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APPENDICES

APPENDIX A The experimental flow rate of nitrogen (N_2), carbon dioxide (CO_2), hydrogen (H_2), propane (C_3H_8), and propylene (C_3H_6) of the studied mixed matrix membranes at pressure around 50 psia.

Table A1 Silicone rubber coated on polysulfone (SIL/PS)

Gas : C_3H_8

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
51	90	32.69	2.753136	2.754818	2.36168E-04	2.37098E-04	2.86646E-06
51	90	32.57	2.763279		2.37038E-04		
51	90	32.95	2.731411		2.34304E-04		
51	90	32.97	2.729754		2.34162E-04		
50.5	90	32.53	2.766677		2.39679E-04		
50.5	90	32.32	2.784653		2.41237E-04		

Gas : C_3H_6

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
50	9	3.79	2.374670	2.374154	2.07777E-04	2.07731E-04	3.38417E-06
50	9	3.76	2.393617		2.09434E-04		
50	9	3.77	2.387268		2.08879E-04		
50	9	3.89	2.313625		2.02435E-04		
50	9	3.71	2.425876		2.12257E-04		
50	9	3.83	2.349869		2.05607E-04		

Gas : CO_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
49	10	13.31	0.751315	0.753996	6.70794E-05	6.75164E-05	2.97056E-07
49	10	13.19	0.758150		6.76897E-05		
49	10	13.21	0.757002		6.75872E-05		
49	10	13.23	0.755858		6.74850E-05		
49	10	13.29	0.752445		6.71803E-05		
48.5	10	13.28	0.753012		6.79240E-05		
48.5	10	13.33	0.750188		6.76693E-05		

Gas : N_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
52	1	15.06	0.066401	0.066491	5.58644E-06	5.59404E-06	3.37413E-08
52	1	14.87	0.067249		5.65782E-06		
52	1	15.12	0.066138		5.56427E-06		
52	1	15.04	0.066489		5.59387E-06		
52	1	15.11	0.066181		5.56795E-06		
52	1	15.04	0.066489		5.59387E-06		

Gas : H_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
50.5	1	5.92	0.168919	0.170404	1.46336E-05	1.47622E-05	1.19686E-07
50.5	1	5.87	0.170358		1.47582E-05		
50.5	1	5.86	0.170648		1.47834E-05		
50.5	1	5.78	0.173010		1.49880E-05		
50.5	1	5.90	0.169492		1.46832E-05		
50.5	1	5.83	0.171527		1.48595E-05		
50.5	1	5.87	0.170358		1.47582E-05		
50.5	1	5.92	0.168919		1.46336E-05		

Selectivity of C_3H_6/C_3H_8 = 2.077E-04/2.371E-04 = 0.876142

Selectivity of CO_2/N_2 = 6.752E-05/5.594E-06 = 12.069

Selectivity of CO_2/H_2 = 6.752E-05/1.476E-05 = 4.574

Table A2 10wt%Activated carbon/Silicone rubber coated on polysulfone
(10wt%Act.C./SIL/PS MMM)

Gas : C_3H_8

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
49.5	9	5.48	1.642336	1.654981	1.45151E-04	1.47569E-04	2.27586E-06
49.5	99	59.20	1.672297		1.47799E-04		
49.5	99	59.27	1.670322		1.47624E-04		
49	99	58.89	1.681100		1.50093E-04		
49	99	59.17	1.673145		1.49383E-04		
49	99	58.77	1.684533		1.50400E-04		
48.5	99	61.59	1.607404	n	1.44993E-04		
48.5	99	61.54	1.608710		1.45111E-04		

Gas : C_3H_8

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
48	99	60.34	1.640703	1.631705	1.49538E-04	1.49496E-04	1.87807E-07
48	99	60.27	1.642608		1.49712E-04		
47.5	99	61.00	1.622951		1.49477E-04		
47.5	99	61.09	1.620560		1.49257E-04		

Gas : CO_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
50	10	18.93	0.528262	0.529229	4.62214E-05	4.64616E-05	2.03573E-07
50	10	18.93	0.528262		4.62214E-05		
49.5	10	18.99	0.526593		4.65407E-05		
49.5	10	18.94	0.527983		4.66636E-05		
50	10	18.86	0.530223		4.63929E-05		
50	10	18.81	0.531632		4.65162E-05		
50	10	18.84	0.530786		4.64422E-05		
50	10	18.89	0.529381		4.63192E-05		
49.5	10	18.87	0.529942		4.68367E-05		

Gas : N_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
56	1	20.98	0.047664	0.044492	3.72366E-06	3.6796E-06	4.00332E-08
56	1	20.84	0.047985		3.74867E-06		
56	1	21.09	0.047416		3.70424E-06		
56	1	20.99	0.047642		3.72188E-06		
56	1	21.04	0.047529		3.71304E-06		
56	1	20.87	0.047916		3.74328E-06		
51	1	23.51	0.042535		3.64872E-06		
51	1	23.51	0.042535		3.64872E-06		
51	1	23.34	0.042845		3.6753E-06		
51	1	23.37	0.042790		3.67058E-06		
51	1	23.46	0.042626		3.6565E-06		
51	1	23.69	0.042212		3.621E-06		
51	1	23.57	0.042427		3.63943E-06		
51	1	23.47	0.042608		3.65494E-06		
51	1	23.47	0.042608		3.65494E-06		
51	1	23.51	0.042535		3.64872E-06		

Gas : H_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
50	1	9.18	0.108932	0.109399	9.53127E-06	9.57212E-06	7.01583E-08
50	1	9.28	0.107759		9.42856E-06		
50	1	9.07	0.110254		9.64686E-06		
50	1	9.10	0.109890		9.61506E-06		
50	1	9.17	0.109051		9.54166E-06		
50	1	9.12	0.109649		9.59397E-06		
50	1	9.12	0.109649		9.59397E-06		
50	1	9.09	0.110011		9.62564E-06		

Selectivity of C_3H_6/C_3H_8 = 1.495E-04/1.476E-04 = 1.013

Selectivity of CO_2/N_2 = 4.646E-05/3.680E-06 = 12.627

Selectivity of CO_2/H_2 = 4.646E-05/9.572E-06 = 4.854

Table A3 20wt%Activated carbon/Silicone rubber coated on polysulfone
(20wt%Act.C./SIL/PS MMM)

Gas : C_3H_8

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
49	99	58.57	1.690285	1.645141	1.50913E-04	1.48579E-04	1.32034E-06
49	99	58.78	1.684246		1.50374E-04		
48.5	99	60.29	1.642063		1.48119E-04		
48.5	90	54.73	1.644436		1.48333E-04		
48.5	90	54.81	1.642036		1.48117E-04		
48	99	61.18	1.618176		1.47485E-04		
48	99	61.21	1.617383		1.47413E-04		
48	90	55.47	1.622499		1.47879E-04		

Gas : C_3H_6

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
48	99	59.47	1.664705	1.656938	1.51726E-04	1.51809E-04	1.64054E-07
48	99	59.49	1.664145		1.51675E-04		
47.5	99	59.97	1.650825		1.52045E-04		
47.5	99	60.07	1.648077		1.51791E-04		

Gas : CO_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
50	10	17.09	0.585138	0.589521	5.11978E-05	5.15813E-05	3.81546E-07
50	10	17.14	0.583431		5.10484E-05		
50	10	16.89	0.592066		5.1804E-05		
50	10	17.10	0.584795		5.11678E-05		
50	10	16.93	0.590667		5.16816E-05		
50	10	16.83	0.594177		5.19887E-05		
50	10	16.89	0.592066		5.1804E-05		
50	10	16.84	0.593824		5.19579E-05		

Gas : N_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
55	1	23.33	0.042863	0.042354	3.40946E-06	3.41564E-06	2.1958E-08
55	1	23.61	0.042355		3.36903E-06		
54	1	23.73	0.042141		3.41406E-06		
54	1	23.60	0.042373		3.43287E-06		
54	1	23.78	0.042052		3.40689E-06		
54	1	23.61	0.042355		3.43142E-06		
54	1	23.66	0.042265		3.42417E-06		
54	1	23.57	0.042427		3.43724E-06		

