Supporting Information

Electrospun nanofiber substrates that enhance polar solvent separation from organic compounds in thin-film composites

Tian-Dan Lu,[a,b,c] Bo-Zhi Chen,[a,b,c] Jue Wang,[a,b,c] Tian-Zhi Jia,[a,b,c] Xue-Li Cao,[a,b,c] Yong Wang,[a,b,c] Weihong Xing,[a,b,c] Cher Hon Lau,[d*] Shi-Peng Sun[a,b,c*]

[a]State Key Laboratory of Materials-Oriented Chemical Engineering,

[b]Jiangsu National Synergetic Innovation Center for Advanced Materials

[c]College of Chemical Engineering, Nanjing Tech University, Nanjing 210009, China

[d]School of Engineering, University of Edinburgh, Robert Stevenson Road, Edinburgh EH9 3FB, UK.

*Corresponding author

Email:

Prof. Shi-Peng Sun: ssp@njtech.edu.cn , ssp@live.com

Dr. Cher-Hon Lau: cherhon.lau@ed.ac.uk

Tel:+86-25-83587560

Comprising 11 pages: 5 tables and 6 figures.

Table S1. Molecular structure of dyes used in this work

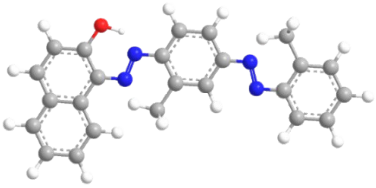
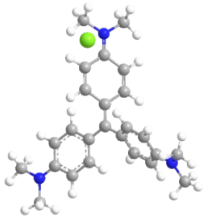
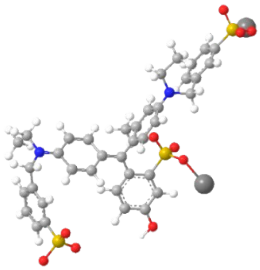
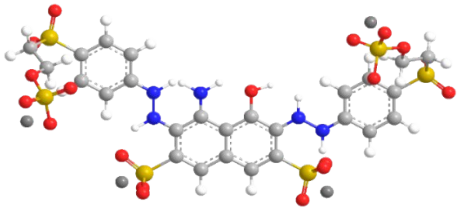
Molecular structure
 **SudanⅣ** **MW=380.44 g·mol^{-1} ， Charge=-2**
 **Crystal Violet** **MW=407.98 g·mol^{-1}， Charge= +1**
 **Fast Green** **MW= 808.91 g·mol^{-1}， Charge= -2**
 **Reactive Black** **MW= 991.82 g·mol^{-1}， Charge= -4**

Table S2. Effect of cross-linking duration on the specific surface area and pore volume of PAN nanofibers

Cross-linking duration(h)	S_{total} /($m^2 \cdot g^{-1}$)	V_{total} /($cm^3 \cdot g^{-1}$)
0	8.01	0.021
8	9.04	0.024
24	9.26	0.030

Table S3. Weight loss of cross-linked substrates degraded in aprotic solvents

Solvent	Substrates	Cross-linking duration(h)	Reduction ratio of solid content gel content after 48h
DMF	**asymmetrical**	**8**	**1.04%**
	nanofibrous	**8**	**1.74%**
DMSO	**asymmetrical**	**8**	**5.54%**
	nanofibrous	**8**	**0.90%**

Table S4. D-spacing and particle sizes of nanofibrous substrates

Cross-linking duration(h)	d-spacing(Å)	particle size(nm)
0	5.22	9.62
4	5.20	9.34
6	5.19	8.71
8	5.23	10.01
24	5.28	8.92

Table S5. A comparison of the MeOH permeability and Sudan4 (Mw 380.44 g mol^{-1}) dye rejection rates between our membranes and literature.

