**Supporting information**

**High-Performance FAU Zeolite Membranes Derived from Nano-Seeds for Gas Separation**

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Table S1 Comparison of the H2/C3H8 separation properties of FAU membranes (MA and MM) with other membranes from recent literature.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Membrane type | Temperature [°C] | H2 permeance[mol/(m2 s Pa)] | H2/C3H8 selectivity [-] | Ref. |
|
| Silica | 500 | 1.00E-07 | 98 | [1] |
| 650 | 1.60E-07 | 111 |
| Silica | 500 | 1.57E-07 | 139 |
| 650 | 2.78E-07 | 201 |
| MFI | 25 | 7.26E-08 | 0.86  | [2] |
| 100 | 9.20E-08 | 0.86  |
| 200 | 1.82E-07 | 1.21  |
| 300 | 2.06E-07 | 1.54  |
| 400 | 2.28E-07 | 2.48  |
| 450 | 2.28E-07 | 3.33  |
| 500 | 2.29E-07 | 3.99  |
| 550 | 2.36E-07 | 5.17  |
| 600 | 2.56E-07 | 6.34  |
| 650 | 2.56E-07 | 6.88  |
| SSZ-13 | 25 | 7.10E-06 | 4 | [3] |
| 25 | 3.20E-06 | 4 |
| 25 | 6.60E-08 | 520 |
| 25 | 6.00E-08 | 590 |
| 25 | 8.40E-08 | 810 |
| 25 | 3.00E-08 | 220 |
| Silica | 200 | 1.53E-08 | 4.6 | [4] |
| 200 | 1.66E-08 | 3.7 |
| 400 | 3.13E-08 | 14 |
| 400 | 3.31E-08 | 11 |
| 500 | 1.39E-07 | 92 |
| 500 | 1.43E-07 | 67 |
| NaA | 25 | 1.70E-05 | 3.95 | [5] |
| 25 | 3.61E-06 | 11.34 |
| ANA Zeolite | 25 | 1.07E-06 | 138 | [6] |
| NaA | 50 | 4.81E-07 | 7.28 | [7] |
| 100 | 3.44E-07 | 5.72 |
| 250 | 1.62E-07 | 4.82 |
| 100 | 2.06E-07 | 4.62 |
| 200 | 2.46E-07 | 4.02 |
| 300 | 4.45E-07 | 4.38 |
| SAPO-34 | 25 | 4.20E-08 | 18 | [8] |
| 25 | 4.80E-08 | 21 |
| 25 | 8.60E-08 | 18 |
| 25 | 1.12E-07 | 16 |
| 25 | 1.23E-07 | 22 |
| 25  | 4.77E-08 | 5  |
| 100  | 5.73E-08 | 7  |
| 200  | 7.16E-08 | 10  |
| 300  | 9.36E-08 | 14  |
| 400  | 1.16E-07 | 14  |
| 450  | 1.37E-07 | 16  |
| 500  | 1.52E-07 | 19  |
| 550  | 1.87E-07 | 22  |
| 600  | 2.01E-07 | 23  |
| 650  | 2.30E-07 | 27  |
| NaY | Room temperature | 5.34E-07 | 183 | This work |