Gas : H_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
50	1	7.68	0.130208	0.129705	1.13928E-05	1.13488E-05	6.22084E-08
50	1	7.77	0.128700		1.12609E-05		
50	1	7.68	0.130208		1.13928E-05		
50	1	7.71	0.129702		1.13485E-05		

Selectivity of C_3H_6/C_3H_8 = 1.518E-04/1.486E-04 = 1.022

Selectivity of CO_2/N_2 = 5.158E-05/3.416E-06 = 15.101

Selectivity of CO_2/H_2 = 5.158E-05/1.135E-05 = 4.545

Table A4 30wt%Activated carbon/Silicone rubber coated on polysulfone (30wt%Act.C./SIL/PS MMM)

Gas : C_3H_8

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
50.5	99	72.60	1.363636	1.377479	1.18133E-04	1.19332E-04	1.04963E-06
50.5	99	72.64	1.362885		1.18068E-04		
50.5	99	72.32	1.368916		1.18590E-04		
50.5	99	72.33	1.368727		1.18574E-04		
50.5	99	72.17	1.371761		1.18837E-04		
50.5	99	72.23	1.370622		1.18738E-04		
50.5	99	71.05	1.393385		1.20710E-04		
50.5	99	71.05	1.393385		1.20710E-04		
50.5	99	71.01	1.394170		1.20778E-04		
50.5	99	71.58	1.383068		1.19816E-04		
50.5	99	71.65	1.381717		1.19699E-04		

Gas : C_3H_6

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
49.5	99	69.99	1.414488	1.416519	1.25014E-04	1.26152E-04	9.84595E-07
49.5	99	70.08	1.412671		1.24853E-04		
49	99	69.19	1.430843		1.27749E-04		
49	99	69.50	1.424460		1.27180E-04		
49	99	70.15	1.411262		1.26001E-04		
49	99	70.20	1.410256		1.25911E-04		
49	99	69.89	1.416512		1.26470E-04		
49	99	70.13	1.411664		1.26037E-04		

Gas : CO_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
49.5	10	14.6	0.684932	0.678493	6.05348E-05	6.05803E-05	5.59585E-07
49.5	10	14.79	0.676133		5.97572E-05		
49	10	14.71	0.679810		6.06952E-05		
49	10	14.69	0.680735		6.07779E-05		
49	10	14.82	0.674764		6.02447E-05		
49	10	14.85	0.673401		6.01230E-05		
49	10	14.73	0.678887		6.06128E-05		
49	10	14.84	0.673854		6.01635E-05		
48.5	10	14.63	0.683527		6.16563E-05		
48.5	10	14.73	0.678887		6.12377E-05		

Gas : N_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
51.5	1	26.93	0.037133	0.036936	3.15442E-06	3.16069E-06	1.78777E-08
51.5	1	26.77	0.037355		3.17327E-06		
51	1	27.24	0.036711		3.1491E-06		
51	1	27.03	0.036996		3.17356E-06		
51	1	26.94	0.037120		3.18416E-06		
51	1	27.05	0.036969		3.17122E-06		
51	1	27.41	0.036483		3.12957E-06		
51	1	27.23	0.036724		3.15025E-06		

Gas : H_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
50.5	1	8.58	0.116550	0.116905	1.00968E-05	1.01276E-05	3.30883E-08
50.5	1	8.53	0.117233		1.01560E-05		
50.5	1	8.58	0.116550		1.00968E-05		
50.5	1	8.56	0.116822		1.01204E-05		
50.5	1	8.52	0.117371		1.01679E-05		

Selectivity of C_3H_6/C_3H_8 = 1.261E-04/1.193E-04 = 1.057

Selectivity of CO_2/N_2 = 6.058E-05/3.161E-06 = 19.167

Selectivity of CO_2/H_2 = 6.058E-05/1.013E-05 = 5.982

Table A5 5wt%PEG+20wt%Activated carbon/Silicone rubber coated on polysulfone (5wt%PEG+20wt%Act.C./SIL/PS MMM)

Gas : C_3H_8

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
51	100	330.92	0.302188	0.301361	2.59221E-05	2.58512E-05	4.5536E-08
51	100	331.53	0.301632		2.58744E-05		
51	100	331.35	0.301796		2.58885E-05		
51	100	332.00	0.301205		2.58378E-05		
51	100	332.33	0.300906		2.58121E-05		
51	100	332.57	0.300689		2.57935E-05		
51	100	332.10	0.301114		2.58300E-05		

Gas : C_3H_6

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
48	10	84.44	0.118427	0.117436	1.07938E-05	1.07034E-05	9.1817E-08
48	10	84.37	0.118526		1.08027E-05		
48	10	86.02	0.116252		1.05955E-05		
48	10	85.33	0.117192		1.06812E-05		
48	10	85.63	0.116782		1.06438E-05		

Gas : CO_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
50	10	48.21	0.207426	0.207890	1.81491E-05	1.81898E-05	3.5662E-08
50	10	47.99	0.208377		1.82323E-05		
50	10	48.14	0.207727		1.81755E-05		
50	10	48.07	0.208030		1.82020E-05		

Gas : N_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
50.5	1	51.67	0.019354	0.019082	1.67662E-06	1.69247E-06	1.8172E-08
50	1	52.19	0.019161		1.67651E-06		
50	1	52.24	0.019142		1.67490E-06		
48.5	1	52.68	0.018983		1.71228E-06		
48.5	1	52.78	0.018947		1.70904E-06		
48.5	1	52.89	0.018907		1.70549E-06		

Gas : H_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
49.5	1	21.72	0.046041	0.045440	4.06910E-06	4.03249E-06	6.4115E-08
49.5	1	22.23	0.044984		3.97575E-06		
49.5	1	22.37	0.044703		3.95086E-06		
49	1	21.84	0.045788		4.08803E-06		
49	1	21.89	0.045683		4.07870E-06		

Selectivity of C_3H_6/C_3H_8 = 1.070E-05/2.585E-05 = 0.414

Selectivity of CO_2/N_2 = 1.819E-05/1.692E-06 = 10.747

Selectivity of CO_2/H_2 = 1.819E-05/4.032E-06 = 4.511

Table A6 10wt%PEG+20wt%Activated carbon/Silicone rubber coated on polysulfone
(10wt%PEG+20wt%Act.C./SIL/PS MMM)

Gas : C_3H_8

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
47.5	10	88.51	0.112982	0.113146	1.04058E-05	1.04684E-05	4.3179E-08
47.5	10	87.81	0.113882		1.04888E-05		
47.5	10	87.89	0.113779		1.04793E-05		
47.5	10	88.4	0.113122		1.04188E-05		
47	10	88.45	0.113058		1.05237E-05		
47	10	88.63	0.112829		1.05023E-05		
47	10	88.99	0.112372		1.04598E-05		

Gas : C_3H_6

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
48	10	227.49	0.043958	0.043920	4.00645E-06	4.00299E-06	7.8856E-09
48	10	227.63	0.043931		4.00399E-06		
48	10	227.3	0.043995		4.00980E-06		
48	10	228.33	0.043796		3.99171E-06		

Gas : CO_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
49.5	10	63.73	0.156912	0.157072	1.38680E-05	1.38822E-05	1.2008E-08
49.5	10	63.63	0.157159		1.38898E-05		
49.5	10	63.61	0.157208		1.38942E-05		
49.5	10	63.69	0.157011		1.38767E-05		

Gas : N_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
50	1	96.55	0.010357	0.010289	9.06235E-07	9.00289E-07	5.0745E-09
50	1	97.03	0.010306		9.01752E-07		
50	1	97.86	0.010219		8.94104E-07		
50	1	97.32	0.010275		8.99065E-07		

Gas : H_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
53	10	208.62	0.047934	0.047515	3.95668E-06	3.92212E-06	4.8885E-08
53	10	212.33	0.047097		3.88755E-06		

Selectivity of C_3H_6/C_3H_8 = 4.003E-06/1.047E-5 = 0.382

Selectivity of CO_2/N_2 = 1.388E-05/9.003E-07 = 15.420

Selectivity of CO_2/H_2 = 1.388E-05/3.922E-06 = 3.539

Table A7 15wt%PEG+20wt%Activated carbon/Silicone rubber coated on polysulfone (15wt%PEG+20wt%Act.C./SIL/PS MMM)

