

## Electronic Supplementary Information

### Oriented Two-dimensional Zeolitic Imidazolate Framework-L

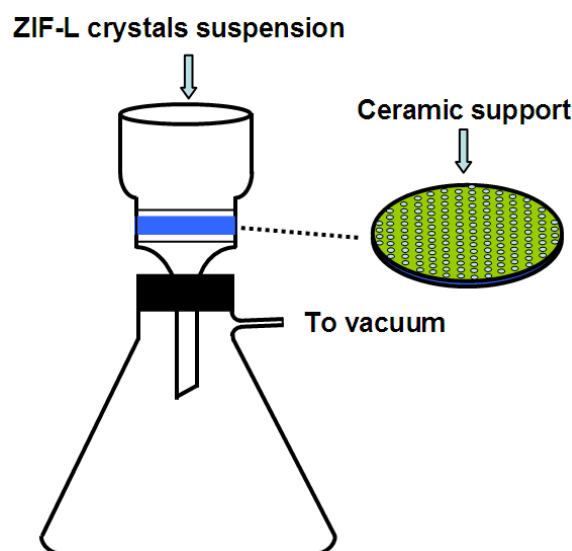
#### Membranes and their Gas Permeation Properties

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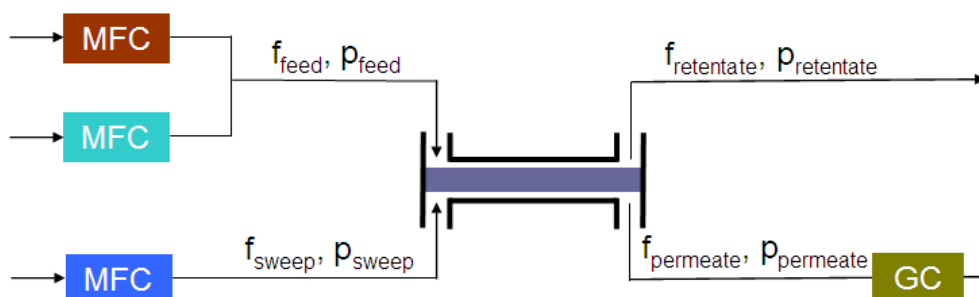
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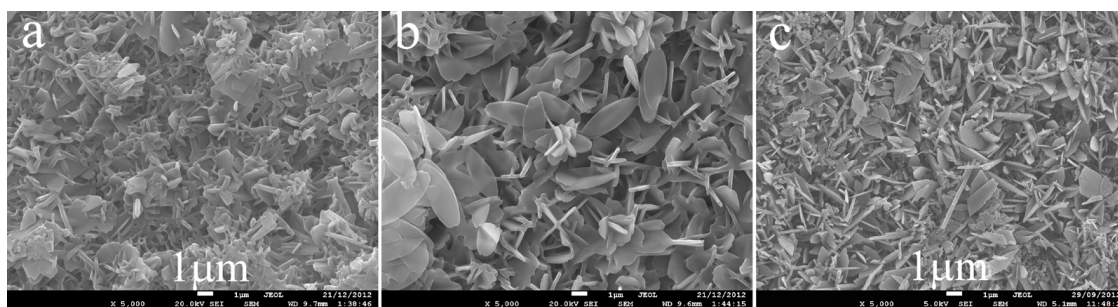
**Figure S1.** Coating of ZIF-L crystals on the membrane by vacuum filtration technique.



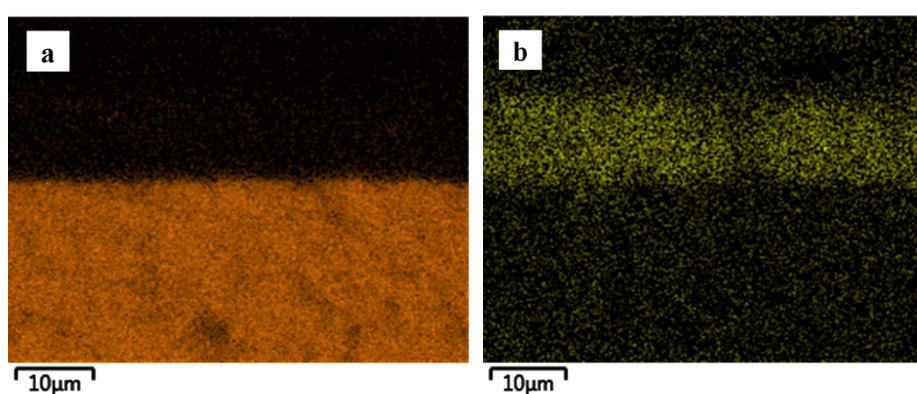
**Figure S2.** Permeation equipment for the binary gas mixture separation.

“MFC” and “GC” are mass flow controller and gas chromatography, respectively. “f” and “p” are the flow rate and pressure, respectively. During the measurements,  $P_{\text{feed}}$  was maintained at 2 bar,  $P_{\text{sweep}}$  was constant at

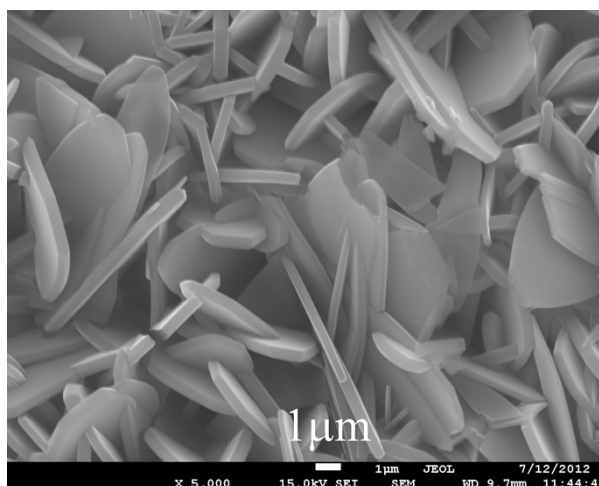
1 bar.



**Figure S3.** SEM images of ZIF-L membrane after 0.5 (a) and 1.0 h (b) secondary growth, and ZIF-L membrane prepared by in-situ growth at 30 °C for 2 h.



**Figure S4.** EDXS mapping of the ZIF-L membrane: orange Al, yellow Zn



**Figure S5.** SEM image of ZIF-L membrane after 2 h secondary growth on ZIF-L seeding support by PEI-assisted filtration-deposition.