Electronic Supplementary Information for

Robust Construction of Graphene Oxide Barrier Layer on Nanofibrous Substrate Assisted by Flexible Poly(vinylacohol) for Efficient Pervaporation Desalination

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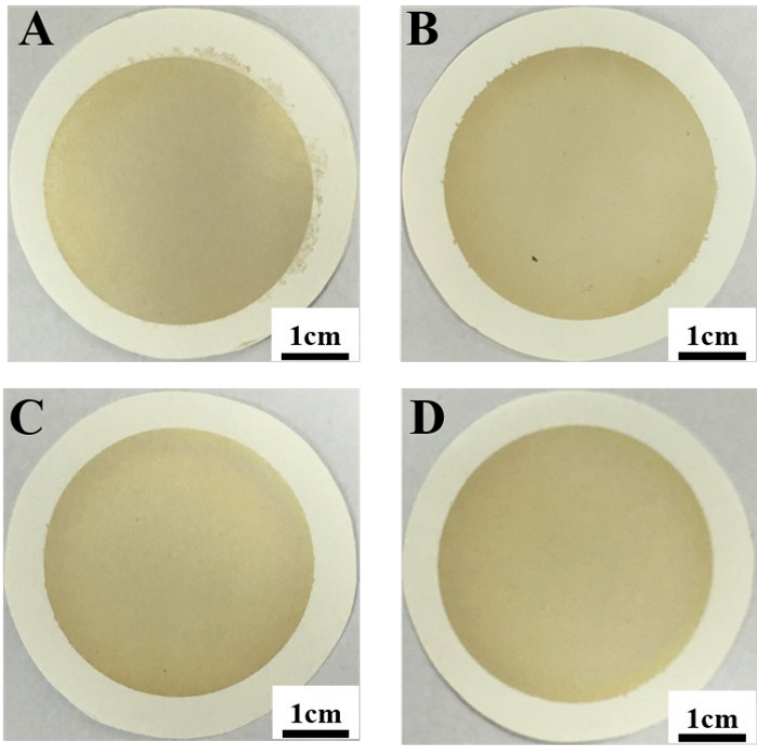

Fig. S1 Photographs of GO/PAN (A) and GO-PVA-GA/PAN TFNC membranes with different GO/PVA mass ratio: (B) 1:0.5, (C) 1:1, (D) 1:10.

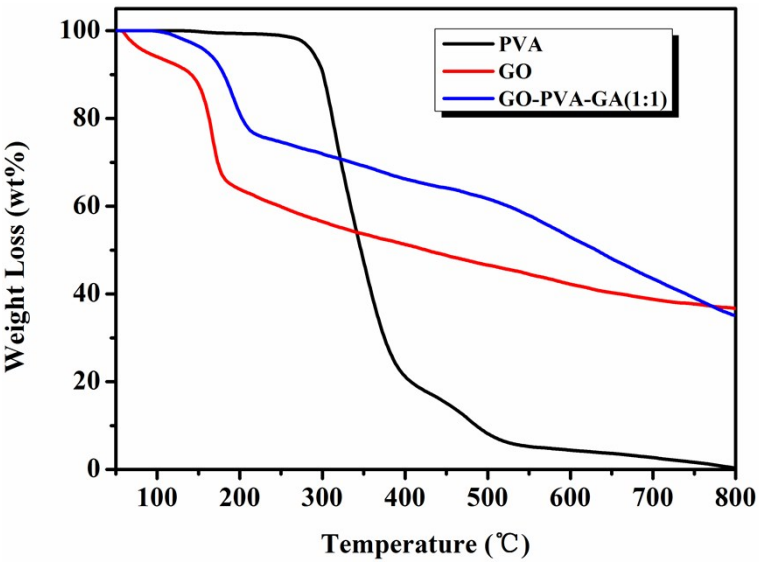

Fig. S2 TGA curves of PVA, GO and GO-PVA-GA (1:1) under nitrogen atmosphere with a temperature rising rate of 10 K/min.

