

Supplementary Information

Room temperature synthesis of ZIF-8 membranes from seeds anchored in gelatin films for gas separation

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1. FTIR spectra of the pure gelatin and GA-cross-linked gelatin

Fig. S1, the FTIR of gelatin before and after cross-linking shows a new peak at 2359 cm^{-1} is observed from the GA cross-linked gelatin, which arises from the C-H bond in the C_3H_6 alkene generated by the cross-link reaction between gelatin chains with GA similar as we reported elsewhere.¹

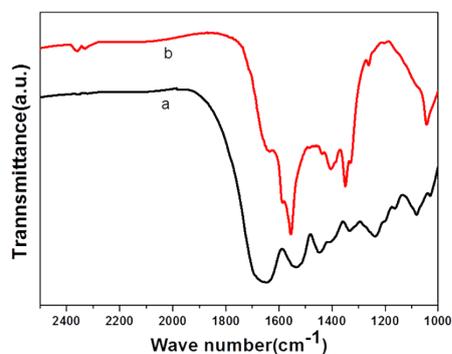


Figure S1. The FTIR spectra of (a) pure gelatin; (b) GA cross-linked gelatin/Zn(OH)₂ film.

2. SEM image of ZIF-8 seeds directly on gelatin films and the ZIF-8 thin films after secondary growth

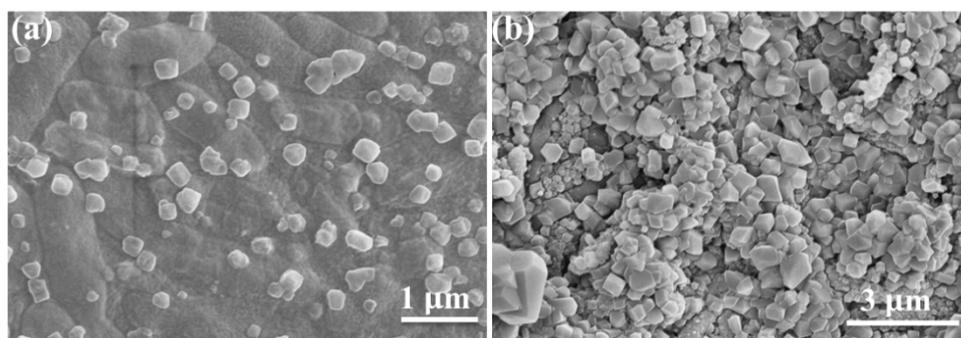


Figure S2. SEM images of (a) surface of ZIF-8 seeds directly on gelatin films, (b) ZIF-8 membrane after secondary growth using seeds (a).

3. SEM images of the ZIF-8/gelatin membrane after secondary growth using seeds converted from 0.2 mL gelatin solution (0.1 wt%) with 10 mL ZHNs

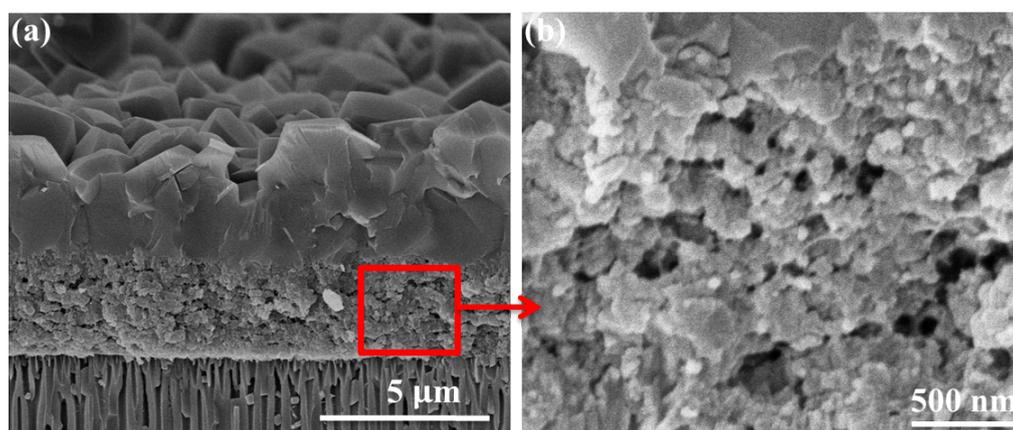


Figure S3. SEM images of (a) cross section of ZIF-8/gelatin membrane after secondary growth using seeds converted from 0.2 mL gelatin solution (0.1 wt%) with 10 mL ZHNs; (b) the higher magnification zoomed from the marked area in (a).

