# Supporting information

# Large-area clay composite membranes with enhanced permeability for efficient dye/salt separation

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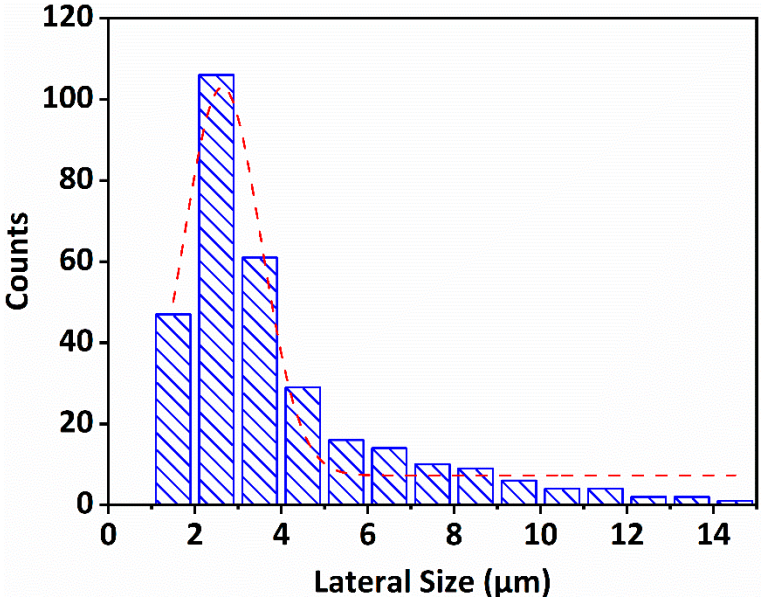



