

# Supporting Information

## Ultrafast Molecule Separation through Layered WS<sub>2</sub> Nanosheet Membranes

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Figure S1

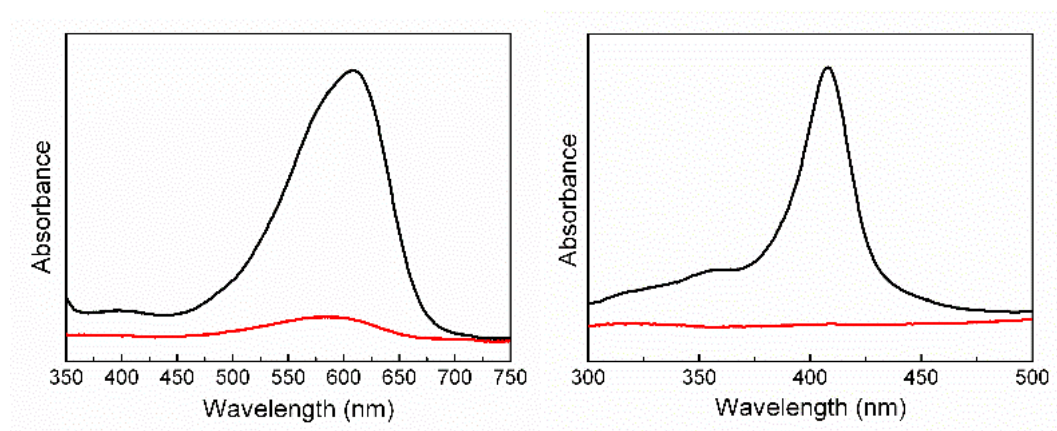


Figure S1 UV-*vis* spectra of EB (left) and Cyt. C (right) in original feed (black) and permeate (red) solutions, respectively.

Figure S2

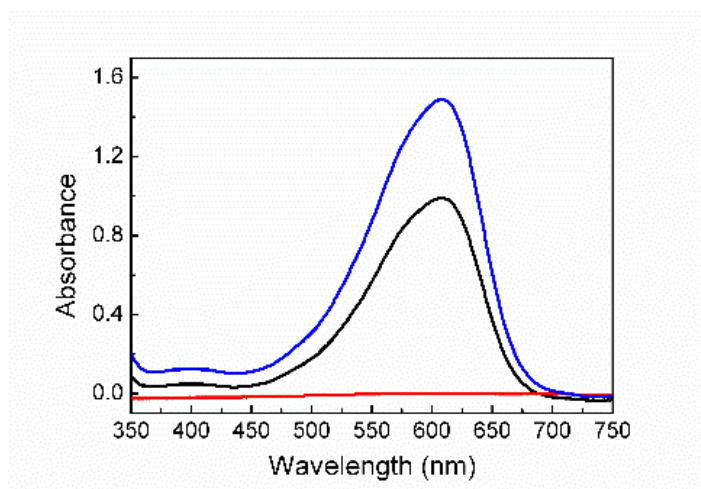


Figure S2 UV-*vis* spectra of EB in original feed (black), retentate (blue) and permeate (red) solution. Permeate and retentate solutions are collected in 120 minutes. This test aims at the separation mechanism in the WS2 membrane. Higher absorbance in retentate solution suggests that most EB molecules are blocked instead of being absorbed by the membrane.

Figure S3

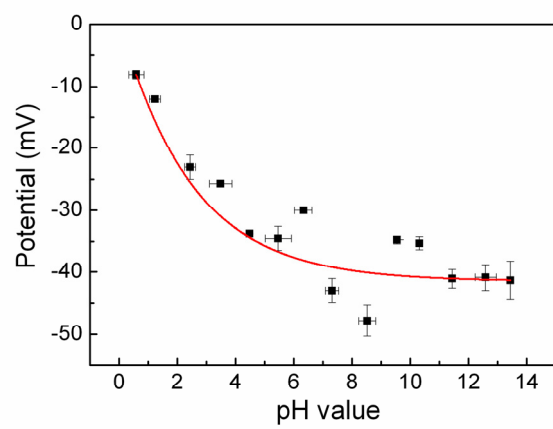


Figure S3 pH-dependent zeta potential of WS<sub>2</sub> aqueous solution.

Figure S4

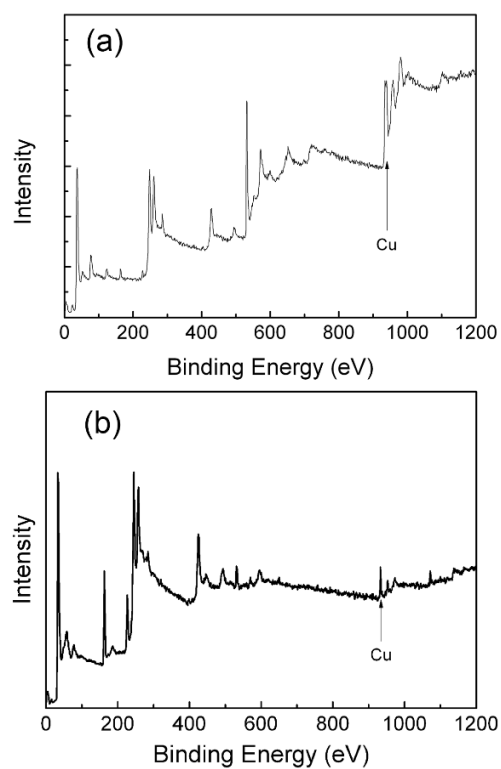


Figure S4 XPS spectra of WS<sub>2</sub>/copper hydroxide nanostrands composite membrane before (a) and after (b) removing copper hydroxide nanostrands.

Table S1 Comparison of separation performance of GO and MoS<sub>2</sub> membrane.

Membrane	Thickness ( $\mu\text{m}$ )	Water Permeance ( $\text{L}/\text{m}^2\cdot\text{h}\cdot\text{bar}$ )	Rejection % (EB)	Reference
GO	2	71	85	S1
MoS <sub>2</sub>	1.8	245	89	S2
WS <sub>2</sub>	0.5	450	89	This work
Nanostrands-channelled GO	2	695	84	S3
Nanostrands-channelled WS <sub>2</sub>	0.5	930	83	This work
Nanostrands-channelled WS <sub>2</sub> after cracked	0.5	1850	82	This work

References:

- S1. Huang, H. B.; Mao, Y. Y.; Ying, Y. L.; Liu, Y.; Sun, L. W.; Peng, X. S. Salt Concentration, pH and Pressure Controlled Separation of Small Molecules through Lamellar Graphene Oxide Membranes. *Chem. Commun.* **2013**, 49, 5963-5965.
- S2. Sun, L. W.; Huang, H. B.; Peng, X. S. Laminar MoS<sub>2</sub> Membranes for Molecule Separation. *Chem. Commun.* **2013**, 49, 10718-10720.
- S3. Huang, H. B.; Song, Z. G.; Wei, N.; Shi, L.; Mao, Y. Y.; Ying, Y. L.; Sun, L. W.; Xu, Z. P.; Peng, X. S. Ultrafast Viscous Water Flow through Nanostrand-Channeled Graphene Oxide Membranes. *Nat. Commun.* **2013**, 4, 3979.