	Membrane	Solute	Rejection (%)	Marker MW (g mol^{-1})	Permeance（L m^{-2} h^{-1} bar^{-1}）	Reference
1	PA/PAN nanofibous-8	Sudan4	99.2	380	9.9	This work
2	PA/PAN	Oleic acid	93	282	6.0	55
3	(PIM-1/PEI)/PAN	HPB	91	535	3.6	56
	PIM-1/PAN	HPB	73	535	6.0	
4	PA/cross-linked P84	Styrene Oligomers	98	236	1.5	57
5	NH_2-MWCNT/P84	Methylene Blue	99.8	320	2.26	58
6	(PA/MOFs)/P84	Styrene Oligomers	96	236	3.9	59
7	MIL-101/ZIF-11/P84	Sunset Yellow	90	450	13.2	60
8	(Ultrathin PA)/P84	Naphthalene Brown	99.9	400.3	19.11	61
9	(UiO-66-NH_2)/PI	Tetracycline	99	444	20.0	62
10	(PS-b-PEO/PAA)/alumina	Polyethylene Glycols	80	370	0.1	63
11	Inopor TiO_2/alumina	Victoria Blue	99	506	0.4	64
12	0.8Cu-BTC/PPSU	Reactive Orange 16	93.4	600	3.3	65
13	PA/PSF	Crystal Violet	90	407	2.0	66
14	PA/ZIF-8/PSF	Sunset Yellow	90	450	8.7	67
15	Cross-linked PANI	Styrene Oligomers	97	236	0.8	68

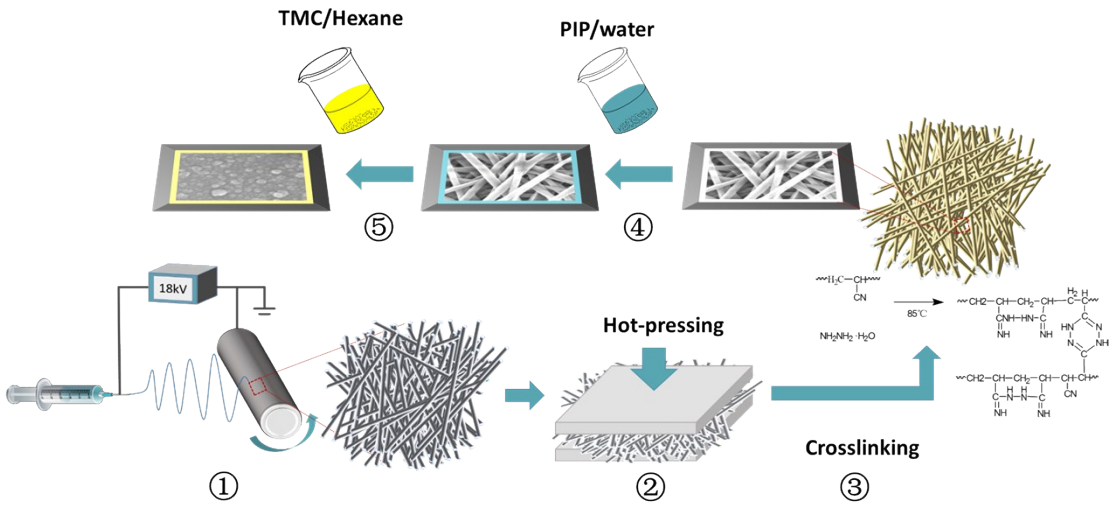


Fig S1. The fabrication process for thin film composite membranes based on PAN nanofibrous substrates

