

## Supporting information

# Contra-diffusion synthesis of ZIF-8 films on a polymer substrate

Jianfeng Yao\*, Dehua Dong, Dan Li, Li He, Gengsheng Xu, and Huanting Wang\*  
Department of Chemical Engineering, Monash University, Clayton, Vic 3800,  
Australia

Email: jianfeng.yao@monash.edu; huanting.wang@monash.edu

### Characterization

Scanning electron microscopy (SEM) images of surfaces of membranes were taken with a JSM-6300F microscope (JEOL). X-ray diffraction (XRD) patterns were measured on a Philips PW1140/90 diffractometer with Cu K $\alpha$  radiation (25 mA and 40 kV) at a scan rate of 2°/min with a step size of 0.02°. Gas separation was tested with the same method described by Li et al. (Microporous Mesoporous Mater., 2009, 126, 14-19). The nylon membrane samples were firstly attached to a porous stainless steel stand (pore size: ~ 200 nm), which was then fixed in a sample holder by using Torr Seal epoxy resin (Varian). Before measurements, the samples were dried at 100 °C for 2 h to remove entrapped methanol in ZIF-8. The gas permeation tests were performed at 20 °C on pure H<sub>2</sub> and pure N<sub>2</sub>. The pressure rise of the permeate stream was measured with a Series 901 Transducer (MKS).

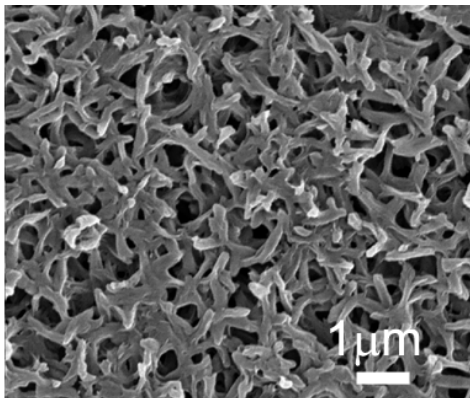


Figure S1. SEM image of the surface of the nylon membrane. The pore size and thickness of the nylon membrane: 0.1 μm and 80 μm.

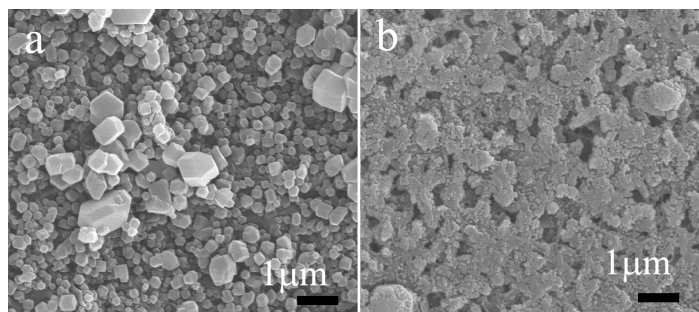


Figure S2. SEM images of ZIF-8 films prepared on the nylon membrane at room temperature for 120 h. (a) unhomogeneous ZIF-8 crystals with sizes of 100-1000 nm on the zinc nitrate side; (b) ZIF-8 film composed of nanocrystals on the Hmim solution side.

