Supplementary Information

of

Propylene-Selective Thin Zeolitic Imidazolate Framework Membranes on Ceramic Tubes by Microwave Seeding and Solvothermal Secondary Growth

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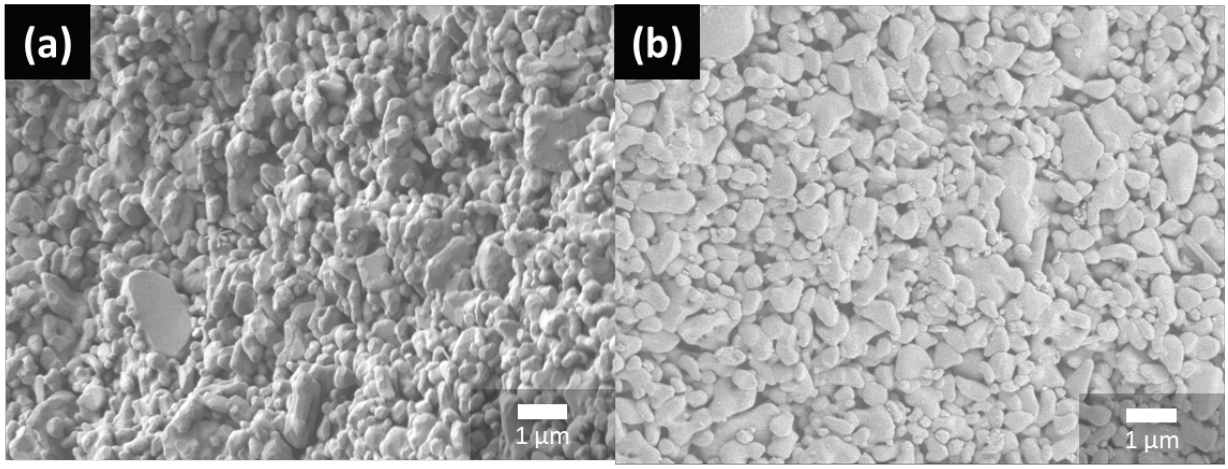

Figure S1. Top-view SEM images of pristine tubular support on its inner side (a) and outer side (b).

