Electronic Supplementary Material (ESI) for Materials Advances.

Supplementary Information

Bimetallic PdPt alloy nanoparticles decorated track-etched polyethylene terephthalate membrane for efficient H_2 separation

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Table S1. *Raman peaks of PET membranes and their corresponding bond assignments.*

Peaks (cm^{-1})	Corresponding bonds
277	C-C stretching (aromatic), CCC bending (aromatic)
628	CCC in-plane bending
796	CH out of plane bending (aromatic)
854	C−C stretching (ring breathing), C−O stretching
1093	C–O–C anti-symmetric stretching vibration
1112	CH in-plane bending (aromatic), C−O stretching
1181	CH in-plane bending (aromatic)
1290	C–C stretching (aromatic), C−O stretching
1414	C–C stretching (aromatic)
1459	CH deformation
1612	C=C stretching (aromatic)
1727	C=O stretching
2965	Methylene groups adjacent to O- atom
3081	Aromatic C-H bonds

Table S2. *Table representing the data from the previously reported literature used for the comparison in Robeson upper bound plot.*

Membrane material	Nature of membrane	H_2 gas permeability	H_2/CO_2	H_2/N_2	Ref.
Conventional polymer					
PDMS/Matrimid-5218	Surface coating	7149038	2.53	-	[1]
Silica NPs/polysulfone	MMM	32.3	1.64	28.8	[2]
PBI	Self-supported	26000	27	-	[3]
LiCl/PVDF	MMM	2.6E6	4.8	3.73	[4]
Conjugate polymer					
PANI/PBI	MMM	3.79	3.6	306	[5]
PANI/PBI	MMM	5.5	15.41	340	[6]
Polymer blending					
Polysiloxane/PVA	MMM	8400	1/118	-	[7]
PSF/PC	MMM	25.11	1.17	-	[8]
COOH functionalized polyimide/PIM-1	MMM	1245	-	128.9	[9]
PEBAX/PVA	MMM	2.63	1/7.6	-	[10]
Functionalized polymer membranes					
Titanium implanted PC	Surface coated	3413	4.72	-	[11]
COOH functionalized PET	Track etched	56029	2.36	-	[12]
Amine functionalized PET	Track etched	222000	4.28	4.27	[12]
UV functionalized PC	Track etched	49000	3.92	3.43	[13]
Polymer crosslinking					
6-FDA durene with BuDA	Self-supported	359	2.9	48.2	[14]
Matrimid with BuDA	Self-supported	245	23	273	[14]
6-FDA durene with EDA vapors	Self-supported	32.6	120	-	[15]
PEO-600 and PEO-526	Self-supported	26.3	1/6.84	8.4	[16]
PBI with TCL	Self-supported	39	22	-	[17]
P84 with BuDA	Self-	47	14	-	[18]

	supported				
Metal/polymer					
PdPt alloy PC	MMM	16.2	1.4	-	[19]
SiO_2/PC	MMM	39.46	1.52	-	[19]
LaNi5/Polyethylene	MMM	1320	132	66	[20]
CNT/polymer					
MWCNT/PEBAX-1657	MMM	40.96	1/6.40	9.14	[21]
PVA-CNT/Polysiloxane	MMM	19.44	43		[22]
Pd NPs-CNT/PC	MMM	4758	7.96	4.19	[23]
Graphene/polymer					
GO/PDMS	MMM	313.6	1/11.7	-	[24]
GO/Polyster	Surface coating	79.7	35.3	31.5	[25]
Laser induced graphene/polysulfone	Surface coating	1.7E6	30.5	-	[26]
Zeolite/polymer					
pNA zeolite 4A/PC	MMM	10.8	2.34	76.6	[27]
Zeolite A/PDMS	MMM	9516	3.23	-	[28]
MOF/polymer					
Cu-BPY-HFS/matrimid	MMM	26.74	1.77	54.78	[29]
ZIF8/PBI	MMM	470.5	26.3	-	[30]
ZIF8/6FDA-durene	MMM	500	29	341	[31]
ZIF8/polyimide	MMM	2585	1.78	21.72	[32]
ZIF8/PD/polyimide	MMM	1858	1.75	25.45	[32]
ZIF67/PIM	MMM	4532	1/1.35	11.5	[33]
PIM based					
PIM-7	Self-supported	860	1/1.27	20.47	[34]
Silica NPs/PIM-1	MMM	5060	1/1.99	5.75	[35]
ZIF8/PIM-1	MMM	6680	1.06	19.1	[36]
PIM-1	Self-supported	5240	0.51	9.5	[37]
TPIM-1	Self-suported	2666	1.72	50	[38]
TPIM-2	Sel-supported	655	1.51	37	[38]
Thermally rearranged polymer					
ZIF-8/Poly(benzoxazole-co-imide)	MMM	1206	1.273	21.3	[39]

*here, some abbreviations are used in the above table- PDMS, poly(dimethyl siloxane); PBI, polybenzimidazole; LiCl, lithium chloride; PVDF, polyvinylidene fluoride; PANI, polyaniline; PVA, polyvinyl alcohol; PSF, polysulfone; BuDA, 1,4- butanediamine; EDA, ethylenediamine; TCL, terephthaloyl chloride;

pNA, para-nitroaniline; Cu–BPY–HFS, Cu–4,4_-bipyridine–hexafluorosilicate; PD, polydopamine TPIM, triptycene ladder polymers.

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