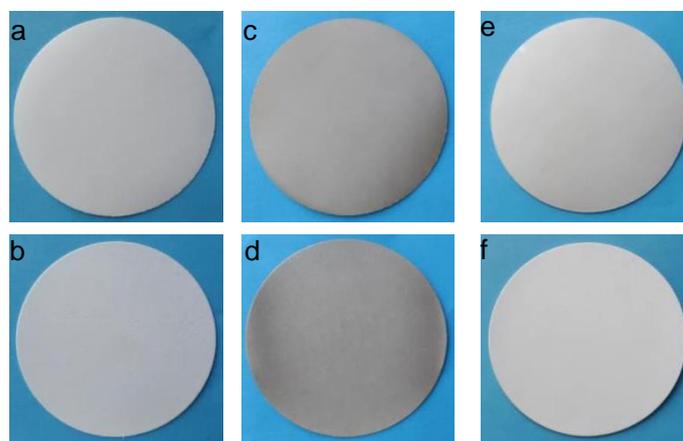


Fig. S7 Photographs of PP nonwovens before and after surface modification. (a,b) The nascent membrane, (c,d) the traditionally PDA/PDDA-deposited membrane, and (e,f) the Janus membrane with deposited PDA/PDDA on the top surface. Both top surfaces (a,c,e) and bottom surfaces (b,d,f) are compared. The traditionally PDA/PDDA-deposited membrane was prepared by immersing in 20 mL aqueous solution containing 2 mg/mL DA and 2 mg/mL PDDA for 5 h. To prepare the Janus membranes, PDDA was added into Solution B, and PP nonwovens were first sprayed by Solution A for 10 s and then by Solution B containing PDDA/DA (1:1) for 10 s; such modification process was repeated for 5 times.

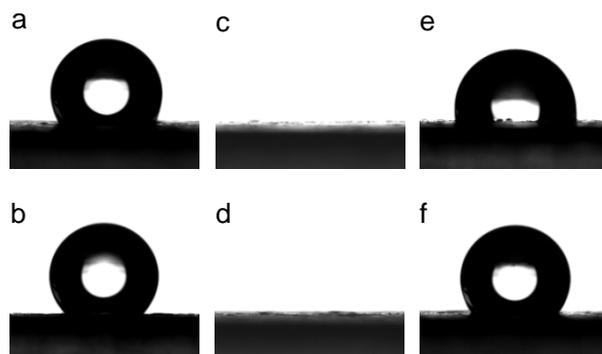


Fig. S8 Water contact angles on the surfaces of membranes. The top (a) and bottom (b) surfaces of nascent PP nonwoven, the top (c) and bottom (d) surfaces of the traditionally PDA/PDDA-deposited membrane, and the top (e) and bottom (f) surfaces of the Janus membrane.

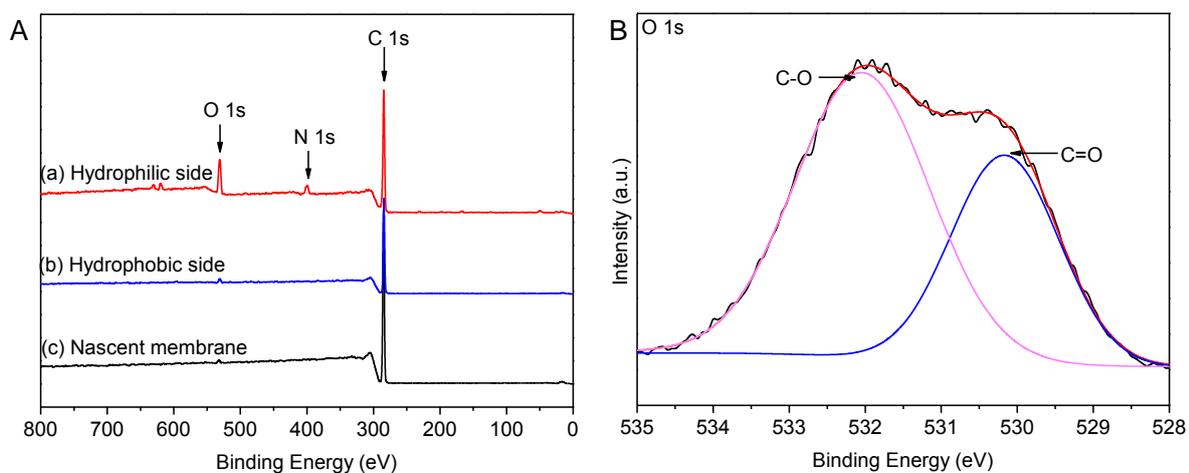


Fig. S9 (A) XPS spectra of the top (a) and bottom (b) surfaces of the Janus membrane, the top (c) surface of nascent PP nonwoven. (B) High resolution XPS spectra of O 1s of the top surface of the Janus membrane.