Electronic Supplementary Information (ESI)

High flux electroneutral loose nanofiltration membranes based on rapid deposition of polydopamine/polyethyleneimine

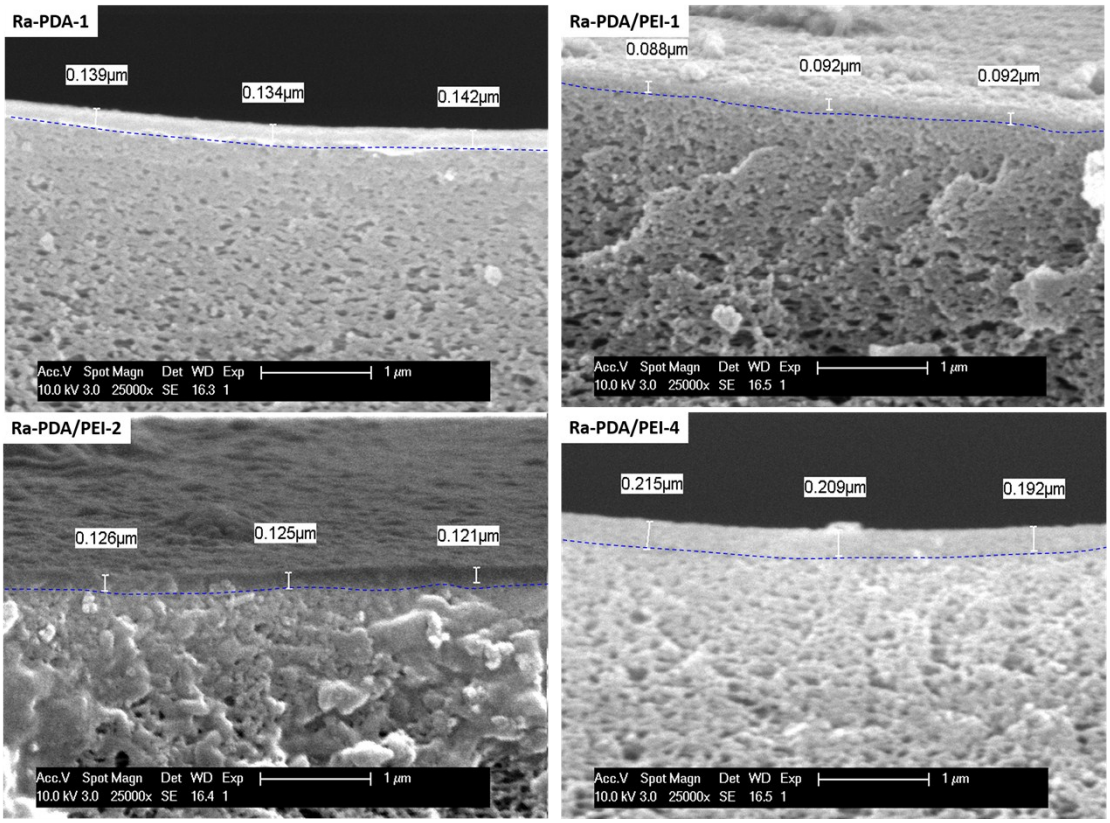
Jing Wang,[ab] Junyong Zhu,[b] Misgina Tilahun Tsehaye,[b] Jian Li,[b] Guanying Dong,[a] Shushan Yuan,[b] Xin Li,[b] Yatao Zhang,*[a] Jindun Liu,[a] Bart Van der Bruggen,*[bc]

[a.]School of Chemical Engineering and Energy, Zhengzhou University, Zhengzhou 450001, China.

[b.]Department of Chemical Engineering, KU Leuven, Celestijnenlaan 200F, B-3001 Heverlee, Belgium.

[c.]A Faculty of Engineering and the Built Environment, Tshwane University of Technology, Private Bag X680, Pretoria 0001, South Africa.

Email: E-mail: bart.vanderbruggen@kuleuven.be (Bart Van der Bruggen)
zhangyatao@zzu.edu.cn (Yatao Zhang)



Supplementary Fig. S1 Cross-section SEM images of HPAN, Ra-PDA-1, Ra-PDA/PEI-1, Ra-PDA/PEI-2 and Ra-PDA/PEI-4 membranes.