Table S2. Membrane separation performance data of C3H6/C3H8

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Material | Permeability/ Barrer | Selectivity | Membrane type | Reference |
| 6FDA-TeMPD | 37 | 8.6 | Polymers | [9] |
| 6FDA-TrMPD | 30 | 11 | Polymers | [9] |
| 6FDA-DDBT | 0.76 | 27 | Polymers | [9] |
| 6FDA-ODA | 0.48 | 11 | Polymers | [9] |
| BPDA-TeMPD | 3.2 | 13 | Polymers | [9] |
| PPO | 2.9 | 9.1 | Polymers | [9] |
| P4MP | 54 | 2 | Polymers | [9] |
| 1.2PB | 260 | 1.7 | Polymers | [9] |
| PDMS | 6600 | 1.1 | Polymers | [9] |
| Matrimid® 5218 | 0.1 | 16 | Polymers | [10] |
| 6FDA-1,5-NDA | 0.24 | 5.8 | Polymers | [11] |
| 6FDA-BPDA/DDBT(1/1) | 1 | 31 | Polymers | [12] |
| PIM-PIs | 393 | 6 | Polymers | [13] |
| 6FDA-DAM | 15.7 | 12.4 | Polymers | [14] |
| sulfonylated PPO | 18.1 | 3.05 | Polymers | [15] |
| 6FDA-based PI | 0.89 | 16 | Polymers | [16] |
| PEO | 6.6 | 2.75 | Polymers | [17] |
| P84/Matrimid | 7 | 18.2 | Polymers | [17] |
| azide-PIM | 40 | 10 | Polymers | [18] |
| crosslinked PI | 4.5 | 11 | Polymers | [19] |
| Pebax 2533 | 580 | 1.6 | Polymers | [20] |
| Na-X-Ag | 420 | 50 | Zeolites | [21] |
| ETS-10 | 944 | 5.5 | Zeolites | [22] |
| Zeolite Y-Ag | 1016 | 4.8 | Zeolites | [23] |
| Na-X | 520 | 6.2 | Zeolites | [24] |
| Na-X | 428 | 13.7 | Zeolites | [25] |
| Na-X | 420 | 3.3 | Zeolites | [26] |
| NaY | 1090 | 46 | Zeolites | This Work |
| Phenolic resin carbon membrane | 90 | 17 | Carbon Membranes | [27] |
| Phenolic resin carbon membrane | 200 | 3.1 | Carbon Membranes | [28] |
| PI-based carbon membrane | 5.2 | 22 | Carbon Membranes | [29] |
| Phenolic resin carbon membrane | 19 | 5.4 | Carbon Membranes | [30] |
| Sulfonated PI-based carbon membranes | 15 | 4.2 | Carbon Membranes | [31] |
| Interpenetrating network-based carbon membrane | 48 | 44 | Carbon Membranes | [32] |
| PI-based carbon membrane | 14.4 | 36 | Carbon Membranes | [33] |
| Silicon membrane | 13.3 | 37 | Carbon Membranes | [34] |
| PI-based carbon membrane | 0.528 | 35 | Carbon Membranes | [35] |
| PIM-PI-based carbon membrane | 45 | 33 | Carbon Membranes | [36] |
| PI-based carbon membrane | 15.6 | 31 | Carbon Membranes | [37] |
| PIM-β-CD | 1500 | 5.8 | Carbon Membranes | [38] |
| PI-based carbon membrane | 240 | 30 | Carbon Membranes | [39] |
| PI-based carbon membrane | 403 | 25 | Carbon Membranes | [40] |
| 6FDA-DAM/ZIF-8 | 100 | 6.6 | Mixed Matrix Membranes | [41] |
| Ethy CA/C60 | 61.3 | 4.9 | Mixed Matrix Membranes | [42] |
| CA/SiO2 | 0.098 | 6.12 | Mixed Matrix Membranes | [43] |
| Fluorinated PI/TiO2 | 0.08 | 5.11 | Mixed Matrix Membranes | [44] |
| Matrimid/SiO2 | 0.16 | 18.03 | Mixed Matrix Membranes | [45] |
| Thermal crosslinked PI/ZIF-8 | 42.7 | 27.47 | Mixed Matrix Membranes | [46] |
| 6FDA-DAM+Y-fum- fcu-MOF | 33.4 | 18 | Mixed Matrix Membranes | [47] |
| PIM-6FDA-OH/ZIF-8 | 38 | 43 | Mixed Matrix Membranes | [48] |
| XLPEO/ZIF-8 | 28 | 15 | Mixed Matrix Membranes | [49] |
| PU/ZIF-8 | 140 | 3.5 | Mixed Matrix Membranes | [50] |
| SBS/Cu@MIL-101(Cr) | 353 | 1.9 | Mixed Matrix Membranes | [51] |
| Pebax 1657/ZIF-8 | 84 | 5.57 | Mixed Matrix Membranes | [52] |
| 6FDA-DAM/ZIF-8 | 56.2 | 31 | Mixed Matrix Membranes | [14] |
| 6FDA-DAM/ZIF-67 | 34.1 | 29.9 | Mixed Matrix Membranes | [53] |
| PIM-1/SIFSIX-3-Zn | 4012 | 7.9 | Mixed Matrix Membranes | [54] |



Figure S1. The optical photograph of an FAU (MA) membrane.

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