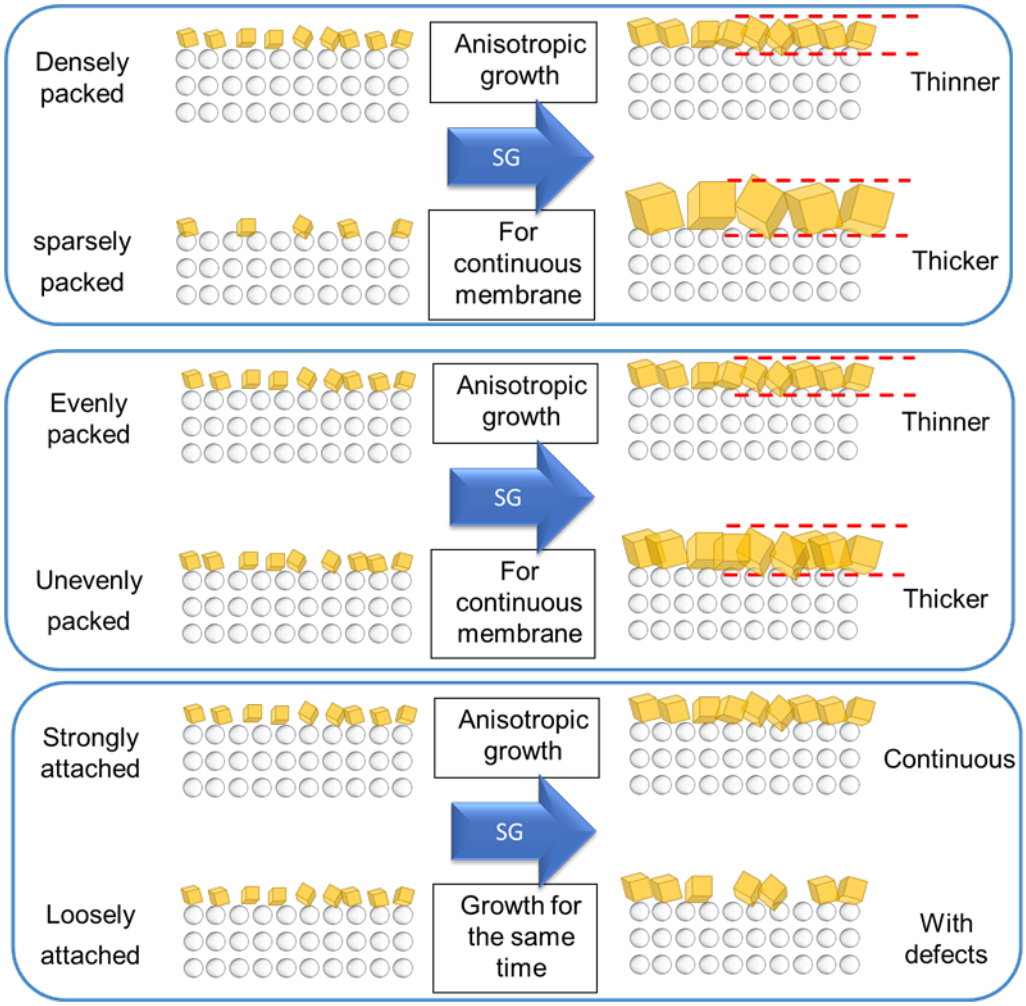

Figure S2. Schematic illustrations on common reasons for a low-quality seeding layer.

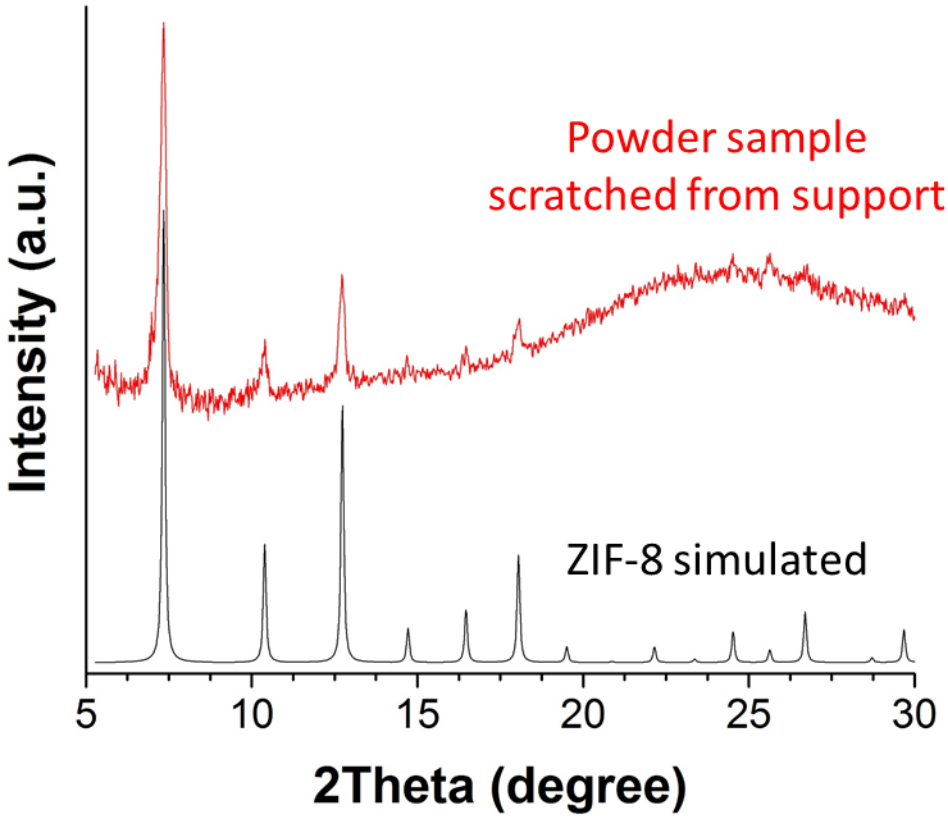

Figure S3. PXRD pattern of powder sample scratched from the inner surface of the tubular membrane and the simulated pattern.

