Supporting Information:

3D Printed MOF-based Mixed Matrix Thin-Film Composite Membranes

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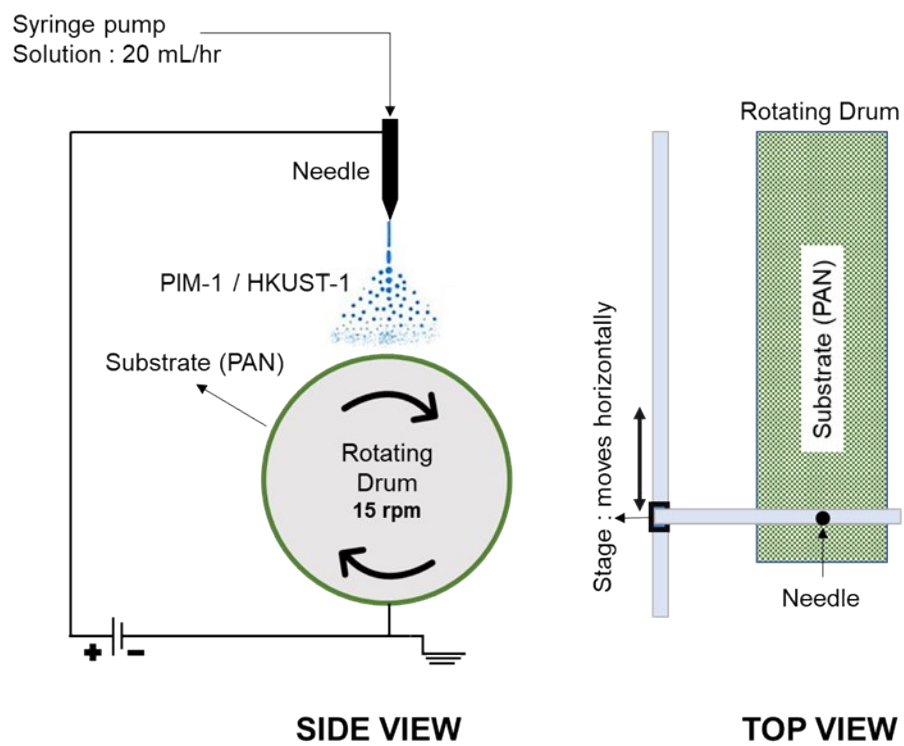
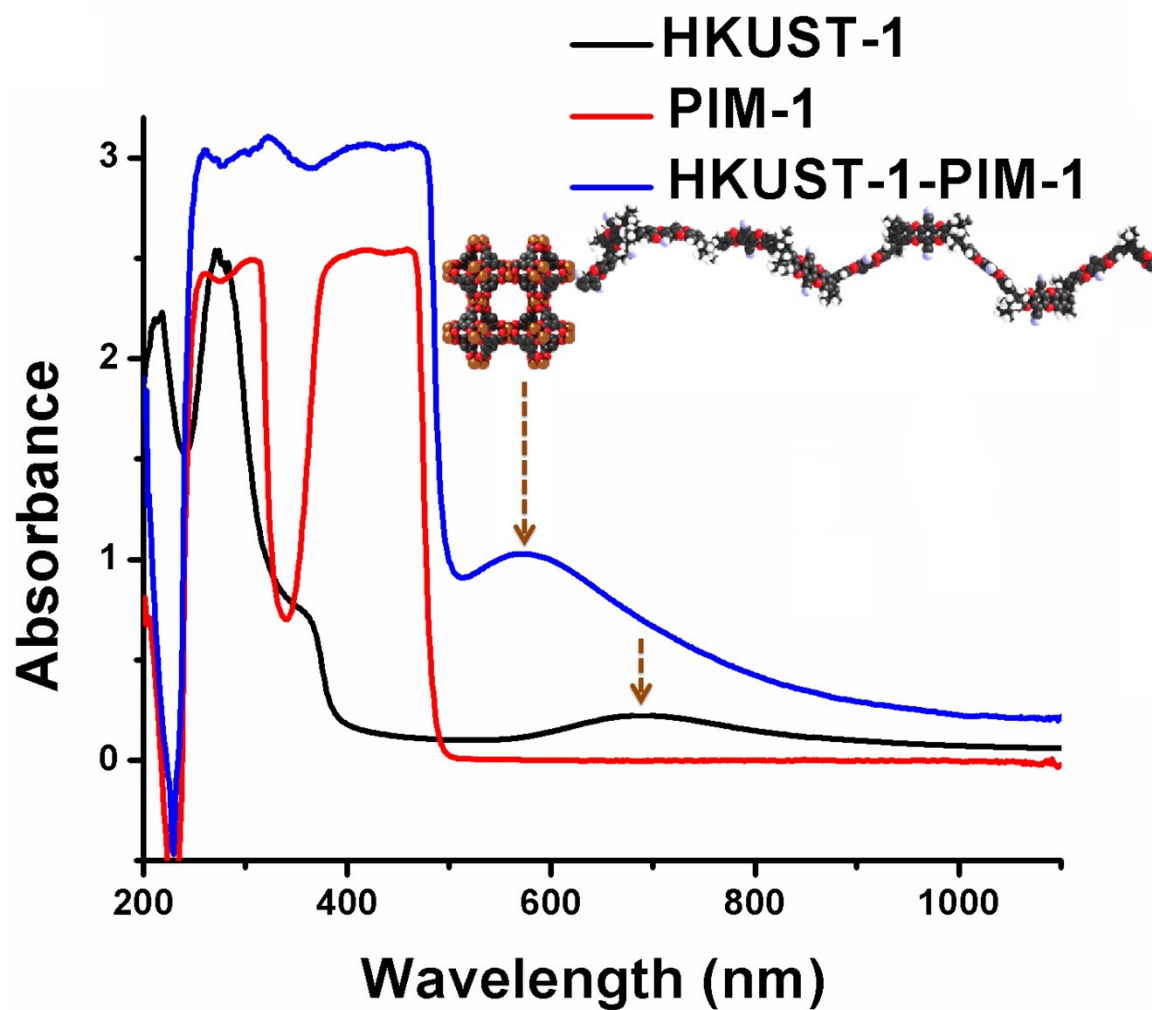**Figure S1** : Schematic of the electrospray system.

