Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting Information

Next-generation carbon molecular sieve membranes derived from polyimides and polymers of intrinsic microporosity for key energy intensive gas separations and carbon capture

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Table S1. CO_2 separation performance of PI- and PIM-derived CMS membranes.

Precursors	Pyrolysis Temperature (°C)	P_{CO_2} (Barrer)	α_{CO_2/CH_4}(-)	α_{CO_2/N_2}(-)	α_{CO_2/H_2}(-)	Ref
P84	550	1808	22.0	-	-	1
P84	650	738	37.0	-	-	1
P84	800	499	89.0	-	-	1
Matrimid	800	611	61.0	20.0	-	2
Matrimid-EtOH	800	191	169.0	30.0	-	2
P84-EtOH	800	278	139.0	31.0	-	2
Matrimid	500	871	18.0	-	-	3
Br-Matrimid	500	2900	25.0	-	-	3
6FDA-DAM	550	3465	21.1	-	-	4
Br-6FDA-DAM	550	5887	27.0	-	-	4
Br-6FDA-DAM	550 (heat-treating at 350 °C for 10 h)	11169	26.5	-	-	4
Br-6FDA-DAM	800 (heat-treating at 350 °C for 10 h)	1119	41.2	-	-	4
Matrimid	550	1246	65.0	-	-	5
Matrimid	800	66	209.0	-	-	5
6FDA/BPDA-DAM	550	4864	54.0	-	-	5
6FDA/BPDA-DAM	800	94	122.0	-	-	5
6FDA/BPDA-DMB	550	1936	23.5	-	-	6
6FDA/BPDA-TCDB	550	6031	46.2	-	-	6
6FDA/BPDA-TFDB	550	14938	20.3	-	-	6

6FDA/DETDA	550	2779	46.3	-	-	7
6FDA: BPDA/DETDA	550	4663	24.0	-	-	7
6FDA/DETDA: DABA	550	21740	30.1	-	-	7
6FDA/1,5-ND: ODA	550	6243	45.1	-	-	7
6FDA/DETDA: DABA	550 (aged 2 days)	12043	29.0	-	-	8
6FDA/DETDA: DABA	550 (aged 30 days)	11071	32.0	-	-	8
6FDA: BPDA-DAM	550 (3.4 bar)	331[a]	-	-	-	9
6FDA: BPDA-DAM	550 (6.9 bar)	269[a]	49.6	-	-	9
6FDA: BPDA-DAM	550 (34.4 bar)	215[a]	23.3	-	-	9
6FDA: BPDA-DAM (1:1)	675	1100	66.0	-	-	10
6FDA: BPDA-DAM (2:1)	675	2800	77.0	-	-	10
6FDA-mPDA: DABA	550	14750	52.0			11
6FDA-mPDA: DABA	800	2610	118.0	-	-	11
6FDA-6FpDA: DABA-50	576	2609	45.6	-	-	12
6FDA-6FpDA:DABA-50-Zn	576	2284	55.1	-	-	12
6FDA-6FpDA:DABA-75	576	3573	51.5			12
6FDA-6FpDA:DABA-75-Zn	576	1396	76.3	-	-	12
6FDA :sBPDA/DAM	800	2649	83.0	-	-	13
6FDA:sBPDA: aBPDA/DAM	800	4001	65.0	-	-	13
6FDA: BPDA-DAM	550	267[a]	34.2	-	-	14

6FDA: BPDA-DAM	550 (N_2-aged)	206[a]	42.2	-	-	14
SBFDA-DMN	800	105	113.0			15
SBFDA-DMN	900	60	222.0	-	-	15
SBFDA-DMN	1000	30	1475.0	-	-	15
Al_2O_3- SBFDA-DMN	500	907[a]	30.3	-	-	16
Al_2O_3- SBFDA-DMN	600	813[a]	35.3			16
Al_2O_3- SBFDA-DMN	700	228[a]	53.0	-	-	16
Al_2O_3- SBFDA-DMN	800	58[a]	124.0	-	-	16
PIM-6FDA-OH	800	471	59.0	-	-	17
PIM-6FDA-OH	600 (440 °C TR)	5040	38.0	-	-	18
PIM-6FDA-OH	800 (440 °C TR)	556	93.0	-	-	18
TB-TBDA-6FDA	550	16050	34.0	21.0	-	19
TB-TBDA-6FDA	650	4200	62.0.	36.0	-	19
TB-TBDA-6FDA	800	1406	112.0	37.0	-	19
6FDA-DAM: DABA/LPSQ	675	956[a]	50.2	-	-	20
6FDA: BPDA/DAM	550	7170	29.0			21
PMDA/pPDA	550	396	34.8	-	-	21
PIM-1	550	3297	52	-	-	22
PIM-1 (aged)	550	1902	70	-	-	22
40 wt/wt MOP-18/PIM-1	550	4167	19	-	-	22
40 wt/wt MOP-18/PIM-1 (aged)	550	4187	21	-	-	22
BTDA-m-PDA	600	840	-	70.0	-	23
BTDA-2,4-DAT	600	925	-	54.0	-	23