Gas : C_3H_8

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
48.5	1	430.69	0.002322	0.002264	2.09439E-07	2.04205E-07	4.2301E-09
48.5	1	444.78	0.002248		2.02804E-07		
48.5	1	439.58	0.002275		2.05203E-07		
48.5	1	452.43	0.002210		1.99375E-07		

Gas : C_3H_6

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
51.5	1	259.61	0.003852	0.003841	3.27216E-07	3.26303E-07	1.3896E-09
51.5	1	260.67	0.003836		3.25885E-07		
51.5	1	259.32	0.003856		3.27582E-07		
51.5	1	261.76	0.003820		3.24528E-07		

Gas : CO_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
49.5	10	125.83	0.079472	0.078612	7.02383E-06	6.94777E-06	5.6084E-08
49.5	10	127.70	0.078309		6.92097E-06		
49.5	10	127.99	0.078131		6.90529E-06		
49.5	10	128.12	0.078052		6.89829E-06		
49.5	10	126.43	0.079095		6.99050E-06		

Gas : N_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
50	1	273.05	0.003662	0.003663	3.20443E-07	3.20490E-07	6.2124E-11
50	1	272.95	0.003664		3.20561E-07		
50	1	273.03	0.003663		3.20467E-07		

Gas : H_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
48	1	26.95	0.037106	0.036527	3.38192E-06	3.32913E-06	5.2714E-08
48	1	27.73	0.036062		3.28679E-06		
48	1	27.07	0.036941		3.36693E-06		
48	1	27.78	0.035997		3.28088E-06		

Selectivity of C_3H_6/C_3H_8 = 3.263E-7/2.042E-7 = 1.598

Selectivity of CO_2/N_2 = 1.388E-5/9.003E-7 = 21.679

Selectivity of CO_2/H_2 = 6.948E-6/3.329E-6 = 2.087

APPENDIX B The experimental flow rate of nitrogen (N_2), carbon dioxide (CO_2), hydrogen (H_2), propane (C_3H_8), and propylene (C_3H_6) of the studied mixed matrix membranes at pressure around 5-100 psia.

Table B1 Silicone rubber coated on polysulfone (SIL/PS)

Gas : C_3H_8

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
4	10	153.46	0.065164	0.065287	7.12702E-05	7.14055E-05	1.84429E-07
4	10	153.33	0.065219		7.13306E-05		
4	10	152.72	0.065479		7.16156E-05		
10	10	40.8	0.245098	0.244818	1.07227E-04	1.07104E-04	1.24833E-07
10	10	40.87	0.244678		1.07043E-04		
10	10	40.91	0.244439		1.06938E-04		
10	10	40.88	0.244618		1.07017E-04		
10	10	40.83	0.244918		1.07148E-04		
10	10	40.79	0.245158		1.07253E-04		
20	10	16.63	0.601323	0.599954	1.31535E-04	1.31235E-04	2.75198E-07
20	10	16.70	0.598802		1.30984E-04		
20	10	16.63	0.601323		1.31535E-04		
20	10	16.69	0.599161		1.31062E-04		
20	10	16.69	0.599161		1.31062E-04		
30	99	90.34	1.095860	1.102259	1.59807E-04	1.60741E-04	9.41057E-07
30	99	90.20	1.097561		1.60056E-04		
30	99	89.17	1.110239		1.61904E-04		
30	99	89.35	1.108002		1.61578E-04		
30	99	90.03	1.099633		1.60358E-04		
50.5	90	34.62	2.599653	2.597538	2.25210E-04	2.25027E-04	4.86622E-07
50.5	90	34.63	2.598903		2.25145E-04		
50.5	90	34.54	2.605675		2.25731E-04		
50.5	90	34.64	2.598152		2.25080E-04		
50.5	90	34.76	2.589183		2.24303E-04		
50.5	90	34.70	2.593660		2.24691E-04		
74	90	19.04	4.726891	4.731260	2.79452E-04	2.79710E-04	3.82741E-06
74	90	18.99	4.739336		2.80188E-04		
74	90	19.3	4.663212		2.75687E-04		
74	90	19.3	4.663212		2.75687E-04		
74	90	18.64	4.828326		2.85449E-04		
74	90	18.59	4.841313		2.86217E-04		
74	90	19.21	4.685060		2.76979E-04		
74	90	19.11	4.709576		2.78428E-04		
74	90	19.05	4.724409		2.79305E-04		
100	90	8.59	10.477299	10.531639	4.58366E-04	4.60744E-04	3.16556E-06
100	90	8.53	10.550996		4.61590E-04		
100	90	8.46	10.638298		4.65410E-04		
100	90	8.54	10.538642		4.61050E-04		
100	90	8.61	10.452962		4.57302E-04		

Gas : C_3H_6

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
4	10	119.92	0.083389	0.083462	9.12035E-05	9.12836E-05	1.32689E-07
4	10	119.77	0.083493		9.13178E-05		
4	10	119.59	0.083619		9.14552E-05		
4	10	119.98	0.083347		9.11579E-05		
10	10	36.15	0.276625	0.273854	1.21019E-04	1.19807E-04	1.08928E-06
10	10	36.13	0.276778		1.21086E-04		
10	10	36.53	0.273748		1.19761E-04		
10	10	36.54	0.273673		1.19728E-04		
10	10	36.85	0.271370		1.18721E-04		
10	10	36.91	0.270929		1.18528E-04		
20	10	15.07	0.663570	0.666684	1.45151E-04	1.45832E-04	8.01394E-07
20	10	14.83	0.674309		1.47500E-04		
20	10	14.99	0.667111		1.45926E-04		
20	10	15.07	0.663570		1.45151E-04		
20	10	15.02	0.665779		1.45634E-04		
20	10	14.99	0.667111		1.45926E-04		
20	10	15.03	0.665336		1.45537E-04		
30.5	99	81.06	1.221318	1.200021	1.75183E-04	1.73547E-04	8.69552E-07
30.5	99	81.77	1.210713		1.73662E-04		
30.5	99	81.91	1.208644		1.73365E-04		
30	99	83.33	1.188048		1.73251E-04		
30	99	83.36	1.187620		1.73189E-04		
30	99	83.63	1.183786		1.72630E-04		
49	90	37.16	2.421959	2.424292	2.16239E-04	2.16447E-04	1.07715E-06
49	90	37.18	2.420656		2.16123E-04		
49	90	36.83	2.443660		2.18177E-04		
49	90	36.99	2.433090		2.17233E-04		
49	90	37.26	2.415459		2.15659E-04		
49	90	37.33	2.410930		2.15254E-04		
74	90	20.19	4.457652	4.504350	2.63535E-04	2.69665E-04	4.40623E-06
74	90	20.06	4.486540		2.65243E-04		
73	90	19.53	4.608295		2.76173E-04		
73	90	19.44	4.629630		2.77451E-04		
73	90	19.81	4.543160		2.72269E-04		
73	90	19.76	4.554656		2.72958E-04		
73	90	19.89	4.524887		2.71174E-04		
73	90	19.97	4.506760		2.70088E-04		
73	90	19.91	4.520342		2.70902E-04		
73	90	20.16	4.464286		2.67542E-04		
73	90	20.09	4.479841		2.68474E-04		
72.5	90	20.53	4.383829		2.64532E-04		
72.5	90	20.47	4.396678		2.65308E-04		
82	90	16.14	5.576208	5.390678	2.97501E-04	2.92320E-04	4.33887E-06
82	90	16.22	5.548705		2.96034E-04		
80	90	17.16	5.244755		2.86813E-04		
80	90	17.11	5.260082		2.87651E-04		
80	90	16.77	5.366726		2.93483E-04		
80	90	16.83	5.347594		2.92437E-04		
99.5	90	11.11	8.100810	8.151444	3.56179E-04	3.58996E-04	6.82973E-06
99.5	90	11.07	8.130081		3.57466E-04		
99.5	90	10.8	8.333333		3.66403E-04		
99.5	90	10.74	8.379888		3.68450E-04		
99	90	11.26	7.992895		3.53209E-04		
99	90	11.29	7.971656		3.52271E-04		