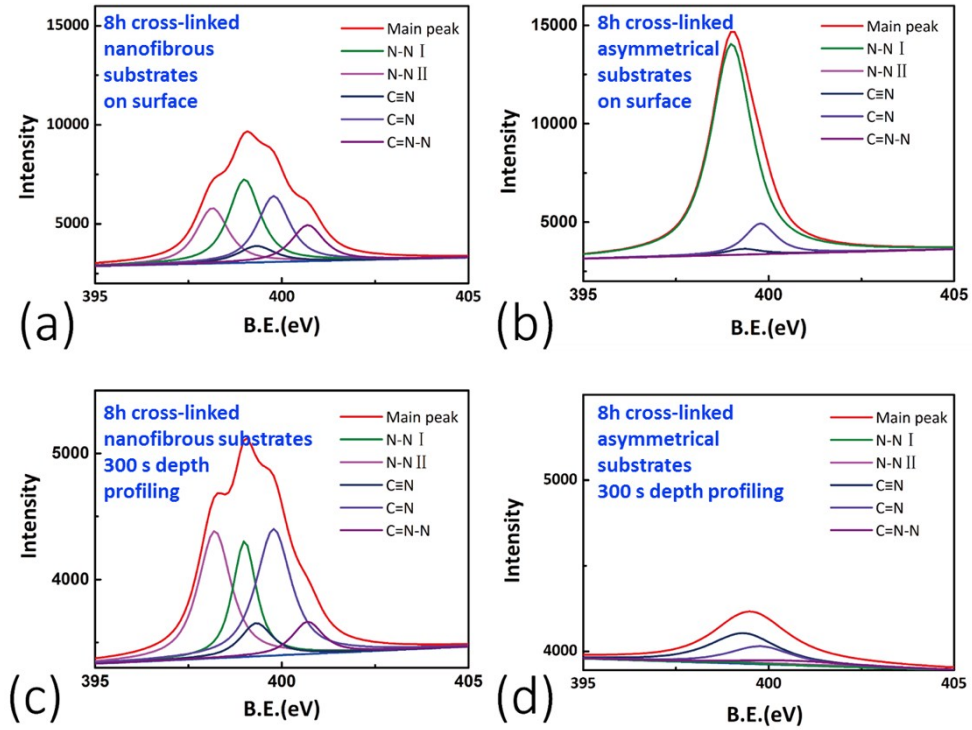


Fig S2. N1s XPS spectra for the 8h cross-linked PAN substrates, (a) 8h cross-linked asymmetrical substrates and (b) 8h cross-linked asymmetrical substrates on surface ,(c) 8h cross-linked asymmetrical substrates and (d) 8h cross-linked asymmetrical substrates with 300 s depth profiling.