Figure S2: UV-VIS absorption spectra of HKUST-1-PIM-1 mixture in chloroform compared with the individual ingredients: PIM-1 and HKUST-1.
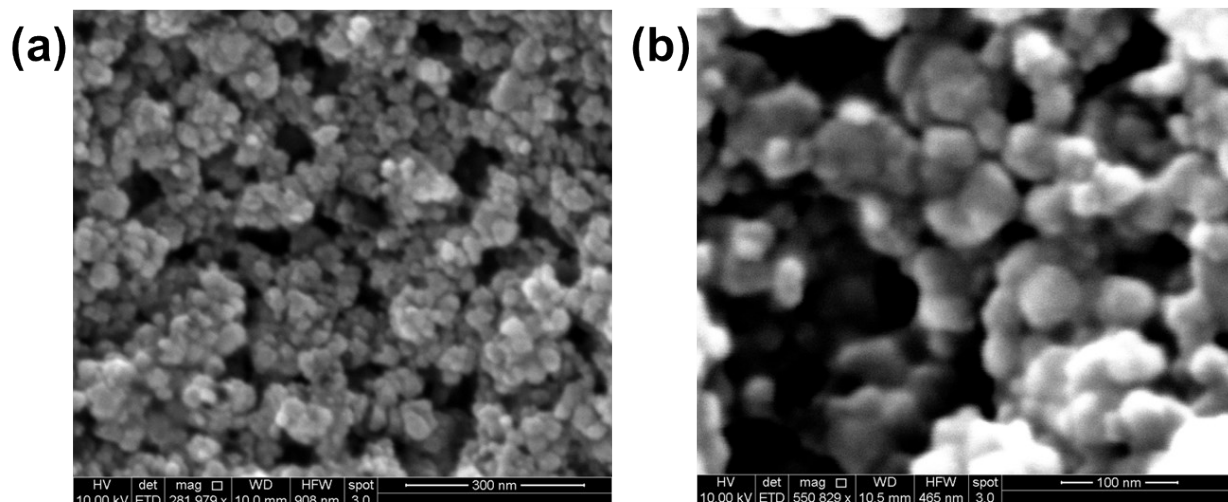
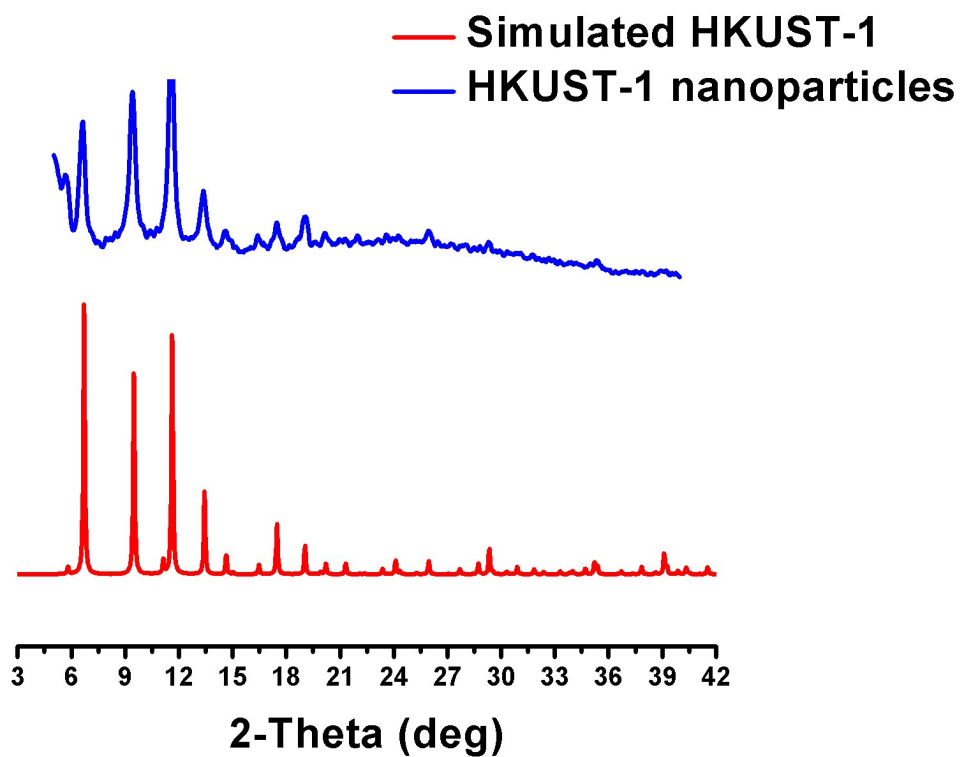**Figure S3:** SEM images for HKUST-1 nanoparticles at different magnifications (a) 300nm, and (b) 100 nm.