Gas : CO_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
6	1	36.02	0.027762	0.026321	2.02427E-05	1.99084E-05	5.05169E-07
6	1	35.96	0.027809		2.02765E-05		
6	1	37.25	0.026846		1.95743E-05		
6	1	38.25	0.026144		1.90625E-05		
5.5	1	40.49	0.024697		1.96450E-05		
5.5	1	38.77	0.025793		2.05166E-05		
5.5	1	39.69	0.025195		2.00410E-05		
10.5	10	104.7	0.095511	0.094895	3.97949E-05	3.95381E-05	1.96144E-07
10.5	10	105.4	0.094877		3.95306E-05		
10.5	10	105.13	0.095120		3.96321E-05		
10.5	10	106.11	0.094242		3.92661E-05		
10.5	10	105.57	0.094724		3.94669E-05		
20.5	10	40.63	0.246124	0.244770	5.25246E-05	5.22356E-05	2.74603E-07
20.5	10	40.67	0.245881		5.24729E-05		
20.5	10	40.99	0.243962		5.20633E-05		
20.5	10	40.69	0.245761		5.24471E-05		
20.5	10	40.84	0.244858		5.22545E-05		
20.5	10	40.94	0.244260		5.21269E-05		
20.5	10	41.23	0.242542		5.17602E-05		
50	10	14.71	0.679810	0.673453	5.94813E-05	5.89251E-05	5.78741E-07
50	10	14.84	0.673854		5.89603E-05		
50	10	14.71	0.679810		5.94813E-05		
50	10	15.04	0.664894		5.81762E-05		
50	10	14.95	0.668896		5.85264E-05		
69	99	97.94	1.010823	1.010617	6.40899E-05	6.40768E-05	2.88809E-08
69	99	98.02	1.009998		6.40375E-05		
69	99	97.94	1.010823		6.40899E-05		
69	99	97.99	1.010307		6.40572E-05		
69	99	97.91	1.011133		6.41095E-05		
94.5	90	64.09	1.404275	1.402100	6.50105E-05	6.49098E-05	2.17983E-07
94.5	90	64.12	1.403618		6.49801E-05		
94.5	90	64.14	1.403181		6.49599E-05		
94.5	90	64.57	1.393836		6.45273E-05		
94.5	90	64.03	1.405591		6.50714E-05		

Gas : N_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
6.5	1	213.19	0.004691	0.004706	3.15706E-06	3.16744E-06	2.27572E-08
6.5	1	210.38	0.004753		3.19923E-06		
6.5	1	213.9	0.004675		3.14658E-06		
6.5	1	212.53	0.004705		3.16687E-06		
10.5	1	102.12	0.009792	0.009810	4.08003E-06	4.08746E-06	2.74944E-08
10.5	1	101.64	0.009839		4.09930E-06		
10.5	1	102.53	0.009753		4.06371E-06		
10.5	1	100.9	0.009911		4.12936E-06		
10.5	1	102.5	0.009756		4.06490E-06		
19	1	50.39	0.019845	0.019191	4.56946E-06	4.53794E-06	3.93888E-08
19	1	50.47	0.019814		4.56222E-06		
18.5	1	52.83	0.018929		4.47622E-06		
18	1	53.29	0.018765		4.56084E-06		
18	1	53.76	0.018601		4.52097E-06		
28	1	33.83	0.029560	0.029501	4.61852E-06	4.60937E-06	2.49981E-08
28	1	33.8	0.029586		4.62262E-06		
28	1	34.17	0.029265		4.57257E-06		
28	1	33.99	0.029420		4.59678E-06		
28	1	33.7	0.029674		4.63634E-06		
51	1	17.9	0.055866	0.055636	4.79226E-06	4.81702E-06	3.75251E-08
51	1	17.73	0.056402		4.83821E-06		
51	1	18.07	0.055340		4.74717E-06		
51	1	17.8	0.056180		4.81918E-06		

Gas : N_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
50.25	1	18.15	0.055096		4.79679E-06		
50	1	18.1	0.055249		4.83409E-06		
50	1	17.97	0.055648		4.86906E-06		
50	1	18.08	0.055310		4.83944E-06		
71.5	10	124.52	0.080308	0.080032	4.91381E-06	4.89692E-06	1.24494E-08
71.5	10	125.07	0.079955		4.89220E-06		
71.5	10	124.57	0.080276		4.91184E-06		
71.5	10	125.2	0.079872		4.88712E-06		
71.5	10	125.17	0.079891		4.88829E-06		
71.5	10	125.17	0.079891		4.88829E-06		
94	10	92.08	0.108601	0.108449	5.05441E-06	5.04734E-06	1.97131E-08
94	10	92.08	0.108601		5.05441E-06		
94	10	92.03	0.108660		5.05715E-06		
94	10	91.77	0.108968		5.07148E-06		
94	10	92.69	0.107887		5.02114E-06		
94	10	92.61	0.107980		5.02548E-06		

Gas : H_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
10	1	56.32	0.017756	0.017883	7.76785E-06	7.82356E-06	8.38592E-08
10	1	56.15	0.017809		7.79136E-06		
10	1	56.27	0.017771		7.77475E-06		
10	1	54.89	0.018218		7.97022E-06		
10	1	55.99	0.017860		7.81363E-06		
32.5	10	118.77	0.084196	0.084639	1.13337E-05	1.15419E-05	1.28231E-07
32	10	119.1	0.083963		1.14789E-05		
32	10	118.49	0.084395		1.15380E-05		
32	10	116.71	0.085682		1.17140E-05		
32	10	117.92	0.084803		1.15938E-05		
32	10	117.93	0.084796		1.15928E-05		
52.5	10	63.69	0.157011	0.155475	1.30838E-05	1.29558E-05	1.84697E-07
52.5	10	64.96	0.153941		1.28280E-05		
52.5	10	63	0.158730		1.32271E-05		
52.5	10	65.27	0.153210		1.27670E-05		
52.5	10	64.94	0.153988		1.28319E-05		
52.5	10	63.47	0.157555		1.31291E-05		
52.5	10	64.98	0.153894		1.28240E-05		
74.5	10	45.93	0.217723	0.218540	1.27853E-05	1.28333E-05	3.81424E-08
74.5	10	45.87	0.218007		1.28020E-05		
74.5	10	45.82	0.218245		1.28160E-05		
74.5	10	45.58	0.219394		1.28835E-05		
74.5	10	45.63	0.219154		1.28693E-05		
74.5	10	45.65	0.219058		1.28637E-05		
74.5	10	45.83	0.218198		1.28132E-05		
93.5	10	35.06	0.285225	0.284702	1.33457E-05	1.33640E-05	7.48656E-08
93.5	10	34.78	0.287522		1.34531E-05		
93	10	35.03	0.285470		1.34289E-05		
93	10	35.43	0.282247		1.32773E-05		
93	10	35.33	0.283046		1.33149E-05		

Table B2 10wt%Activated carbon/Silicone rubber coated on polysulfone (10wt%Act.C./SIL/PS MMM)

Gas : C_3H_8

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
8.5	10	71.83	0.139218	0.138986	7.16537E-05	7.15347E-05	2.10532E-07
8.5	10	71.6	0.139665		7.18839E-05		
8.5	10	72.11	0.138677		7.13755E-05		
8.5	10	71.93	0.139024		7.15541E-05		
8.5	10	72.17	0.138562		7.13161E-05		
8.5	10	72.06	0.138773		7.14250E-05		
18.5	10	26.05	0.383877	0.383751	9.07787E-05	9.07489E-05	1.19657E-07
18.5	10	26.01	0.384468		9.09183E-05		
18.5	10	26.03	0.384172		9.08484E-05		
18.5	10	26.05	0.383877		9.07787E-05		
18.5	10	26.09	0.383289		9.06395E-05		
18.5	10	26.11	0.382995		9.05701E-05		
18.5	10	26.07	0.383583		9.07090E-05		
28	99	140.89	0.702676	0.704047	1.09789E-04	1.10004E-04	1.8472E-07
28	99	140.43	0.704978		1.10149E-04		
28	99	140.57	0.704275		1.10039E-04		
28	99	140.36	0.705329		1.10204E-04		
28	99	140.83	0.702975		1.09836E-04		
40.5	99	78.07	1.268093	1.272768	1.36981E-04	1.36643E-04	2.64745E-07
40.5	99	78.23	1.265499		1.36701E-04		
41	99	77.37	1.279566		1.36534E-04		
41	99	77.47	1.277914		1.36358E-04		
49.5	9	5.48	1.642336	1.654981	1.45151E-04	1.47569E-04	2.27586E-06
49.5	99	59.20	1.672297		1.47799E-04		
49.5	99	59.27	1.670322		1.47624E-04		
49	99	58.89	1.681100		1.50093E-04		
49	99	59.17	1.673145		1.49383E-04		
49	99	58.77	1.684533		1.50400E-04		
48.5	99	61.59	1.607404		1.44993E-04		
48.5	99	61.54	1.608710		1.45111E-04		