4. SEM images of ZIF-8 membrane after sonication

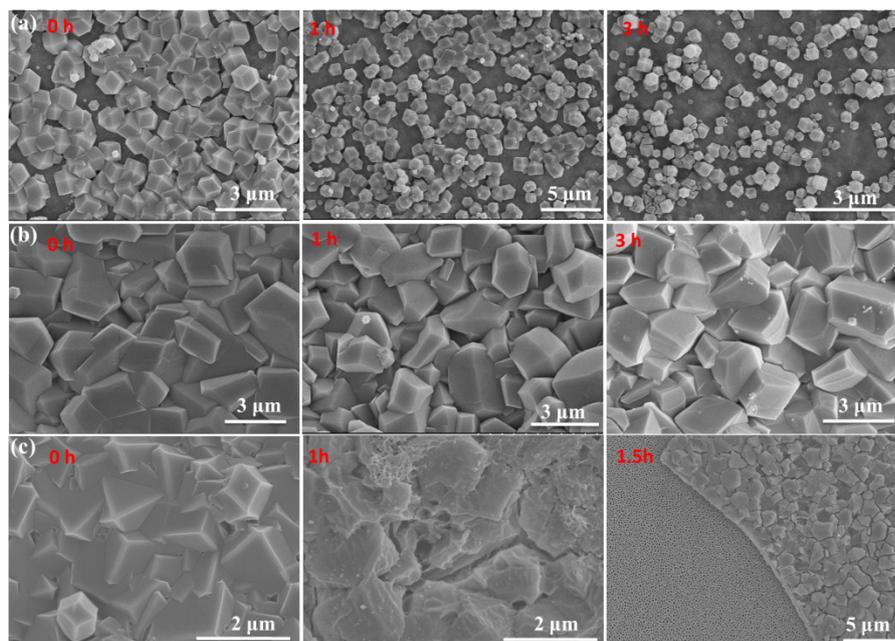


Figure S4: SEM images of surface of (a) ZIF-8 seeds converted from 0.2 ml gelatin solution (0.1 wt%) with 10ml ZHNs after sonication at 150 W for 1h, 3h; (b) ZIF-8 membrane after secondary growth using seeds (a) after sonication at 150 W for 1h,3h. (c) ZIF-8 membrane after secondary growth using seeds converted from 10mL pure ZHNs after sonication at 150 W for 1 h, 1.5 h.

5. ZIF-8/gelatin composite membrane on PTFE porous support after secondary growth using seeds converted from ZHNs/gelatin

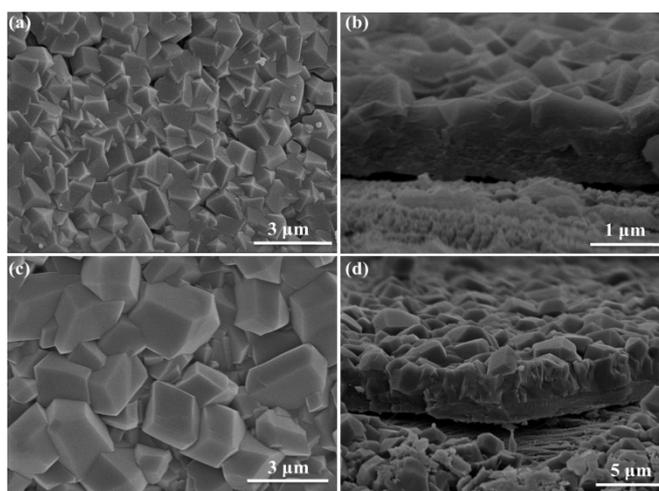


Figure S5: SEM images of (a) surface and (b) cross section of ZIF-8/gelatin seeds prepared by using 0.2 mL gelatin solution (0.1 wt%) with 10mL ZHNs on PTFE; (c) surface and (d) cross section of ZIF-8/gelatin composite membrane after secondary growth using seeds (a) and (b) on PTFE.

6. Pressure dependence and durability of the prepared ZIF-8/gelatin membranes

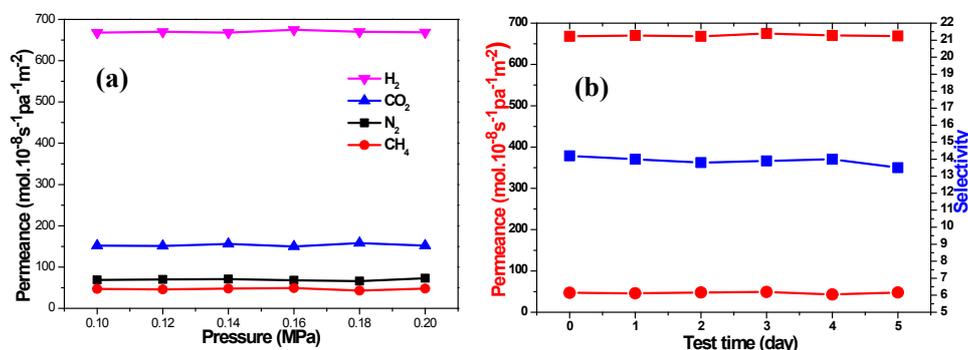


Figure S6. (a) Gas permeance through the prepared ZIF-8 membrane converted from 0.2 mL gelatin with 10 mL ZHNs after secondary growth under different pressures; (b) Time dependence of H₂ permeability (■), CH₄ (●), H₂/CH₄ separation factors (■) through ZIF-8 membrane converted from 0.2 mL gelatin with 10 mL ZHNs after secondary growth.

7. Gas separation performance of various ZIF-8 membranes

Table S1: Summary of various ZIF-8 membranes for gas separation

MOF	Support	Preparation			Performance		Ref	
		Synthesis method	T/°C	Solvent	Thickness (μm)	Permeance (H ₂) mol.10 ⁻⁸ s ⁻¹ pa ⁻¹ m ⁻²		Selectivity H ₂ /CH ₄
ZIF-8	polysulfone	Direct synthesis	90	Methanol	10	20±4	10.52±0.6	3
ZIF-8	Alumina	Direct synthesis	25	Methanol	25	24	13	4
ZIF-8	YSZ fibers	Seeded growth	25	Water	2	154	13	5
ZIF-8	Alumina	Seeded growth	23	Water	2.5	36	4.5	6
ZIF-8	Alumina	Pre-deposition synthesis	100	Methanol	15	34	8.2	7
ZIF-8	Alumina/PT FE	Seeded growth	25	Water	2	768	14.2	This work

Reference:

1. L. Shi, Q. Yu, Y. Y. Mao, H. B. Huang, H.W. Huang, Z. Z. Ye and X. S. Peng, *J. Mater. Chem. A*, 2013, **1**, 1899.