Figure S4: PXRD patterns for HKUST-1 nanoparticles compared to the simulated HKUST-1 from the single crystal structure.
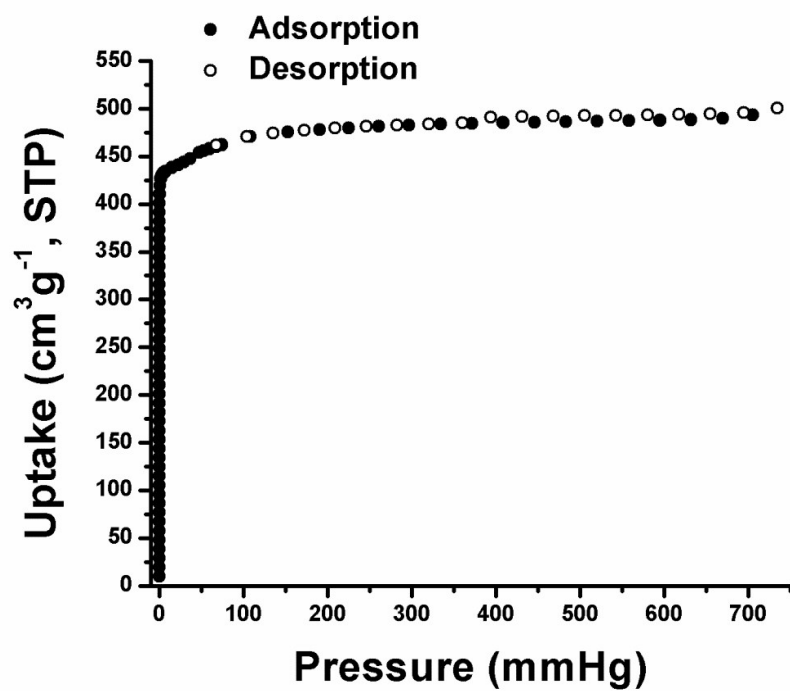
Figure S5: N_2 sorption isotherm of HKUST-1 nanoparticles collected at 77 K (BET=1869 m^2/g).
