

Table S1. Gas permeation properties of the recently developed carbon molecular sieve membranes (data mostly from 2015).

| Polymer Temp | Form | Permeability (barrer) | | | | | | | Selectivity | | | Ref | | | |
|--|----------------------|--|----------------|----------------|---------------------|-----------------|-------------------------------|-------------------------------|---|--------------------------------|---------------------------------|---------------------|----------------------------------|--|---------|
| | | O ₂ | N ₂ | H ₂ | CO ₂ | CH ₄ | C ₂ H ₄ | C ₂ H ₆ | O ₂ /N ₂ | H ₂ /N ₂ | CO ₂ /N ₂ | | CO ₂ /CH ₄ | C ₂ H ₄ /C ₂ H ₆ | |
| PPESK * ₁ | Film | 270 * ₂ 257 * ₃ | | | | | | | 4.6 * ₄ 10.3 * ₅ | | | | | [41] | |
| PIM-6FDA-OH 803.15 K 873.15 K 1073.15 K | Film | | | | 4110 5040 556 | 206 132 6 | | | | 5.8 | 28 | 27 | 20 38 91 | 17.5 | [42,43] |
| Polyimide + ZSM-5 923.15 K | Plate supported | | 15.7 | 1475 | 325 | | | | | 94 | | 21 | | | [54] |
| Larch sawdust + F- 127+Ni (10 nm) | | 0.21 | 0.14 | | 0.07 | | | | | | | 1.5 | | | [55] |
| Matrimid 923.15 K | disk Supported | | 650 | | | | | | | | | | | | [58] |
| Matrimid 1123.15 K | Tubular Supported | | | | | | | | | | | 80 * ₆ | 87 * ₆ | | [59] |
| Matrimid 1123.15 K | Tubular Supported | | | | | | | | | | | | 87 | | [77] |
| Phenolic novolac 973.15 K | Tubular supported | 2.77 | 0.18 | | 17.5 | | | | | | | 15.4 * ₇ | 97 * ₇ | | [60] |
| Phenolic novolac 773.15 K 823.15 K | Tubular | 101.6 35.8 | 14.4 2.4 | 1673 1732 | | | | | 7.1 15 | 117 725 | | | | | [51] |
| PEI 873.15 K | Disk supported | 17 | 1.9 | 601 | 72.9 | | | | 8.9 | 316 | 38 | 88 | | | [76] |

*₁ PPESK = poly (phthalazinone ether sulfone ketone). *₂ CM-fd- 1023.15 K = Carbon membrane freeze-drying and carbonized at 1023.15 K, Single gas. *₃ CM-fd-1023.15 K = Carbon membrane freeze-drying and carbonized at 1023.15 K, Mix gas (O₂/N₂). *₄ CM-rd-923.15 K = Carbon membrane refrigerate-drying and carbonized at 923.15 K. *₅ CM-rd-1123.15 K = Carbon membrane refrigerate-drying and carbonized at 1123.15 K. *₆ Carbonization under Ar. *₇ S20_20_20 = carbon membrane coated on stainless steel tube and carbonized 3 times with 20 cP polymer solution.