Gas : C_3H_8

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
5	10	126.94	0.078777	0.078871	6.89279E-05	6.90096E-05	1.16091E-07
5	10	126.47	0.079070		6.91840E-05		
5	10	127.01	0.078734		6.88899E-05		
5	10	126.96	0.078765		6.89170E-05		
5	10	126.66	0.078952		6.90802E-05		
5	10	126.70	0.078927		6.90584E-05		
8	10	64.65	0.154679	0.153900	8.45872E-05	8.41613E-05	9.85273E-07
8	10	64.63	0.154727		8.46134E-05		
8	10	65.99	0.151538		8.28696E-05		
8	10	66.04	0.151423		8.28068E-05		
8	10	65.33	0.153069		8.37068E-05		
8	10	65.05	0.153728		8.40671E-05		
8	10	64.14	0.155909		8.52598E-05		
8	10	64.05	0.156128		8.53796E-05		
19.5	10	21.47	0.465766	0.458095	1.04495E-04	1.04108E-04	3.84221E-07
19.5	10	21.50	0.465116		1.04349E-04		
19.5	10	21.56	0.463822		1.04059E-04		
19.5	10	21.63	0.462321		1.03722E-04		
19	10	22.10	0.452489		1.04188E-04		
19	10	22.01	0.454339		1.04614E-04		
19	10	22.25	0.449438		1.03486E-04		
19	10	22.15	0.451467		1.03953E-04		

Gas : C_3H_6

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
29.5	99	123.84	0.799419	0.810679	1.18554E-04	1.18879E-04	3.06786E-07
29.5	99	123.78	0.799806		1.18611E-04		
30	99	121.01	0.818114		1.19304E-04		
30	99	121.13	0.817304		1.19186E-04		
30	99	121.45	0.815150		1.18872E-04		
30	99	121.58	0.814279		1.18745E-04		
39	99	82.78	1.195941	1.191261	1.34155E-04	1.33630E-04	4.96634E-07
39	99	82.75	1.196375		1.34204E-04		
39	99	83.47	1.186055		1.33047E-04		
39	99	83.45	1.186339		1.33078E-04		
39	99	82.83	1.195219		1.34075E-04		
39	99	82.95	1.193490		1.33881E-04		
39	99	83.32	1.188190		1.33286E-04		
39	99	83.3	1.188475		1.33318E-04		
48	99	60.34	1.640703	1.631705	1.49538E-04	1.49496E-04	1.87807E-07
48	99	60.27	1.642608		1.49712E-04		
47.5	99	61.00	1.622951		1.49477E-04		
47.5	99	61.09	1.620560		1.49257E-04		

Gas : CO_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
7	1	19.31	0.051787	0.051557	3.23655E-05	3.22217E-05	1.94086E-07
7	1	19.35	0.051680		3.22986E-05		
7	1	19.53	0.051203		3.20010E-05		
12	10	96.03	0.104134	0.100737	3.79643E-05	3.70366E-05	7.3168E-07
12	10	97.65	0.102407		3.73345E-05		
12	10	100.22	0.099780		3.63771E-05		
12	10	100.69	0.099315		3.62073E-05		
11.5	10	101.99	0.098049		3.72999E-05		
20.5	10	52.78	0.189466	0.187517	4.04334E-05	4.03478E-05	2.64067E-07
20.5	10	52.89	0.189072		4.03493E-05		
20.5	10	53.33	0.187512		4.00164E-05		
20.5	10	53.28	0.187688		4.00539E-05		
20	10	53.87	0.185632		4.06056E-05		
20	10	53.84	0.185736		4.06283E-05		
50	10	18.93	0.528262	0.529229	4.62214E-05	4.64616E-05	2.03573E-07
50	10	18.93	0.528262		4.62214E-05		
49.5	10	18.99	0.526593		4.65407E-05		
49.5	10	18.94	0.527983		4.66636E-05		
50	10	18.86	0.530223		4.63929E-05		
50	10	18.81	0.531632		4.65162E-05		
50	10	18.84	0.530786		4.64422E-05		
50	10	18.89	0.529381		4.63192E-05		
49.5	10	18.87	0.529942		4.68367E-05		

Gas : N_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
6	1	286.25	0.003493	0.003486	2.54722E-06	2.54159E-06	7.95586E-09
6	1	287.52	0.003478		2.53597E-06		
12	1	119.92	0.008339	0.007914	3.04012E-06	3.04439E-06	3.19197E-08
11.5	1	126.61	0.007898		3.00467E-06		
11	1	130.37	0.007670		3.05065E-06		
11	1	129.04	0.007750		3.08210E-06		
21.5	1	62.91	0.015896	0.015887	3.23448E-06	3.23279E-06	9.35584E-09
21.5	1	63.14	0.015838		3.22270E-06		
21.5	1	62.78	0.015929		3.24118E-06		

Gas : N_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
56	1	20.98	0.047664	0.044492	3.72366E-06	3.6796E-06	4.00332E-08
56	1	20.84	0.047985		3.74867E-06		
56	1	21.09	0.047416		3.70424E-06		
56	1	20.99	0.047642		3.72188E-06		
56	1	21.04	0.047529		3.71304E-06		
56	1	20.87	0.047916		3.74328E-06		
51	1	23.51	0.042535		3.64872E-06		
51	1	23.51	0.042535		3.64872E-06		
51	1	23.34	0.042845		3.6753E-06		
51	1	23.37	0.042790		3.67058E-06		
51	1	23.46	0.042626		3.6565E-06		
51	1	23.69	0.042212		3.621E-06		
51	1	23.57	0.042427		3.63943E-06		
51	1	23.47	0.042608		3.65494E-06		
51	1	23.47	0.042608		3.65494E-06		
51	1	23.51	0.042535		3.64872E-06		
74	10	168.54	0.059333	0.059247	3.50775E-06	3.50266E-06	3.75463E-09
74	10	168.77	0.059252		3.50297E-06		
74	10	168.96	0.059186		3.49903E-06		
74	10	168.87	0.059217		3.50089E-06		
103	10	120.69	0.082857	0.082986	3.51929E-06	3.52477E-06	3.79849E-09
103	10	120.47	0.083008		3.52571E-06		
103	10	120.46	0.083015		3.52601E-06		
103	10	120.39	0.083063		3.52806E-06		

Gas : H_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
12.5	1	38.38	0.026055	0.026121	9.11902E-06	9.14213E-06	3.40375E-08
12.5	1	38.12	0.026233		9.18122E-06		
12.5	1	38.35	0.026076		9.12616E-06		
50	1	9.18	0.108932	0.109399	9.53127E-06	9.57212E-06	7.01583E-08
50	1	9.28	0.107759		9.42856E-06		
50	1	9.07	0.110254		9.64686E-06		
50	1	9.10	0.109890		9.61506E-06		
50	1	9.17	0.109051		9.54166E-06		
50	1	9.12	0.109649		9.59397E-06		
50	1	9.12	0.109649		9.59397E-06		
50	1	9.09	0.110011		9.62564E-06		
103	10	38.82	0.257599	0.256846	1.09413E-05	1.09093E-05	1.86846E-08
103	10	38.93	0.256871		1.09104E-05		
103	10	38.97	0.256608		1.08992E-05		
103	10	38.97	0.256608		1.08992E-05		
103	10	38.98	0.256542		1.08964E-05		