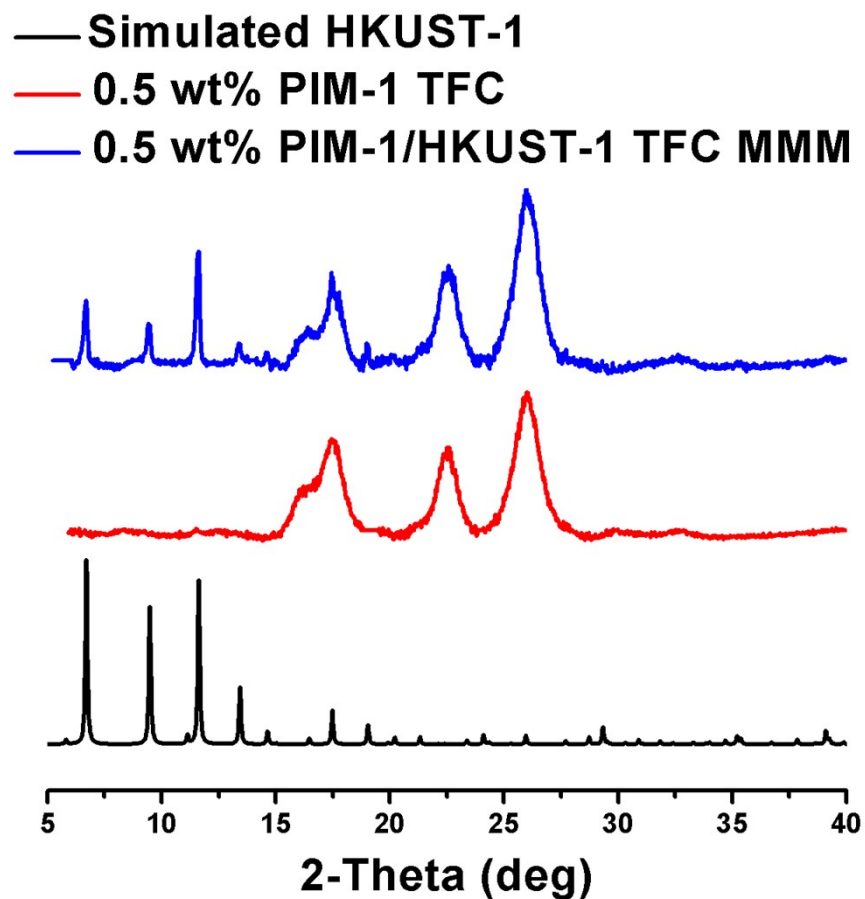
Figure S6: PXRD patterns for 0.5 wt% PIM-1, and 0.5 wt% PIM-1/HKUST-1 TFCs compared to the simulated HKUST-1 from the single crystal structure.