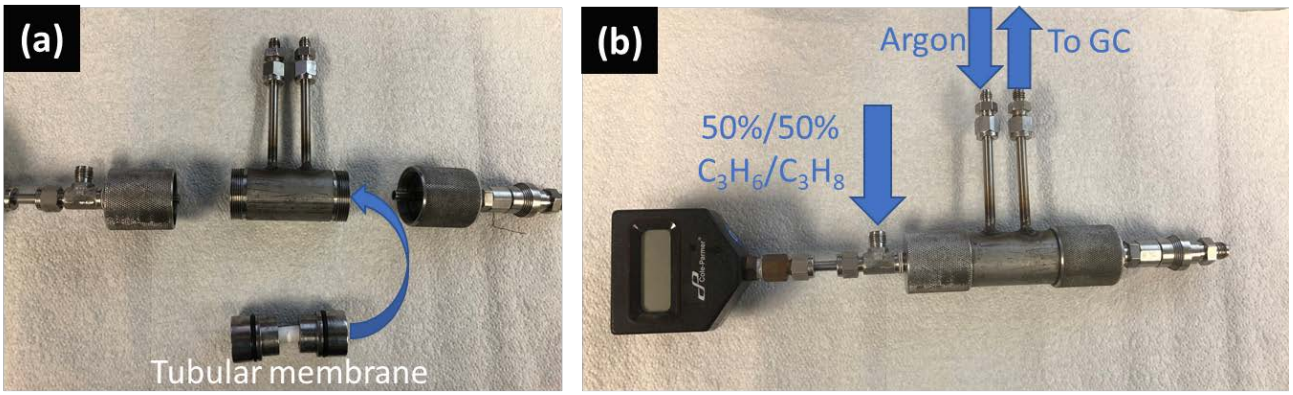

Figure S4. Optical images of loading tubular membranes into the test module (a) and a schematic illustration of its gas connections (b).

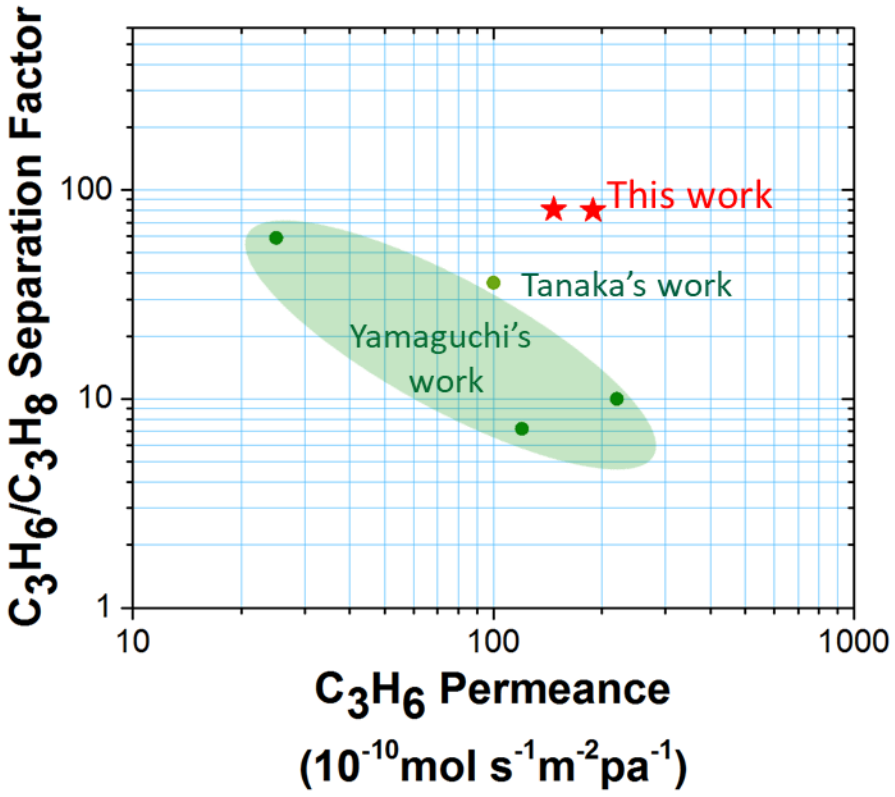

Figure S5. Permeance and separation factors of propylene/propane separation for ZIF-8 membrane on ceramic tubular supports.

