

Ultrathin Molecular Sieving Graphene Oxide membrane

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Abstract

Membranes with precise molecular sieving property and high permeance are of great importance for low-cost and energy-efficient separation process¹⁻³. Graphene oxide (GO) membrane precisely sieves out ions and molecules larger than 4.5 Å in diameter², however, its low permeance to fluids hindered its applications in filtration. Here, we investigated the effect of membrane thickness on the permeance by studying the molecular permeation through GO membranes with different thicknesses. We show that molecular sieving property of GO membrane can be persevered down to few nanometres if the laminar structure of the membrane is maintained. GO membranes with few nanometres in thickness show high permeance to fluids while keeping the 4.5 Å sieve size. Our findings open a novel route for the use of GO membrane in molecular separation.

References

- [1] Nair R. R., Wu H. A., Jayaram P. N., Grigorieva I. V., Geim A. K., Science, 335 (2012) 442-444
- [2] Joshi R. K., Carbone P., Wang F. C., Kravets V. G., Su Y., Grigorieva I. V., Wu H. A., Geim A. K., Nair R. R., Science, 343 (2014) 752-754

- [3] Han Y., Xu Z., Gao C., Adv Funct Mater, 23 (2013) 3693-3700

Figures

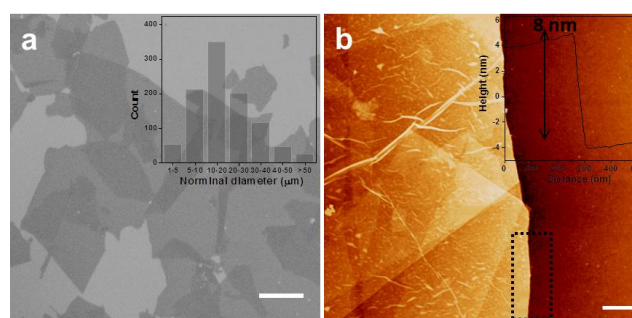


Figure 1: (a) SEM image of GO sheets on silicon wafer, inset is the size distribution of GO sheets. Scale bar 10 μm. (b) AFM image of a section of a GO membrane transferred on a silicon wafer. Scale bar 500 nm. Inset is the height profile along the dotted rectangle.