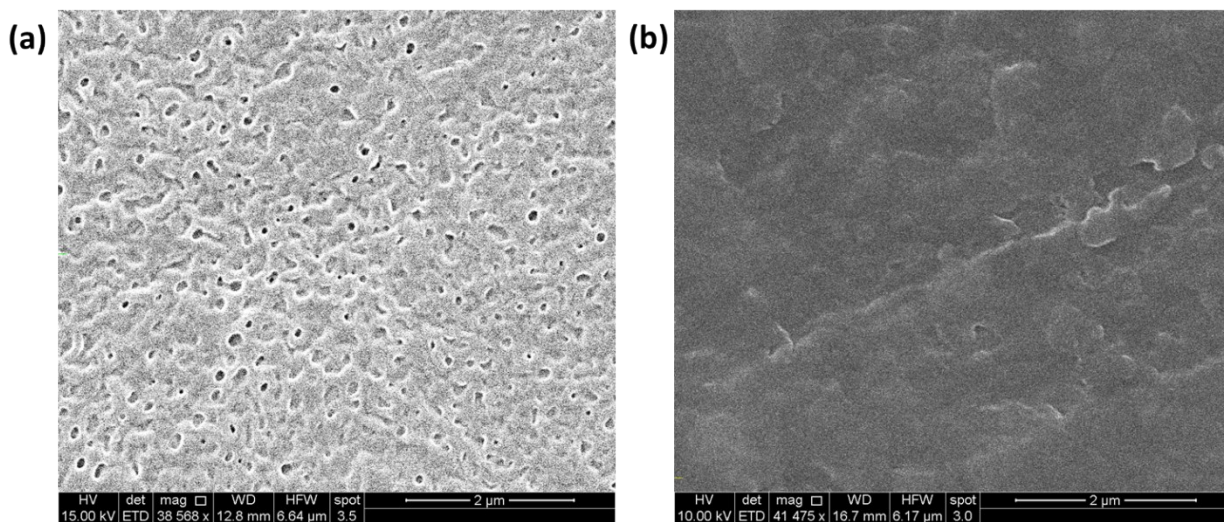

Figure S7: SEM surface images of the fabricated PIM-1 TFC membrane of composition of (a) 0.1 wt% and (b) 0.5 wt%.
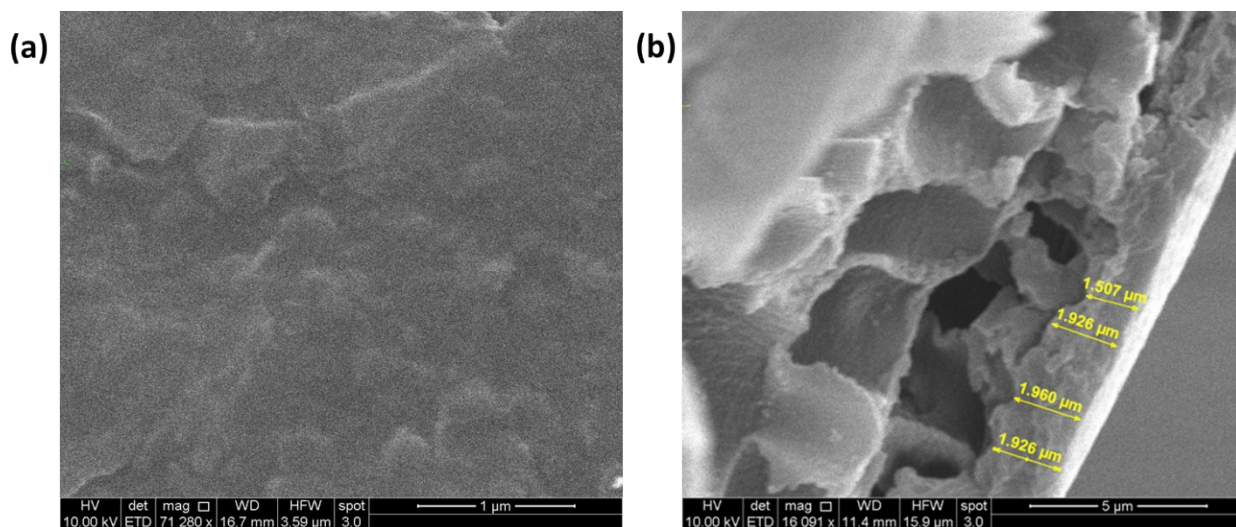
Figure S8: SEM images of the fabricated PIM-1 TFC membrane (2 cycles) of composition of 0.5 wt% (a) surface image and (b) cross-sectional image.
