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Title:

Effect of graphene oxide structure on organic solvent nanofiltration performance for laminar graphene oxide membrane

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Abstract: (Your abstract must use **Normal style** and must fit in this box. Your abstract should be no longer than 300 words. The box will 'expand' over 2 pages as you add text/diagrams into it.)

Graphene oxide (GO) is a chemically stable two-dimensional material with a molecular thickness. Recently laminar GO membranes have attracted attention as organic solvent nanofiltration (OSN) membranes due to their high chemical stability and promising separation performances [1]. GO structures such as sheet size and reduction degree are considered to be important factors affecting the membrane performances. For example, reducing the GO sheet size may shorten the permeation pathway, resulting in improved permeance of liquid [2]. However, the details of the effect of GO structures on OSN performance are not fully understood. In this study, the effects of GO structure on OSN performance were investigated.

GO was crushed by ultrasound to prepare GO with small size (sGO). Laminar GO membranes were fabricated by pressure-assisted filtration on a polyethersulfone (PES) support using different size of GO. For DLS measurements, the particle size of sGO is 200-300 nm while that of GO is 2000-3000 nm. The size difference between sGO and GO was also confirmed by AFM measurements, indicating the successful fabrication of different size of GO. Fig.1 shows the OSN performances of the laminar GO membranes. At lower GO amount less than 0.15 mg, methanol permeance decreased drastically and methyl orange (MO) rejection was greatly enhanced, with increasing GO amount. On the other hand, at higher amount of GO, the decrease in methanol permeance was slight and MO rejections were stable at 70-80%. These results suggest that the GO laminar structure may not be fully formed at low amount of GO. It was found that GO size had little effect on methanol permeance and MO rejection for the laminar GO membranes within the scope of this study.

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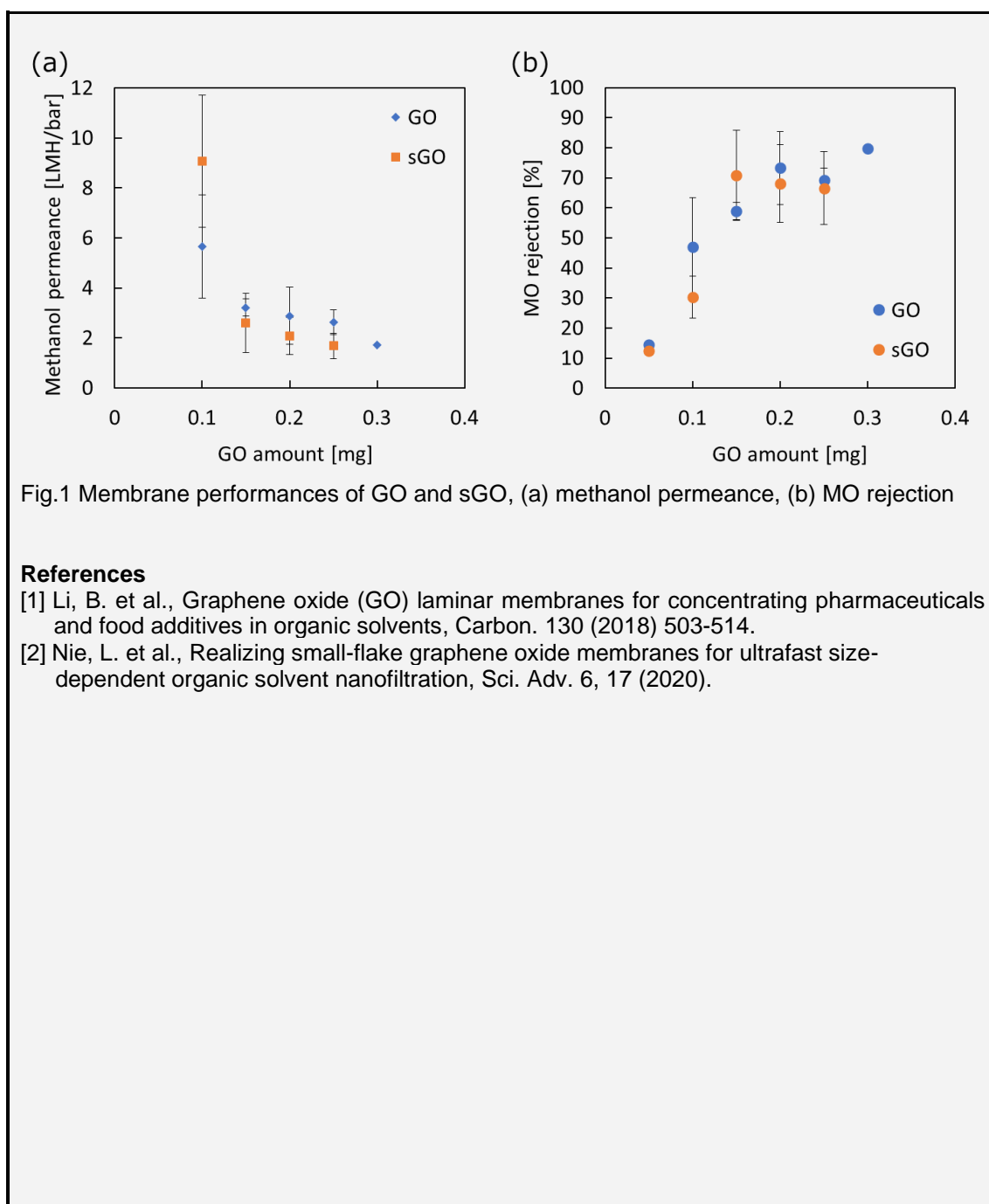


Fig.1 Membrane performances of GO and sGO, (a) methanol permeance, (b) MO rejection

References

- [1] Li, B. et al., Graphene oxide (GO) laminar membranes for concentrating pharmaceuticals and food additives in organic solvents, *Carbon*. 130 (2018) 503-514.
- [2] Nie, L. et al., Realizing small-flake graphene oxide membranes for ultrafast size-dependent organic solvent nanofiltration, *Sci. Adv.* 6, 17 (2020).