**Figure S1.** Lateral size distribution (300 sheets analyzed) of VNSs obtained from SEM.

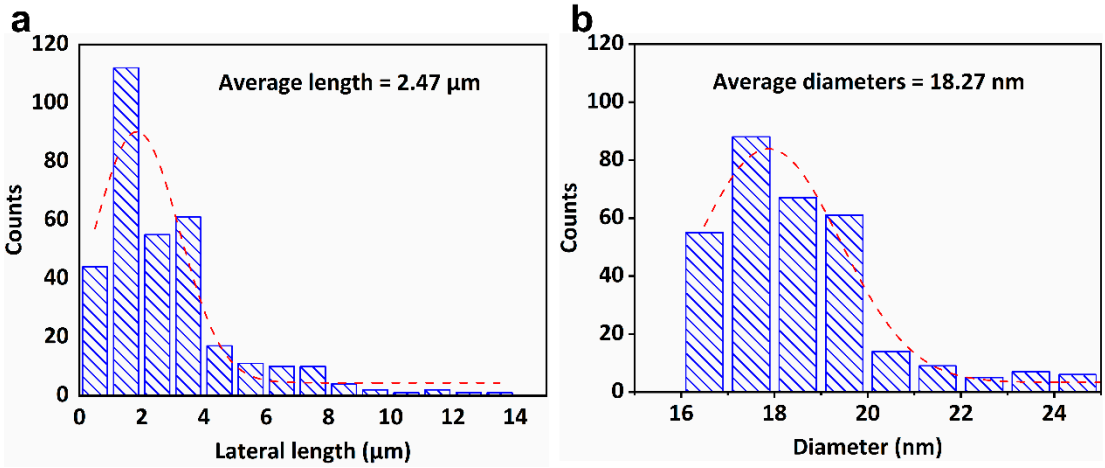



**Figure S2.** (a) Length and (b) diameter distribution (300 fibers analyzed) of SNFs obtained from SEM.

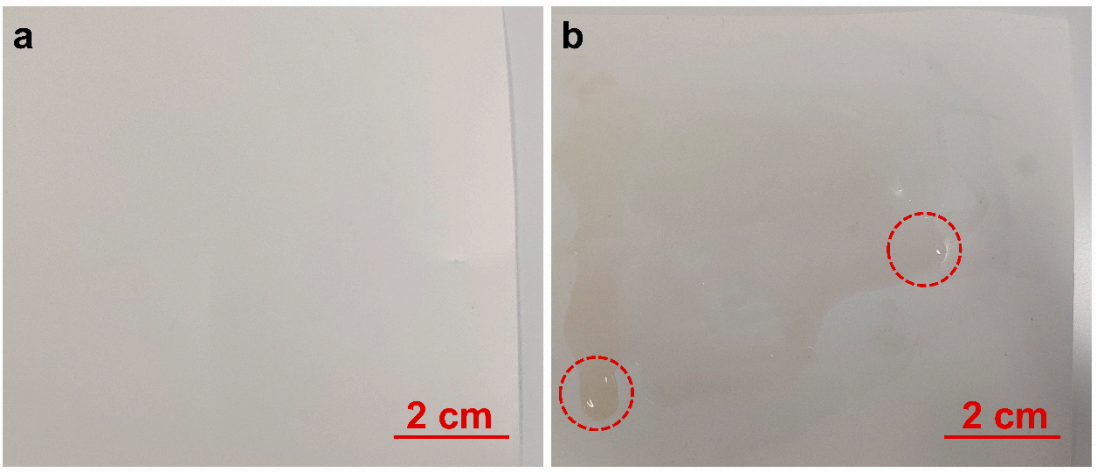



**Figure S3.** Digital images of (a) blank PES membrane (b) the membranes fabricated by SVD-100 (pure sepiolite dispersion) using Meyer rod coating.