Table S1. Typical ZIF-8 tubular membranes targeting propylene/propane separation.

Year	PI	Permeance of propylene (× 10^{-10}mol $s^{-1}Pa^{-1}m^{-2}$)	Permeability Barrer	SF	Thickness (μm)	Membrane Position	Method	Reference
2014	Sankar Nair	135	355	12	8.8	Internal	Interfacial fluidic processing	[1]
2015		220	460	65	7	Internal	Interfacial fluidic processing	[2]
2015		150	355	180	8	Internal	Interfacial fluidic	[3]
2014	Takeo Yamaguchi	25	597	59	80	External	Counter-diffusion	[4]
2014		220	2628	10	40	External	Counter-diffusion with interface control by two immisible solvents	[5]
2014		120	1075	7.2	30	External	Counter-diffusion with interface control by two immisible solvents	[6]
2017	**Shunsuke Tanaka**	**100**	**30**	**36**	**1**	**Internal**	**Surface Modification with APTES**	**[7]**

Table S2. ZIF-8 membrane on new (unrecycled) tubes.

	Synthesis conditions	Selectivity Propylene/propane	Permeance of propylene ($\times 10^{-10}$mol s^{-1}Pa^{-1}m^{-2})
ZIF-8 membrane on new tubular support	**30°C, 5 day**	**52**	**194.32**

Reference

1. Brown, A.J.; Brunelli, N.A.; Eum, K.; Rashidi, F.; Johnson, J.; Koros, W.J.; Jones, C.W.; Nair, S. Interfacial microfluidic processing of metal-organic framework hollow fiber membranes. *Science* **2014**, *345*, 72-75.
2. Eum, K.; Rownaghi, A.; Choi, D.; Bhave, R.R.; Jones, C.W.; Nair, S. Fluidic processing of high‐performance zif‐8 membranes on polymeric hollow fibers: Mechanistic insights and microstructure control. *Adv. Funct. Mater.* **2016**, *26*, 5011-5018.
3. Eum, K.; Ma, C.; Rownaghi, A.; Jones, C.W.; Nair, S. Zif-8 membranes via interfacial microfluidic processing in polymeric hollow fibers: Efficient propylene separation at elevated pressures. *ACS Appl. Mater. Interfaces* **2016**, *8*, 25337-25342.
4. Hara, N.; Yoshimune, M.; Negishi, H.; Haraya, K.; Hara, S.; Yamaguchi, T. Diffusive separation of propylene/propane with zif-8 membranes. *J. Membr. Sci.* **2014**, *450*, 215-223.
5. Hara, N.; Yoshimune, M.; Negishi, H.; Haraya, K.; Hara, S.; Yamaguchi, T. Effect of temperature on synthesis of zif-8 membranes for propylene/propane separation by counter diffusion method. *J. Jpn. Pet. Inst.* **2015**, *58*, 237-244.
6. Hara, N.; Yoshimune, M.; Negishi, H.; Haraya, K.; Hara, S.; Yamaguchi, T. Zif-8 membranes prepared at miscible and immiscible liquid–liquid interfaces. *Microporous and Mesoporous Materials* **2015**, *206*, 75-80.
7. Tanaka, S.; Okubo, K.; Kida, K.; Sugita, M.; Takewaki, T. Grain size control of zif-8 membranes by seeding-free aqueous synthesis and their performances in propylene/propane separation. *Journal of Membrane Science* **2017**, *544*, 306-311.