Table B3 20wt%Activated carbon/Silicone rubber coated on polysulfone (20wt%Act.C./SIL/PS MMM)

Gas : C_3H_8

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability (cm^3/cm^2 sec.cmHg)	Average Permeability	STDEV of Permeability
8.5	10	69.49	0.143906	0.143655	7.40665E-05	7.39377E-05	1.78818E-07
8.5	10	69.48	0.143926		7.40772E-05		
8.5	10	69.54	0.143802		7.40133E-05		
8.5	10	69.44	0.144009		7.41199E-05		
8.5	10	69.88	0.143102		7.36532E-05		
8.5	10	69.78	0.143308		7.37587E-05		
8.5	10	69.67	0.143534		7.38752E-05		
18.5	10	25.14	0.397772	0.397819	9.40646E-05	9.40755E-05	1.53914E-07
18.5	10	25.08	0.398724		9.42896E-05		
18.5	10	25.14	0.397772		9.40646E-05		
18.5	10	25.19	0.396983		9.38779E-05		
18.5	10	25.09	0.398565		9.42521E-05		
18.5	10	25.14	0.397772		9.40646E-05		
18.5	10	25.18	0.397141		9.39152E-05		
28	99	136.99	0.722680	0.718386	1.12915E-04	1.12244E-04	8.93698E-07
28	99	137.27	0.721206		1.12685E-04		
28	99	139.4	0.710187		1.10963E-04		
28	99	136.89	0.723208		1.12997E-04		
28	99	138.53	0.714647		1.11660E-04		
42	99	75.99	1.302803	1.301522	1.35704E-04	1.35571E-04	2.68411E-07
42	99	76.01	1.302460		1.35668E-04		
42	99	76.29	1.297680		1.35170E-04		
42	99	75.97	1.303146		1.35740E-04		
49	99	58.57	1.690285	1.645141	1.50913E-04	1.48579E-04	1.32034E-06
49	99	58.78	1.684246		1.50374E-04		
48.5	99	60.29	1.642063		1.48119E-04		
48.5	90	54.73	1.644436		1.48333E-04		
48.5	90	54.81	1.642036		1.48117E-04		
48	99	61.18	1.618176		1.47485E-04		
48	99	61.21	1.617383		1.47413E-04		
48	90	55.47	1.622499		1.47879E-04		

Gas : C_3H_6

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability (cm^3/cm^2.sec.cmHg)	Average Permeability	STDEV of Permeability
5	10	124.49	0.080328	0.080363	7.02844E-05	7.03155E-05	7.0954E-08
5	10	124.25	0.080483		7.04201E-05		
5	10	124.31	0.080444		7.03862E-05		
5	10	124.51	0.080315		7.02731E-05		
5	10	124.48	0.080334		7.02900E-05		
5	10	124.57	0.080276		7.02392E-05		
8	10	62.15	0.160901	0.158850	8.79898E-05	8.68684E-05	6.90748E-07
8	10	63.07	0.158554		8.67063E-05		
8	10	63.30	0.157978		8.63912E-05		
8	10	63.42	0.157679		8.62278E-05		
8	10	63.49	0.157505		8.61327E-05		
8	10	62.63	0.159668		8.73154E-05		
8	10	62.63	0.159668		8.73154E-05		
19.5	10	21.19	0.471921	0.463651	1.05876E-04	1.05378E-04	7.46945E-07
19.5	10	21.40	0.467290		1.04837E-04		
19.5	10	21.48	0.465549		1.04447E-04		
19.5	10	21.48	0.465549		1.04447E-04		
19	10	21.63	0.462321		1.06452E-04		
19	10	21.71	0.460617		1.06060E-04		
19	10	21.83	0.458085		1.05477E-04		
19	10	21.84	0.457875		1.05428E-04		

Gas : C_3H_6

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
29.5	99	120.68	0.820351	0.829596	1.21658E-04	1.21385E-04	3.66878E-07
29.5	99	120.45	0.821918		1.21890E-04		
30	99	118.57	0.834950		1.21759E-04		
30	99	118.49	0.835514		1.21842E-04		
30	99	118.97	0.832143		1.21350E-04		
30	99	119.09	0.831304		1.21228E-04		
30	99	119.28	0.829980		1.21035E-04		
30	99	119.31	0.829771		1.21004E-04		
30	99	119.26	0.830119		1.21055E-04		
30	99	119.29	0.829910		1.21024E-04		
39	99	81.77	1.210713	1.203541	1.35813E-04	1.35356E-04	5.38115E-07
39	99	81.69	1.211899		1.35946E-04		
39	99	81.99	1.207464		1.35448E-04		
39	99	82.02	1.207023		1.35399E-04		
39	99	82.23	1.203940		1.35053E-04		
39	99	82.24	1.203794		1.35036E-04		
39	99	82.5	1.200000		1.34611E-04		
39	99	82.57	1.198983		1.34497E-04		
38.5	99	82.79	1.195797		1.35881E-04		
38.5	99	82.79	1.195797		1.35881E-04		
48	99	59.47	1.664705	1.656938	1.51726E-04	1.51809E-04	1.64054E-07
48	99	59.49	1.664145		1.51675E-04		
47.5	99	59.97	1.650825		1.52045E-04		
47.5	99	60.07	1.648077		1.51791E-04		

Gas : CO_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
7	10	189.88	0.052665	0.052286	3.29144E-05	3.26775E-05	2.41822E-07
7	10	192.71	0.051891		3.24310E-05		
7	10	191.2	0.052301		3.26872E-05		
12	10	93.47	0.106986	0.105245	3.90041E-05	3.86956E-05	4.69934E-07
12	10	93.61	0.106826		3.89457E-05		
12	10	95.33	0.104899		3.82430E-05		
12	10	95.60	0.104603		3.81350E-05		
11.5	10	97.17	0.102912		3.91501E-05		
20.5	10	50.87	0.196580	0.195405	4.19515E-05	4.21452E-05	3.45228E-07
20.5	10	50.83	0.196734		4.19845E-05		
20.5	10	50.94	0.196309		4.18939E-05		
20.5	10	51.19	0.195351		4.16893E-05		
20	10	51.43	0.194439		4.25321E-05		
20	10	51.44	0.194401		4.25238E-05		
20	10	51.54	0.194024		4.24413E-05		
50	10	17.09	0.585138	0.589521	5.11978E-05	5.15813E-05	3.81546E-07
50	10	17.14	0.583431		5.10484E-05		
50	10	16.89	0.592066		5.1804E-05		
50	10	17.10	0.584795		5.11678E-05		
50	10	16.93	0.590667		5.16816E-05		
50	10	16.83	0.594177		5.19887E-05		
50	10	16.89	0.592066		5.1804E-05		
50	10	16.84	0.593824		5.19579E-05		

Gas : N_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
6	1	268.07	0.003730	0.003721	2.71997E-06	2.71310E-06	9.70827E-09
6	1	269.43	0.003712		2.70624E-06		
12	1	117.61	0.008503	0.008116	3.09983E-06	3.12260E-06	5.13255E-08
11.5	1	124.23	0.008050		3.06224E-06		
11	1	126.17	0.007926		3.15221E-06		
11	1	125.22	0.007986		3.17612E-06		
21.5	1	60.37	0.016565	0.016569	3.37057E-06	3.37158E-06	5.54072E-09
21.5	1	60.36	0.016567		3.37113E-06		
21.5	1	60.46	0.016540		3.36555E-06		
21.5	1	60.22	0.016606		3.37897E-06		
55	1	23.33	0.042863	0.042354	3.40946E-06	3.41564E-06	2.1958E-08
55	1	23.61	0.042355		3.36903E-06		
54	1	23.73	0.042141		3.41406E-06		
54	1	23.60	0.042373		3.43287E-06		
54	1	23.78	0.042052		3.40689E-06		
54	1	23.61	0.042355		3.43142E-06		
54	1	23.66	0.042265		3.42417E-06		
54	1	23.57	0.042427		3.43724E-06		
74	10	167.00	0.059880	0.059884	3.54010E-06	3.54031E-06	2.99823E-10
74	10	166.98	0.059887		3.54052E-06		
103	10	119.88	0.083417	0.083294	3.54307E-06	3.53784E-06	6.70634E-09
103	10	120.39	0.083063		3.52806E-06		
103	10	120.01	0.083326		3.53923E-06		
103	10	119.95	0.083368		3.54100E-06		