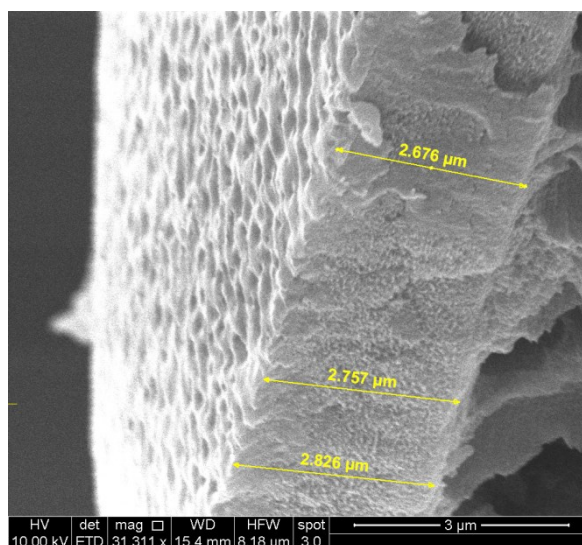

Figure S9: Cross-sectional SEM image of the fabricated PIM-1 TFC membrane (5 cycles) of composition of 0.5 wt%.
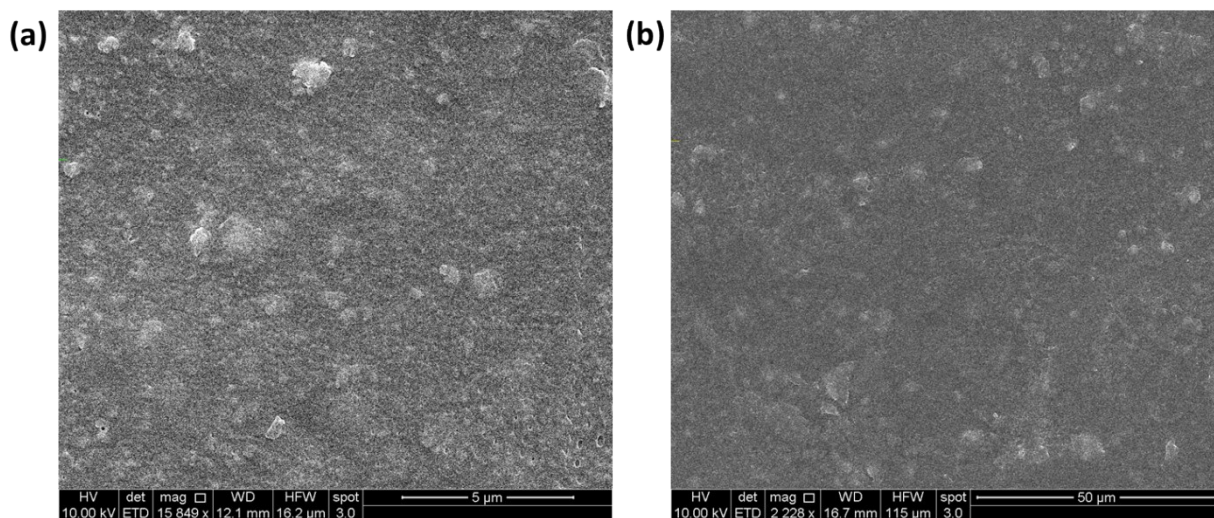
Figure S10: SEM surface images of the fabricated TFC MMM of composition of 0.5 wt% (a) 5 μm and (b) 50 μm.