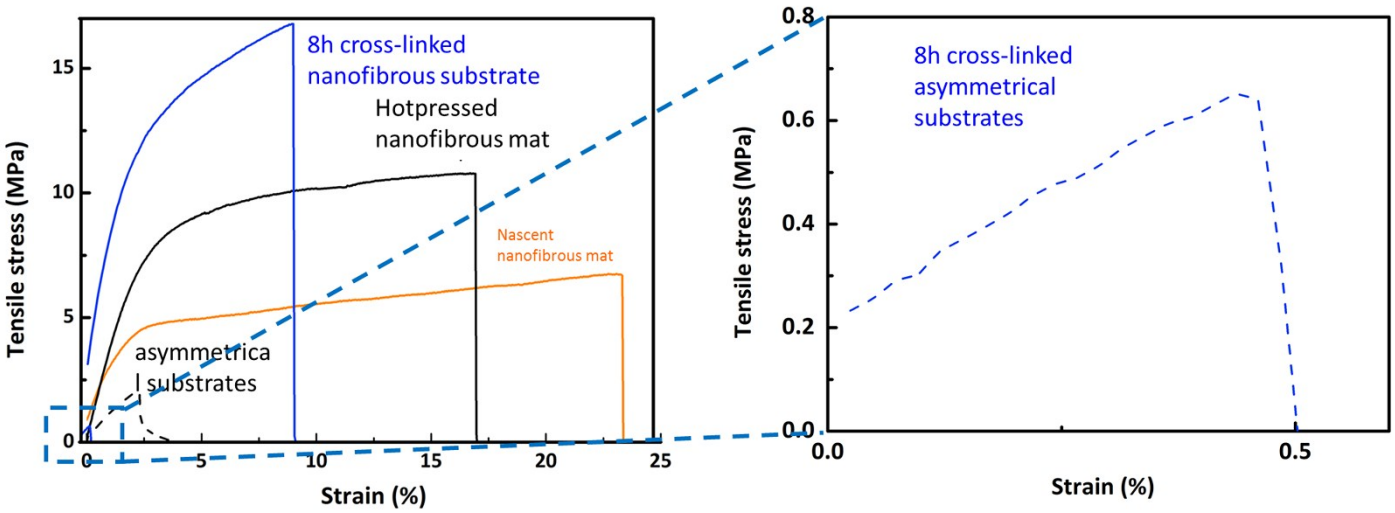


Fig S3.Cross-linking and size effects on mechanical properties

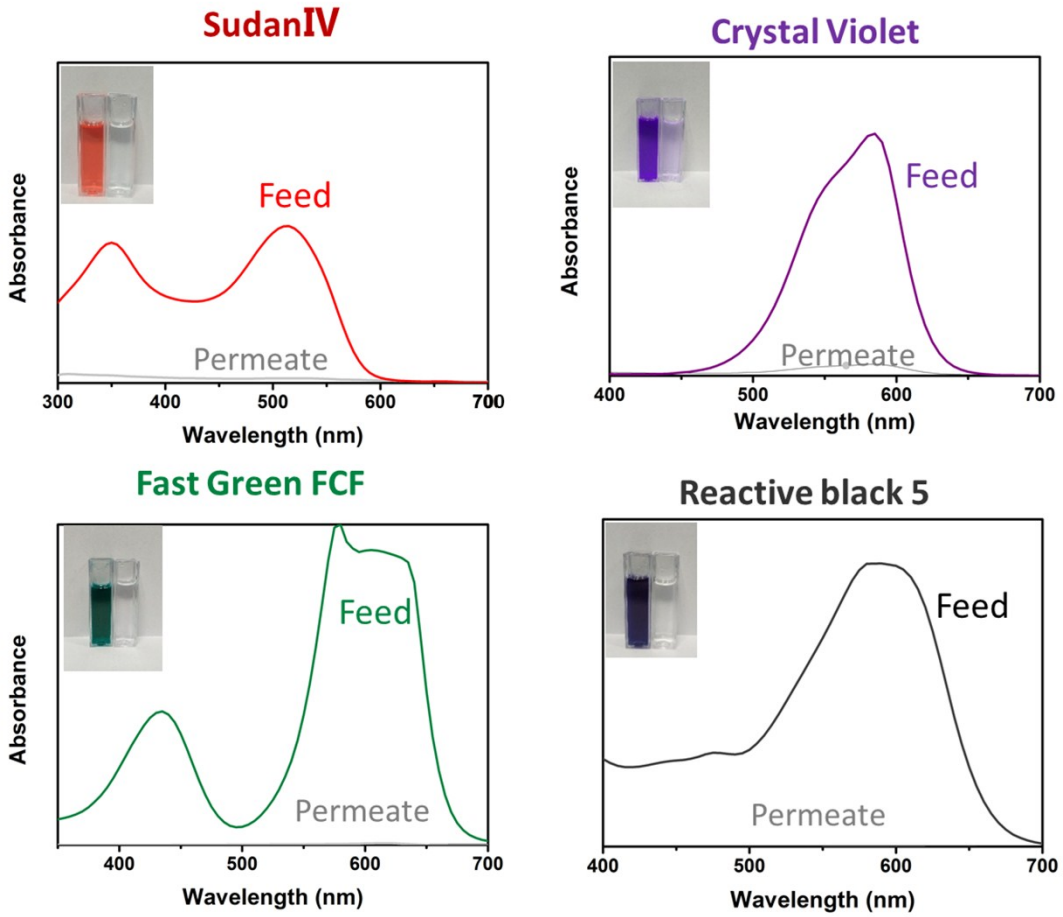


Fig S4. UV−vis absorbance spectra of the feed and permeate of four basic dyes in methanol.