Gas : H_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
12.5	1	34.00	0.029412	0.029369	1.02938E-05	1.02788E-05	5.1742E-08
12.5	1	33.83	0.029560		1.03455E-05		
12.5	1	34.20	0.029240		1.02336E-05		
12.5	1	34.17	0.029265		1.02426E-05		
50	1	7.68	0.130208	0.129705	1.13928E-05	1.13488E-05	6.22084E-08
50	1	7.77	0.128700		1.12609E-05		
50	1	7.68	0.130208		1.13928E-05		
50	1	7.71	0.129702		1.13485E-05		
103	10	34.95	0.286123	0.284681	1.21529E-05	1.20916E-05	4.7288E-08
103	10	35.27	0.283527		1.20426E-05		
103	10	35.1	0.284900		1.21009E-05		
103	10	35.19	0.284172		1.20700E-05		

Table B4 30wt%Activated carbon/Silicone rubber coated on polysulfone (30wt%Act.C./SIL/PS MMM)

Gas : C_3H_8

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
4	10	67.18	0.148854	0.149452	1.62803E-04	1.63457E-04	1.796E-06
4	10	66.09	0.151309		1.65488E-04		
4	10	67.48	0.148192		1.62080E-04		
10	10	51.11	0.195656	0.195355	8.55968E-05	8.54648E-05	6.15689E-07
10	10	51.07	0.195810		8.56638E-05		
10	10	50.6	0.197628		8.64595E-05		
10	10	51.4	0.194553		8.51138E-05		
10	10	50.87	0.196580		8.60006E-05		
10	10	51.62	0.193723		8.47511E-05		
10	10	51.17	0.195427		8.54964E-05		
10	10	51.69	0.193461		8.46363E-05		
20	10	28.96	0.345304	0.344001	7.55327E-05	7.52478E-05	2.94276E-07
20	10	29.09	0.343761		7.51951E-05		
20	10	29.23	0.342114		7.48349E-05		
20	10	29.11	0.343525		7.51434E-05		
20	10	28.96	0.345304		7.55327E-05		
30	99	165.04	0.599855	0.593000	8.74758E-05	8.67676E-05	7.13123E-07
30	99	165.17	0.599382		8.74070E-05		
30	99	165.93	0.596637		8.70066E-05		
30	99	165.99	0.596421		8.69752E-05		
30	99	167.22	0.592034		8.63354E-05		
30	99	167.68	0.590410		8.60986E-05		
30	99	168.07	0.589040		8.58988E-05		
30	99	168.59	0.587223		8.56338E-05		
29.5	99	167.69	0.590375		8.75526E-05		
29.5	99	168.19	0.588620		8.72924E-05		
50.5	99	72.60	1.363636	1.377479	1.18133E-04	1.19332E-04	1.04963E-06
50.5	99	72.64	1.362885		1.18068E-04		
50.5	99	72.32	1.368916		1.18590E-04		
50.5	99	72.33	1.368727		1.18574E-04		
50.5	99	72.17	1.371761		1.18837E-04		
50.5	99	72.23	1.370622		1.18738E-04		
50.5	99	71.05	1.393385		1.20710E-04		
50.5	99	71.05	1.393385		1.20710E-04		
50.5	99	71.01	1.394170		1.20778E-04		
50.5	99	71.58	1.383068		1.19816E-04		
50.5	99	71.65	1.381717		1.19699E-04		

Gas : C_3H_6

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
4	10	50.57	0.197746	0.196556	2.16277E-04	2.14976E-04	2.14848E-06
4	10	50.53	0.197902		2.16448E-04		
4	10	51.63	0.193686		2.11837E-04		
4	10	50.79	0.196889		2.15340E-04		
10	10	34.7	0.288184	0.274739	1.26076E-04	1.20194E-04	4.88196E-06
10	10	34.96	0.286041		1.25139E-04		
10	10	36.19	0.276319		1.20886E-04		
10	10	36.65	0.272851		1.19368E-04		
10	10	37.78	0.264690		1.15798E-04		
10	10	38.41	0.260349		1.13899E-04		

Gas : C_3H_6

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability (cm^3/cm^2 sec cmHg)	Average Permeability	STDEV of Permeability
20	10	22.89	0.436872	0.434065	9.55625E-05	9.49486E-05	5.10846E-07
20	10	22.98	0.435161		9.51882E-05		
20	10	22.99	0.434972		9.51468E-05		
20	10	22.93	0.436110		9.53958E-05		
20	10	23.09	0.433088		9.47348E-05		
20	10	23.17	0.431593		9.44077E-05		
20	10	23.22	0.430663		9.42044E-05		
30.5	99	135.77	0.729174	0.729471	1.04591E-04	1.05507E-04	1.17101E-06
30.5	99	136.02	0.727834		1.04399E-04		
30	99	135.54	0.730412		1.06515E-04		
30	99	135.53	0.730466		1.06523E-04		
49.5	99	69.99	1.414488	1.416519	1.25014E-04	1.26152E-04	9.84595E-07
49.5	99	70.08	1.412671		1.24853E-04		
49	99	69.19	1.430843		1.27749E-04		
49	99	69.50	1.424460		1.27180E-04		
49	99	70.15	1.411262		1.26001E-04		
49	99	70.20	1.410256		1.25911E-04		
49	99	69.89	1.416512		1.26470E-04		
49	99	70.13	1.411664		1.26037E-04		

Gas : CO_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability (cm^3/cm^2 sec cmHg)	Average Permeability	STDEV of Permeability
7	10	88.03	0.113598	0.112461	7.09961E-05	7.02856E-05	7.48663E-07
7	10	88.83	0.112575		7.03567E-05		
7	10	89.92	0.111210		6.95039E-05		
12	10	67.66	0.147798	0.142703	5.38828E-05	5.31160E-05	1.08439E-06
11.5	10	72.67	0.137608		5.23492E-05		
20.5	10	48.57	0.205888	0.201820	4.39381E-05	4.34222E-05	3.4409E-07
20.5	10	48.84	0.204750		4.36952E-05		
20.5	10	49.33	0.202716		4.32612E-05		
20.5	10	49.67	0.201329		4.29650E-05		
20	10	50.44	0.198255		4.33669E-05		
20	10	50.51	0.197981		4.33068E-05		
52.5	10	21.60	0.462963	0.462963	3.85789E-05	3.85789E-05	0
52.5	10	21.60	0.462963		3.85789E-05		

Gas : N_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability (cm^3/cm^2 sec cmHg)	Average Permeability	STDEV of Permeability
6	1	15.44	0.064767	0.064564	4.72242E-05	4.70762E-05	5.27689E-07
6	1	15.27	0.065488		4.77500E-05		
6	1	15.66	0.063857		4.65608E-05		
6	1	15.59	0.064144		4.67698E-05		
11	1	20.22	0.049456	0.049165	1.96693E-05	1.95536E-05	9.05908E-08
11	1	20.45	0.048900		1.94481E-05		
11	1	20.34	0.049164		1.95533E-05		
11	1	20.35	0.049140		1.95437E-05		
20	1	31.44	0.031807	0.031858	6.95746E-06	6.96873E-06	4.16947E-08
20	1	31.63	0.031616		6.91567E-06		
20	1	31.29	0.031959		6.99081E-06		
20	1	31.2	0.032051		7.01098E-06		
51	1	26.13	0.038270	0.038100	3.28287E-06	3.2683E-06	1.01353E-08
51	1	26.27	0.038066		3.26537E-06		
51	1	26.27	0.038066		3.26537E-06		
51	1	26.19	0.038183		3.27535E-06		
51	1	26.37	0.037922		3.25299E-06		
51	1	26.25	0.038095		3.26786E-06		

Gas : N_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
74	10	181.38	0.055133	0.055125	3.25943E-06	3.25898E-06	6.35167E-10
74	10	181.43	0.055118		3.25854E-06		
103	10	133.04	0.075165	0.074974	3.19259E-06	3.18448E-06	1.0456E-08
103	10	133.06	0.075154		3.19212E-06		
103	10	133.87	0.074699		3.17280E-06		
103	10	133.85	0.074710		3.17327E-06		
103	10	133.08	0.075143		3.19164E-06		