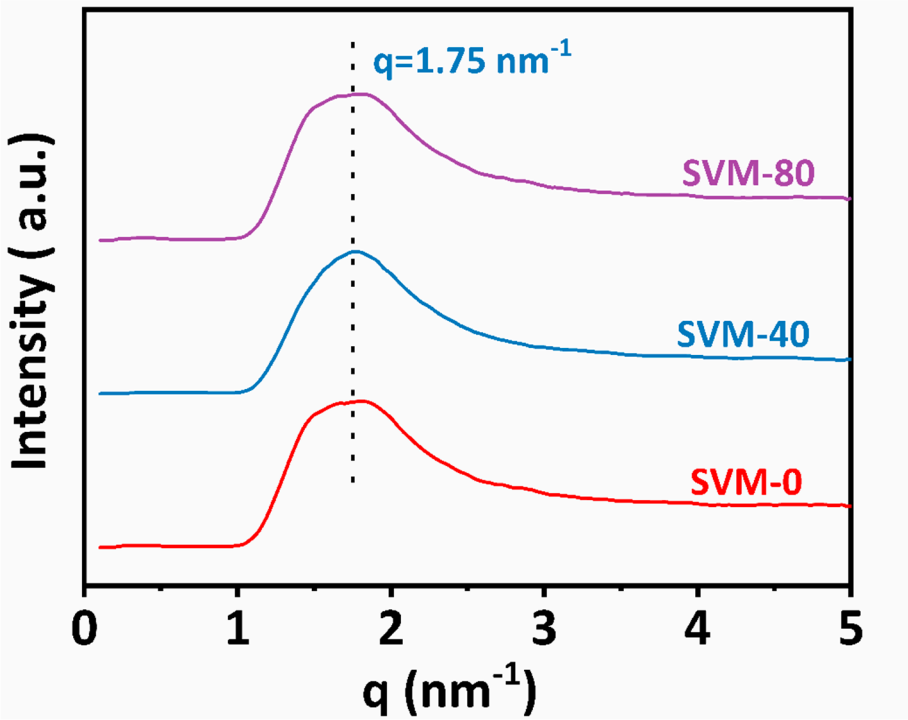



**Figure S4.** SAXS patterns of SVM-*x*.

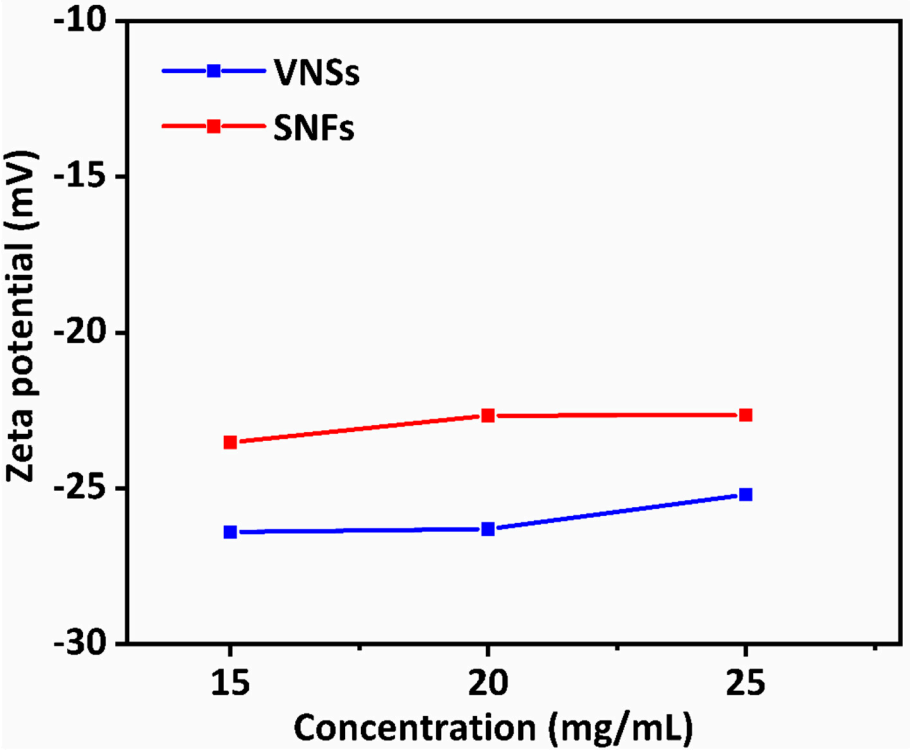



**Figure S5.** Concentration-dependent Zeta potentials of VNSs and SNFs dispersion.

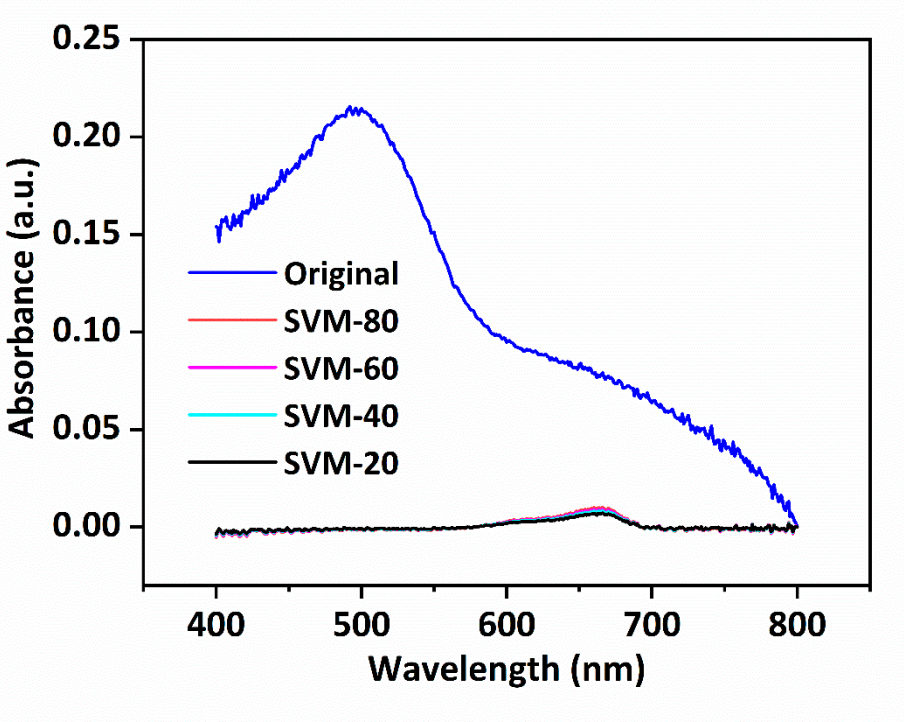