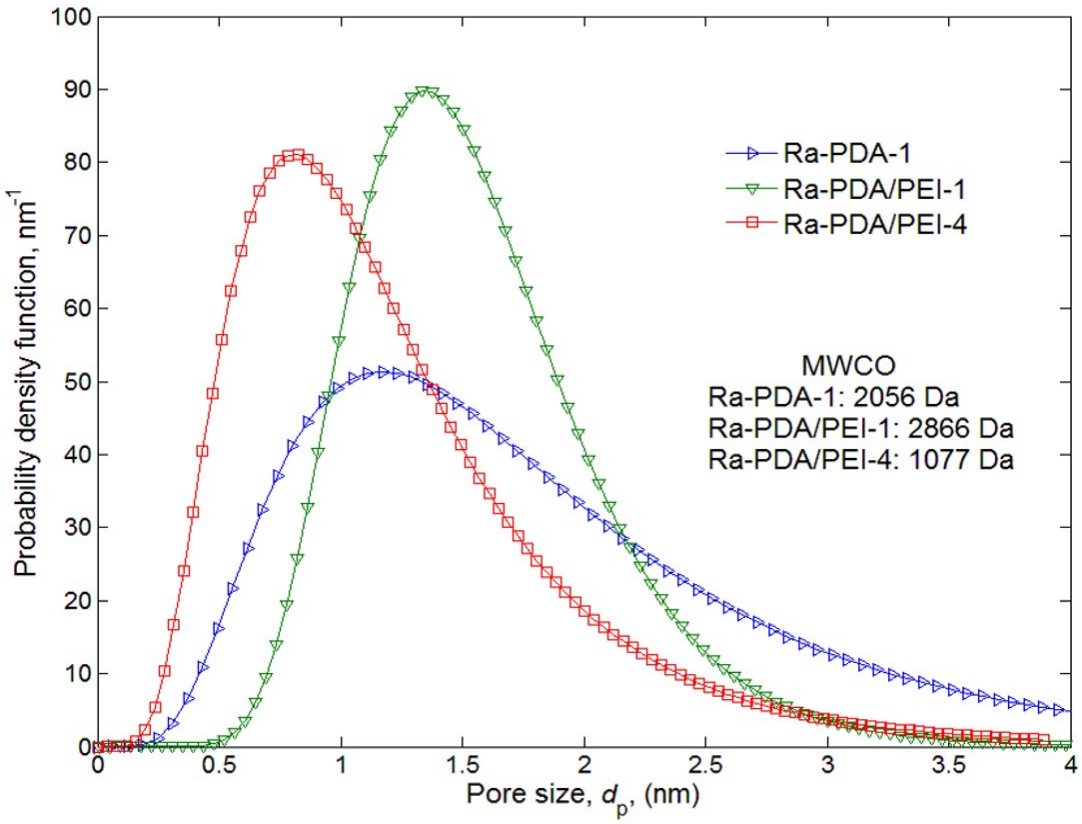


Fig. S2 Pore size distribution and molecular weight cut-off (MWCO) of Ra-PDA-1, Ra-PDA/PEI-

1 and Ra-PDA/PEI-4 membranes.

The pore size, pore size distribution and molecular weight cut-off (MWCO) were determined by polyethylene glycol (PEG) rejection via nanofiltration experiments.1 PEG with molecular weights: 400, 1000, 1500 and 3000 Da at concentrations of 0.2 g L−1 were used as feed solution. The concentrations of permeate and feed solutions were determined by a TOC analyzer (Shimadzu TOC-VCPN , Japan). The Stokes radii of PEG was calculated based on their average Mw as follows: [2, 3]

$$r = 16.73 \times 10^{-12} \times M_w^{0.557}$$

Subsequently, we plotted the obtained solute rejections against the Stokes radii and transformed it into a log-normal probability co-ordinate system. The MWCO, mean pore radius (μ_p), and geometric standard deviation (σ_p) of the membranes were estimated from the resultant linearized function. μ_p is defined as the geometric mean radius of solute at 50% solute rejection. σ_p is defined as the ratio of the solute radius when solute rejections are 84.13% and 50%, and represents the geometric standard deviation of μ_p . Lastly, the pore size distributions of the membranes were described by the following probability density function.

$$\frac{dR(d_p)}{dd_p} = \frac{1}{r_p \ln\sigma_p \sqrt{2\pi}} \exp\left(-\frac{(\ln r_p - \ln\mu_p)^2}{2(\ln\sigma_p)^2}\right)$$

1. Z. Thong, G. Han, Y. Cui, J. Gao, T.-S. Chung, S. Y. Chan and S. Wei, *Environ. Sci. Technol.*, 2014, **48**, 13880-13887.
2. Y. K. Ong, F. Y. Li, S.-P. Sun, B.-W. Zhao, C.-Z. Liang and T.-S. Chung, *Chem. Eng. Sci.*, 2014, **114**, 51-57.
3. W.-Z. Lang, J.-P. Shen, Y.-T. Wei, Q.-Y. Wu, J. Wang and Y.-J. Guo, *Chem. Eng. J.*, 2013, **225**, 25-33.