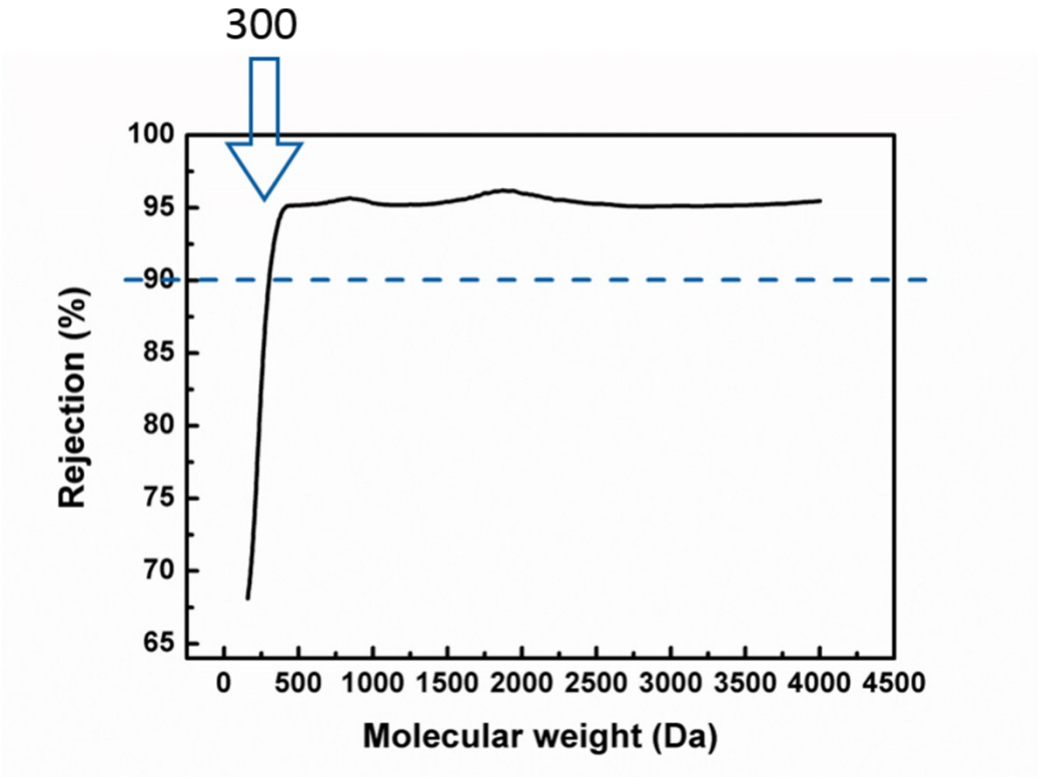


Fig S5. Molecular weight cut-off (MWCO) of the PA/8h-cross-linked nanofibrous substrates

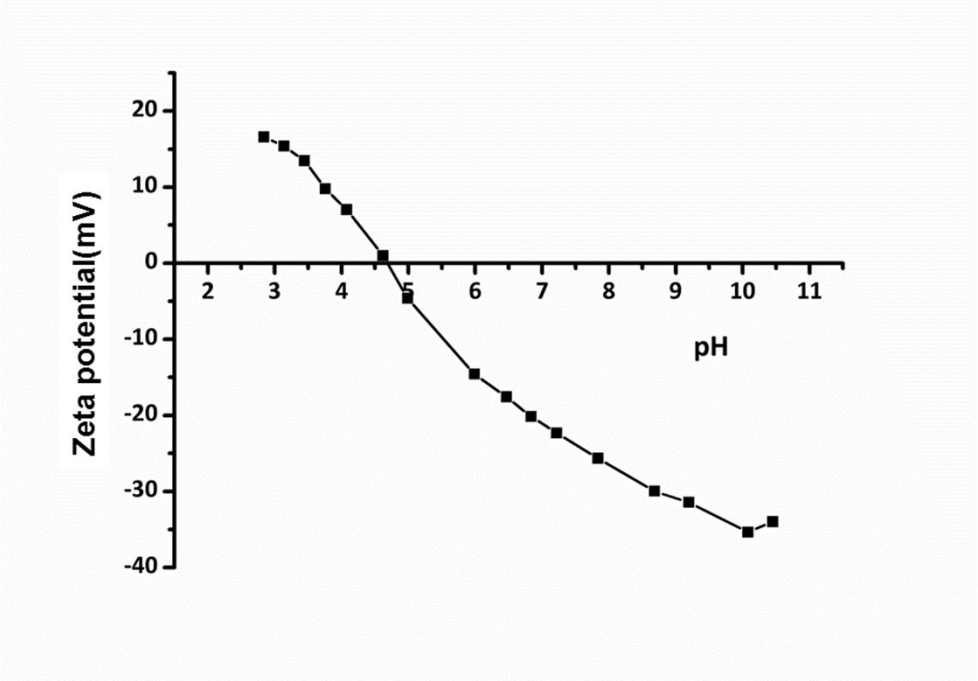


Fig S6. Zeta potential of PA/8h-cross-linked nanofibrous substrates as a function of the pH value.