**Figure S6.** The UV-vis spectra of CR/NaCl solutions before and after treatment using SVM-x.

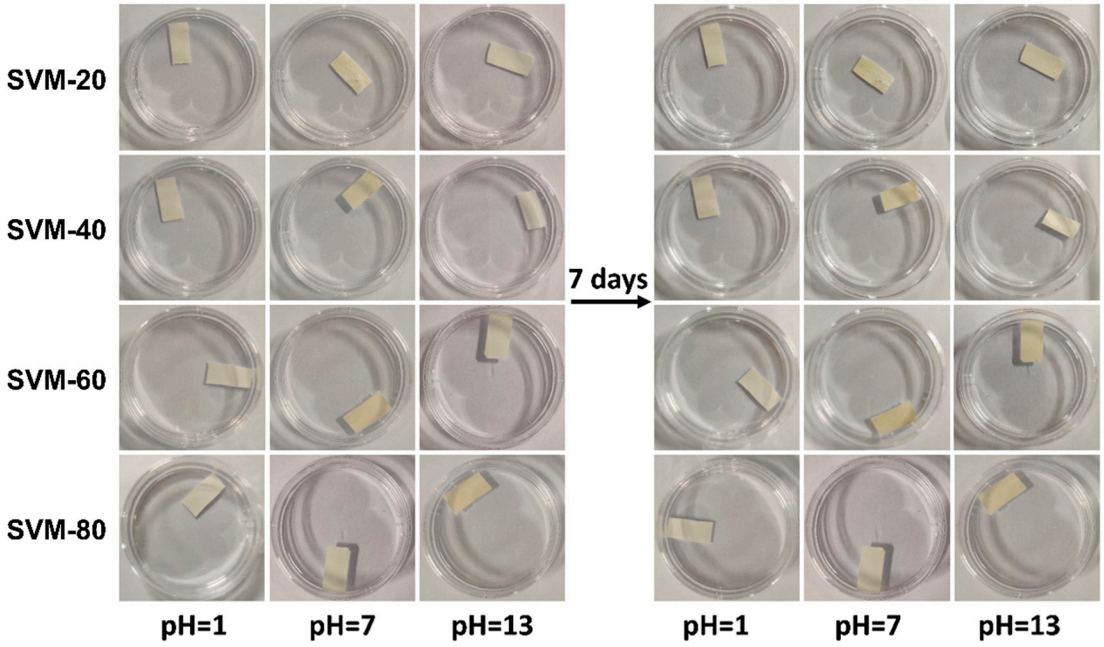



**Figure S7.** The digital photos of SVM-X before and after soaked in solutions of different pH.

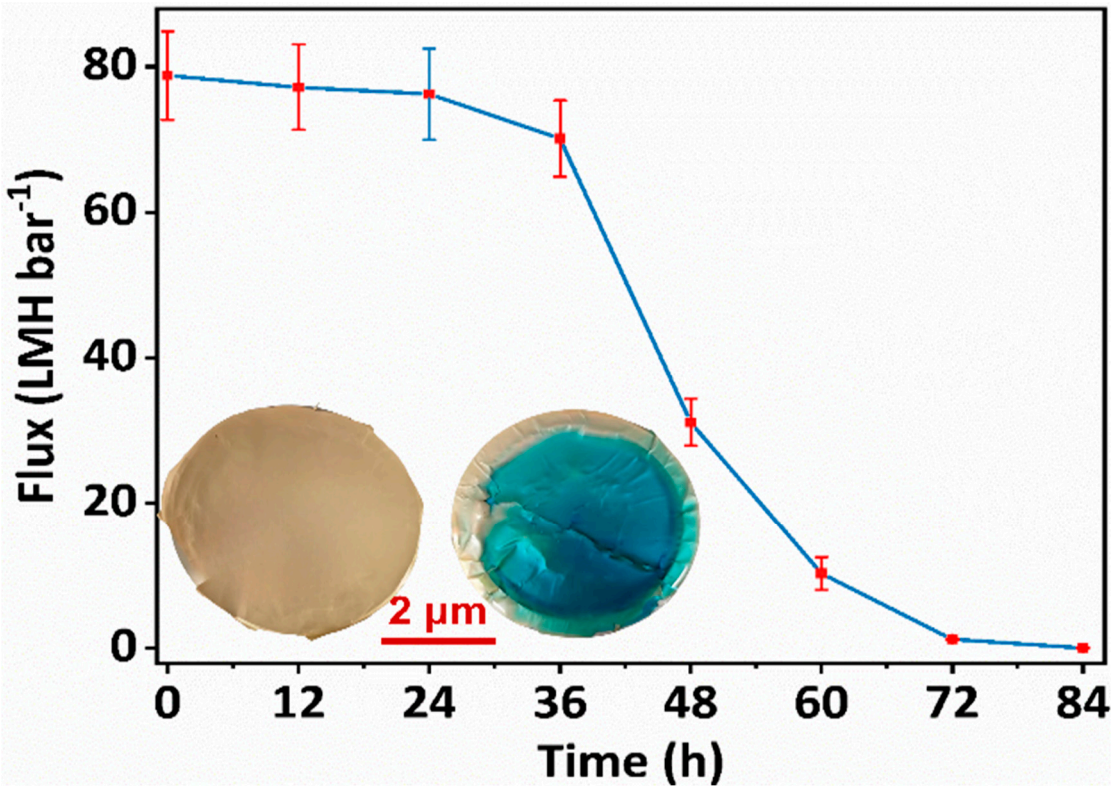



**Figure S8.** 84 h stability and dye/salt separation tests of SVM-80. The simulated wastewater contains 1 g $L^{-1}$ NaCl and 10 mg $L^{-1}$ MB for the tests. The insets show the digital images of SVM-80 before and after 84 h separation test.