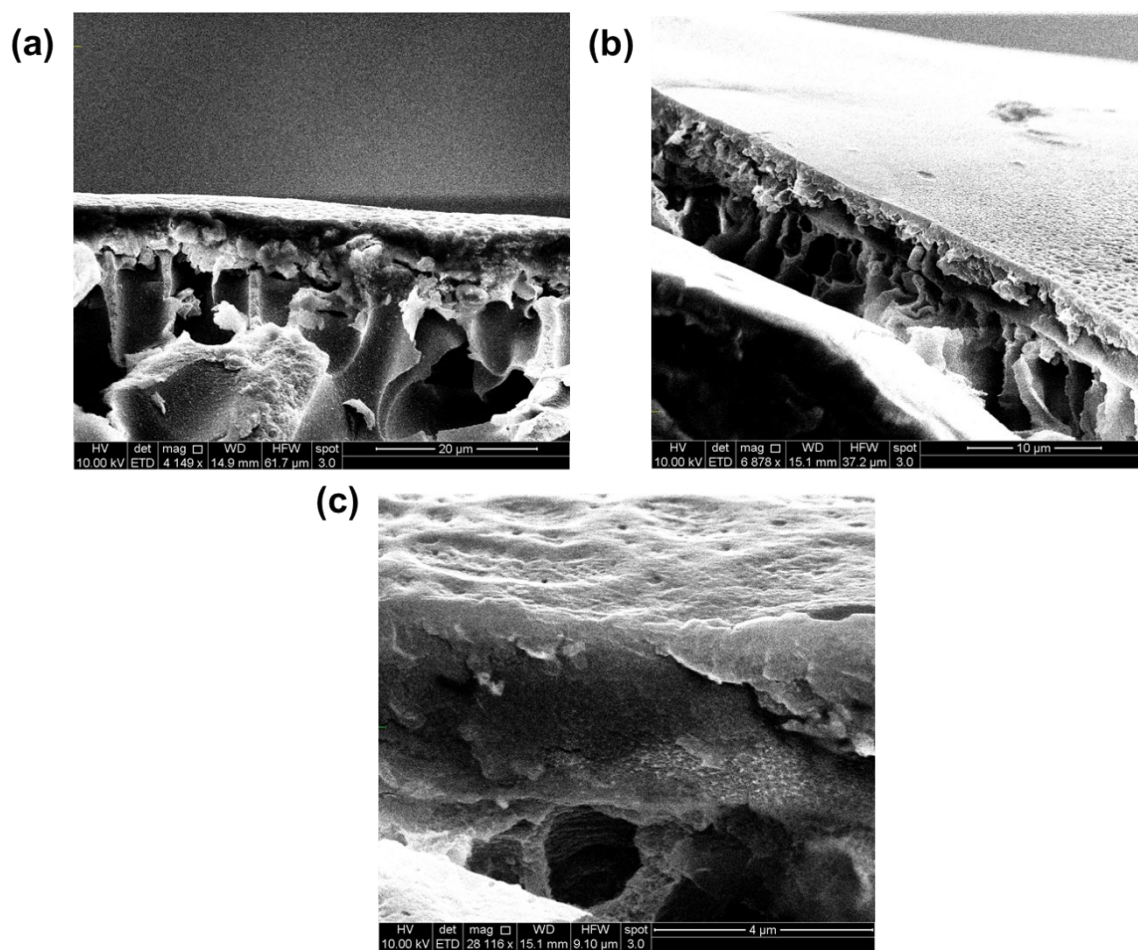

Figure S11: Cross-sectional SEM surface images of the fabricated TFC MMM of composition of 0.5 wt% (a) 20 μm, (b) 10 μm, and (c) 4 μm.

Table S1: Summary of the gas transport properties of the 3D printed TFC membranes (B# denotes to the batch number).

Sample	Thickness (µm)	wt%	Number of cycles	CO2 Permeance (GPU)	N2 Permeance (GPU)	CO_2/ N_2 Selectivity
PIM-1	0.39	0.1	5	147	57	2.6
PIM-1/ HKUST-1	0.5	0.1	5	305	153	2
PIM-1 (B#1)	1.8	0.5	2	271	21	13
PIM-1 (B#2)	2.75	0.5	5	159	13	12
PIM-1/ HKUST-1 (B#1)	2.85	0.5	5	721	103	7.0
PIM-1/ HKUST-1 (B#2)	2.85	0.5	5	638	116	5.5
PIM1-HKUST-1 (B#3)	2.65	0.5	5	730	107	6.8