Thermogravimetric analysis (TGA) of all pure and composite samples was performed on a NETZSCH STA409PC with a temperature increase rate of 10 K/min under nitrogen from 50 to 800 C, as shown in Fig. S2. GO layer showed about 6 wt% weight losses below 100 °C and more than 35 wt% weight losses before 200 °C, which were resulted from the absorbed water evaporation and removal of the labile oxygen-containing functional groups respectively.[1,2] In contrast, the onset of thermal decomposition of GO-PVA-GA (1:1) barrier layer was obviously higher than that of GO layer. The improvement of thermal stability could be attributed to the fact that PVA chains acting as the spacing bridges ensured stabilized GO layer with sufficient bonding by GA crosslinking.[3]

To calculate the GO weight fraction in GO-PVA-GA barrier (1:1), the chosen temperature ranges from 100 ºC to 800 ºC, considering that the weight loss before 100 °C was mainly caused by the water evaporation. The GO weight fraction (w) in GO-PVA-GA (1:1) barrier layer could be decided by equation S1:[2,4]

$$w = \frac{M - M_{PVA}}{M_{GO} - M_{PVA}} \times 100\% \quad \text{(S1)}$$

In this equation, w represents the GO weight fraction; M, M_{PVA} and M_{GO} are the weight loss of GO-PVA-GA barrier layer, pure PVA and GO between 100 ºC and 800 ºC, respectively. After

calculating from TGA curves, the GO contents in GO-PVA-GA (1:1) layer was about 82.8 wt% and PVA was about 17.2 wt%, which means nearly 80wt% PVA in the mixed dispersions ran away from the substrate and only 20wt% remained in barrier layer. This analysis quantitatively proved that large amount of PVA was drained away through the porous nanofibrous substrate and some amount of PVA molecules bonded to the surface of GO nanosheets by GA will be retained and intercalated between neighboring sheets, leading to the slight increase of the GO barrier layer thickness.

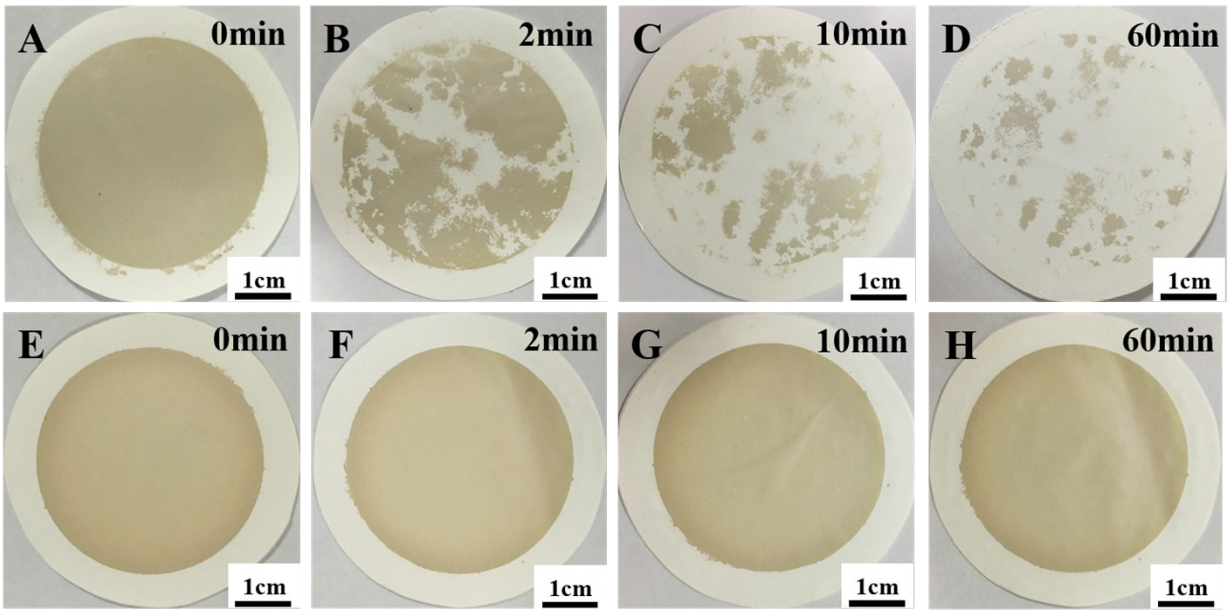

Fig. S3 Photographs of GO/PAN (A, B, C and D) and GO-PVA-GA/PAN (1:1) (E, F, G and H) TFNC membranes subjected to sonication in DI water for various durations.

Notes and references

(1) C. Cheng, S. Li, S. Nie, W. Zhao, H. Yang, S. Sun and C. Zhao, *Biomacromolecules* **2012**, 13, 4236-4246.
(2) S. Wan, J. Peng, Y. Li, H. Hu, L. Jiang and Q. Cheng, *ACS Nano* **2015**, 9, 9830-9836.
(3) B. Liang, K. Pan, L. Li, E. P. Giannelis and B. Cao, *Desalination* **2014**, 347, 199-206.