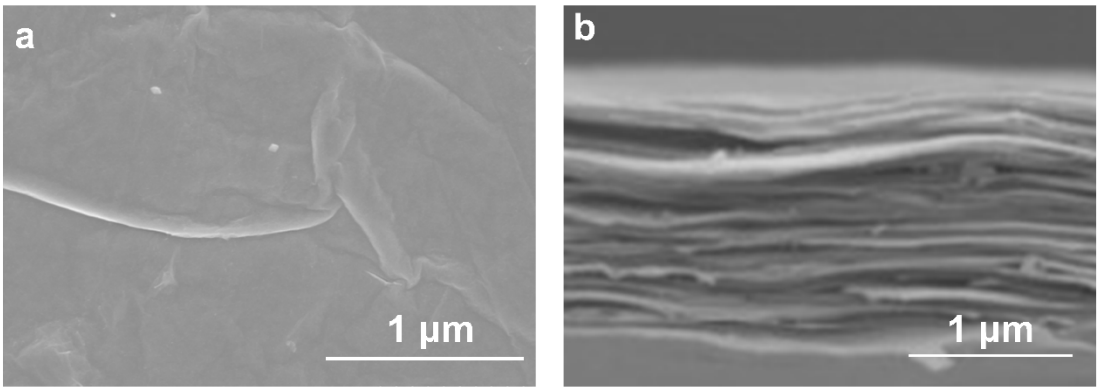



**Figure S9.** (a) Top-view SEM images of SVM-0 (pure vermiculite membrane) (b) Cross-section SEM images of SVM-0.

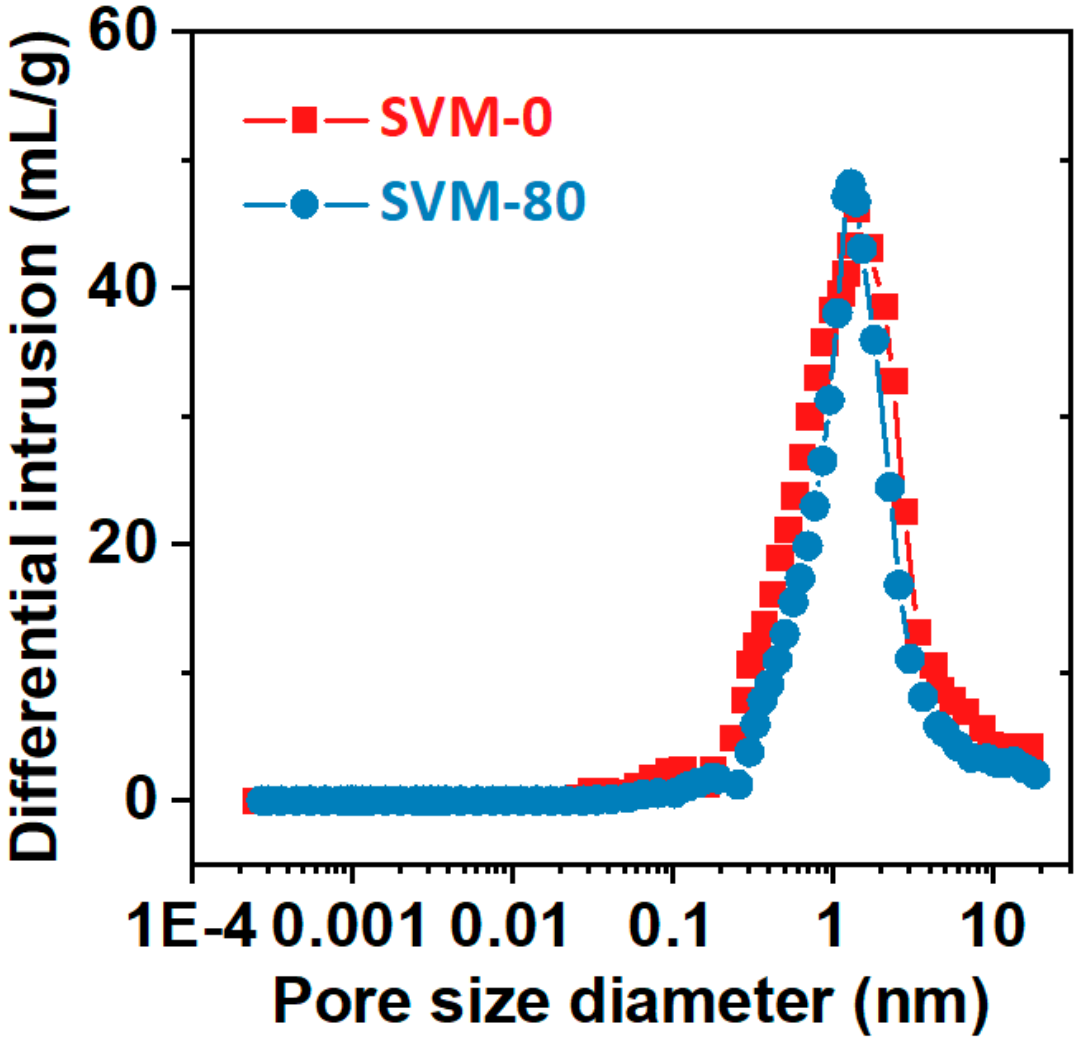



**Figure S10.** Pore size of SVM-0 and SVM-80 measured by the mercuric depressor.

**Table S1** Comparison of salt retention capacity of other nanofiltration membranes. All the salts are 1 g/L NaCl.

| Materials | NaCl rejection (%) | Flux (LMH bar−1) | Ref |
|---|---|---|---|
| MXene/PRGO | 5.32 | 48.66 | [1] |
| MXene/ZIF-8 | 7.88 | 40,85 | [2] |
| MXene/CNT | 23.52 | 10.81 | [3] |
| GO/MoS2 | 43.27 | 10.27 | [4] |
| PEI-modified GO/PAA/ PVA/GA | 37.85 | 0.81 | [5] |
| GO/HNTs | 14.33 | 11.34 | [6] |
| GO/NH2-Fe3O4 | 15.20 | 78.02 | [7] |
| GOQDs TFN/TA | 17.21 | 11.73 | [8] |
| Vermiculite/Sepiolite | 9.44 | 78.12 | This work |

Reference in the supporting material.

[1] S. Li, J. Lu, D. Zou, L. Cui, B. Chen, F. Wang, J. Qiu, T. Yu, Y. Sun, W. Jing, Constructing reduced porous graphene oxide for tailoring mass-transfer channels in ultrathin MXene (Ti3C2T ) membranes for efficient dye/salt separation, Chemical Engineering Journal, 457 (2023) 141217.

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