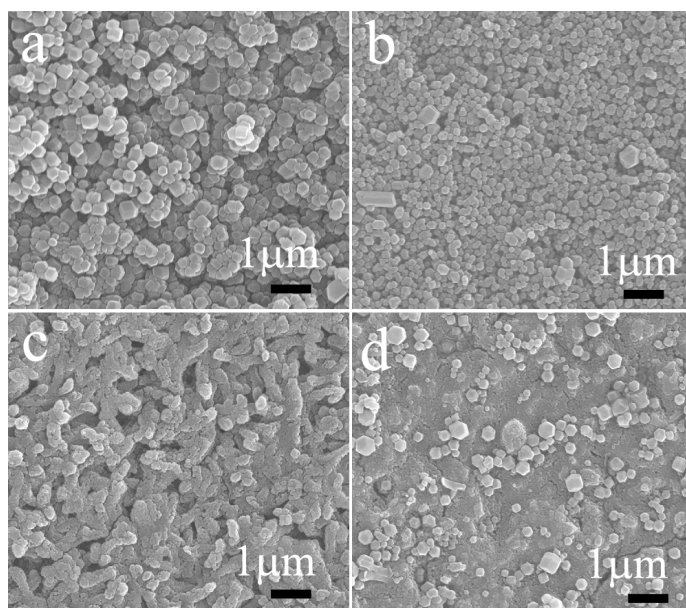


Figure S3 SEM images of ZIF-8 films prepared with twice 24 h crystallization at room temperature. Same fresh solutions in the second cycle (S24R, a, c), the fresh solutions swapped in the second cycle (S24RE, b, d). Zinc nitrate side (a, b) and Hmim side (c,d).

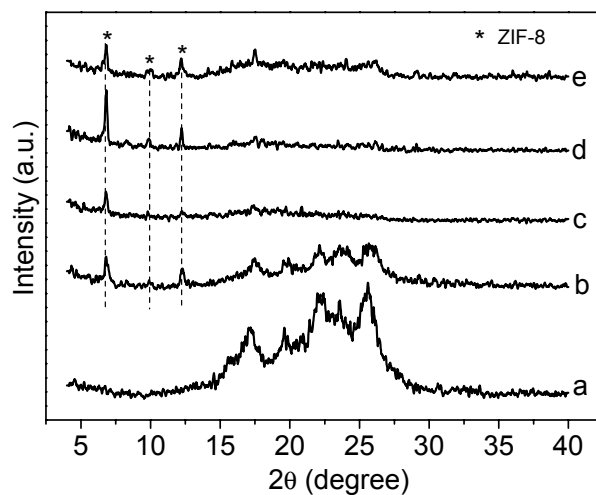


Figure S4. XRD Patterns of clear nylon membrane (a) and ZIF-8 films prepared with different designed Hmim/Zn<sup>2+</sup> molar ratio of 4 (b, c) and 16 (d, e). Zinc nitrate side (b, d) and Hmim side (c, e).

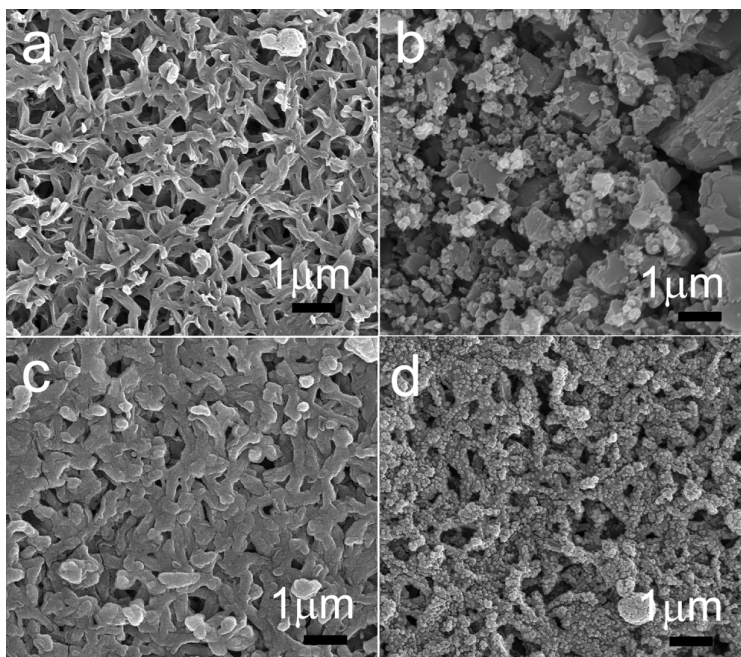


Figure S5. SEM images of ZIF-8 films prepared with different designed Hmim/Zn<sup>2+</sup> molar ratio of 4 (a, c) and 16 (b, d). Zinc nitrate side (a, b) and Hmim side (b, d).