BTDA-m-TMPD	600	1017	-	48.0	-	23
2,2'-diol-1,1'-binaphthyl-6,6'-diamine-6FDA-naphthol	550	1692	-	37.6	-	24
2,2'-diol-1,1'-binaphthyl-6,6'-diamine-6FDA-acetyl	500	2189	-	33.4	-	24
6FDA-Durene/DAmDB21C7	500	6362	-	45.9	-	25
6FDA-Durene/DAmDB21C7	650	7802	-	67.8	-	25
6FDA-Durene/DAmDB21C7	800	5797	-	87.2	-	25
6FDA-TMPDA	550	6810	-	25.0	-	26
6FDA-TMPDA/azide	550	9290	-	26.0	-	26
BTDA-ODA	500	1535	-	27.0	-	27
BTDA-ODA	700	505	-	32.0	-	27
BTDA-ODA	800	176	-	44.0	-	27
BTDA-ODA/mPDA	700	829	-	35.0	-	28
BTDA-ODA/DABA-2	700	1674	-	34.0	-	28
BTDA-ODA/DABA-5	700	2863	-	34.0	-	28
PBI-Kapton	800	119	-	66.0	-	29
PBI-UIP-R	800	168	-	52.2	-	29
PBI-P84 HT	800	163	-	36.1	-	29
PEI-Matrimid®	700	40[a]	-	39.0	-	30
6FDA/ODA: DABA 5 wt.%-Fe_3O_4@ZIF-8	550	5130	-	29.0	-	31
PMDA-ODA/PAA-166	700	383	-	21.5	-	32

PMDA-ODA/PAA-65	700	315	-	34.6	-	32
6FDA/BPDA-DAM	550	107[a]	-	109.0	-	33
6FDA/BPDA-DAM/Matrimid 35 °C (dry-jet)	550	2800[a]	-	30.0	-	34
6FDA/BPDA-DAM/Matrimid -20 °C (dry-jet)	550	2440[a]	-	95.0	-	34
6FDA/BPDA-DAM/Matrimid 35 °C (wet-quench)	550	3522[a]	-	26.0	-	34
6FDA/BPDA-DAM/Matrimid -20 °C (wet-quench)	550	2987[a]	-	43.0	-	34
CTA-6FDA	550	4633	-	39.0	-	35
MTA-6FDA	550	9878	-	34.0	-	35
Triptycene-2,6-diamin-PMDA	550	2514	-	26.0	-	36
Triptycene-2,6-diamin-NBS-PMDA	550	20639	-	29.2	-	36
PIM-6FDA-OH (5.0 wt.% 1 layer)	615	1372[a]	-	28.9	-	37
PIM-6FDA-OH (7.5 wt.% 1 layer)	615	1151[a]	-	35.9	-	37
PIM-6FDA-OH (9.0 wt.% 1 layer)	615	1409[a]	-	39.5	-	37
PIM-6FDA-OH (9.0 wt.% 2 layer)	615	1147[a]	-	20.6	-	37
PIM-6FDA-OH (9.0 wt.% 3 layer)	615	692[a]	-	25.6	-	37

PABZ-6FDA-PI	550	5915	-	-	1.6[c]	38
PABZ-6FDA-PI	650	1233	-	-	3.6[c]	38
PABZ-6FDA-PI	750	200	-	-	6.5[c]	38
PABZ-6FDA-PI	850	15	-	-	13.1[c]	38
BATPPP-6FDA	550	9676	-	-	1.0[c]	39
BATPPP-6FDA	600	3764	-	-	1.9[c]	39
BATPPP-6FDA	700	849	-	-	3.9[c]	39
BATPPP-6FDA	800	349	-	-	7.5[c]	39
6FDA-DAM-Br-85%	550	9204	-	-	1.6[c]	40
6FDA-DAM-Br-85%/DOPO-p-DP-10%	550	6960	-	-	2.1[c]	40
6FDA-DAM-Br-85%/DOPO-p-DP-20%	550	3018	-	-	4.5[c]	40
PBI/Matrimid	800	37	-	-	8.9[c]	41
PBI/Torlon	800	279	-	-	3.5[c]	41
PBI/P84	800	61	-	-	5.9[c]	41
2000kGy 6FDA:BPDA-DAM	675	349[b]	-	-	80.5[c]	42
Matrimid	500	1340	-	-	4.2[c]	43
MFI/Matrimid-4	500	1054	-	-	3.3[c]	43
MFI/Matrimid-6	500	1721	-	-	3.7[c]	43
MFI/Matrimid-10	500	1539	-	-	4.0[c]	43

[a]CO_2 permeance; [b]H_2 permeability; [c]$\alpha(H_2/CO_2)$

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