Gas : H_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability ($cm^3/cm^2.sec.cmHg$)	Average Permeability	STDEV of Permeability
12.5	1	23.53	0.042499	0.042455	1.48741E-05	1.48588E-05	1.83207E-07
12.5	1	23.28	0.042955		1.50339E-05		
12.5	1	23.86	0.041911		1.46684E-05		
52	10	75.72	0.132066	0.131179	1.11109E-05	1.10363E-05	6.7358E-08
52	10	75.93	0.131700		1.10802E-05		
52	10	76.93	0.129988		1.09361E-05		
52	10	76.40	0.130890		1.1012E-05		
52	10	76.19	0.131251		1.10424E-05		
103	10	40.8	0.245098	0.243798	1.04104E-05	1.03552E-05	3.92192E-08
103	10	41.17	0.242895		1.03168E-05		
103	10	41.15	0.243013		1.03218E-05		
103	10	41.04	0.243665		1.03495E-05		
103	10	40.93	0.244320		1.03773E-05		

Table B5 5wt%PEG+20wt%Activated carbon/Silicone rubber coated on polysulfone (5wt%PEG+20wt%Act.C./SIL/PS MMM)

Gas : C_3H_8

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability (cm3/cm2.sec.cmHg)	Average Permeability	STDEV of Permeability
20.5	10	137.93	0.0725005	0.07236088	1.54722E-05	1.54423E-05	1.11582E-07
20.5	10	139.37	0.0717515		1.53123E-05		
20.5	10	139.14	0.0718701		1.53376E-05		
20.5	10	137.26	0.0728544		1.55477E-05		
20.5	10	137.31	0.0728279		1.5542E-05		
31.5	10	67.21	0.1487874	0.14541391	2.06642E-05	2.01957E-05	4.12124E-07
31.5	10	67.37	0.148434		2.06151E-05		
31.5	10	70.2	0.1424501		1.97841E-05		
31.5	10	69.67	0.1435338		1.99346E-05		
31.5	10	69.51	0.1438642		1.99805E-05		
43.5	100	426.14	0.2346647	0.2365429	2.36005E-05	2.37894E-05	4.60297E-07
43.5	100	413.41	0.2418906		2.43273E-05		
43.5	100	419.6	0.2383222		2.39684E-05		
43.5	100	432.35	0.2312941		2.32615E-05		
51	100	330.92	0.302188	0.301361	2.59221E-05	2.58512E-05	4.5536E-08
51	100	331.53	0.301632		2.58744E-05		
51	100	331.35	0.301796		2.58885E-05		
51	100	332	0.301205		2.58378E-05		
51	100	332.33	0.300906		2.58121E-05		
51	100	332.57	0.300689		2.57935E-05		
51	100	332.1	0.301114		2.58300E-05		

Gas : C_3H_6

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability (cm3/cm2.sec.cmHg)	Average Permeability	STDEV of Permeability
21.5	10	314.63	0.0317834	0.03149081	6.46733E-06	6.4078E-06	6.34869E-08
21.5	10	321.34	0.0311197		6.33228E-06		
21.5	10	315.76	0.0316696		6.44418E-06		
21.5	10	315.51	0.0316947		6.44929E-06		
21.5	10	320.65	0.0311867		6.34591E-06		
29.5	10	171.99	0.0581429	0.05800361	8.6226E-06	8.60194E-06	2.47943E-08
29.5	10	171.84	0.0581937		8.63012E-06		
29.5	10	173.27	0.0577134		8.5589E-06		
29.5	10	172.06	0.0581193		8.61909E-06		
29.5	10	172.64	0.057924		8.59013E-06		
29.5	10	172.36	0.0580181		8.60409E-06		
29.5	10	172.67	0.0579139		8.58864E-06		
38.5	10	106.65	0.093765	0.093812	1.06547E-05	1.06601E-05	1.9883E-08
38.5	10	106.38	0.094003		1.06818E-05		
38.5	10	106.91	0.093537		1.06288E-05		
38.5	10	106.7	0.093721		1.06497E-05		
38.5	10	106.41	0.093976		1.06787E-05		
38.5	10	106.53	0.093870		1.06667E-05		
48	10	84.44	0.118427	0.117436	1.07938E-05	1.07034E-05	9.1817E-08
48	10	84.37	0.118526		1.08027E-05		
48	10	86.02	0.116252		1.05955E-05		
48	10	85.33	0.117192		1.06812E-05		
48	10	85.63	0.116782		1.06438E-05		

Gas : CO_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability (cm3/cm2 sec cmHg)	Average Permeability	STDEV of Permeability
6	1	77.15	0.012962	0.012884	9.45096E-06	9.39408E-06	8.0444E-08
6	1	78.09	0.012806		9.33720E-06		
10	1	28.96	0.034530	0.034242	1.51065E-05	1.49802E-05	8.96264E-08
10	1	29.37	0.034048		1.48956E-05		
10	1	29.23	0.034211		1.49670E-05		
10	1	29.26	0.034176		1.49516E-05		
20	10	131.33	0.076144	0.075541	1.66559E-05	1.65240E-05	1.3391E-07
20	10	133.67	0.074811		1.63644E-05		
20	10	131.69	0.075936		1.66104E-05		
20	10	132.85	0.075273		1.64654E-05		
50	10	48.21	0.207426	0.207890	1.81491E-05	1.81898E-05	3.5662E-08
50	10	47.99	0.208377		1.82323E-05		
50	10	48.14	0.207727		1.81755E-05		
50	10	48.07	0.208030		1.82020E-05		

Gas : N_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability (cm3/cm2 sec cmHg)	Average Permeability	STDEV of Permeability
7.5	1	281.27	0.0035553	0.00358184	2.07386E-06	2.08933E-06	1.96101E-08
7.5	1	281.33	0.0035545		2.07341E-06		
7.5	1	280.71	0.0035624		2.07799E-06		
7.5	1	276.19	0.0036207		2.112E-06		
7.5	1	276.53	0.0036162		2.1094E-06		
10.5	1	205.51	0.004866	0.005042	2.02741E-06	2.06127E-06	2.42825E-08
10.5	1	202.52	0.004938		2.05734E-06		
10.5	1	202.71	0.004933		2.05541E-06		
11	1	189.99	0.005263		2.09334E-06		
11	1	191.87	0.005212		2.07283E-06		
20	1	125.53	0.007966	0.007965	1.74255E-06	1.74221E-06	1.8365E-09
20	1	125.38	0.007976		1.74464E-06		
20	1	125.63	0.007960		1.74116E-06		
20	1	125.68	0.007957		1.74047E-06		
50.5	1	51.67	0.019354	0.019082	1.67662E-06	1.69247E-06	1.8172E-08
50	1	52.19	0.019161		1.67651E-06		
50	1	52.24	0.019142		1.67490E-06		
48.5	1	52.68	0.018983		1.71228E-06		
48.5	1	52.78	0.018947		1.70904E-06		
48.5	1	52.89	0.018907		1.70549E-06		
70	10	390.97	0.025577	0.025682	1.59853E-06	1.60506E-06	8.20939E-09
70	10	390.76	0.025591		1.59939E-06		
70	10	386.67	0.025862		1.61631E-06		
70	10	389.15	0.025697		1.60601E-06		
96	10	275.29	0.036325	0.036301	1.65539E-06	1.65427E-06	1.9924E-09
96	10	275.86	0.036250		1.65197E-06		
96	10	275.28	0.036327		1.65546E-06		

Gas : H_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability (cm3/cm2 sec cmHg)	Average Permeability	STDEV of Permeability
12	1	124.33	0.0080431	0.00801389	2.93228E-06	2.98491E-06	7.44288E-08
11.5	1	125.24	0.0079847		3.03754E-06		
49.5	1	21.72	0.046041	0.045440	4.06910E-06	4.03249E-06	6.4115E-08
49.5	1	22.23	0.044984		3.97575E-06		
49.5	1	22.37	0.044703		3.95086E-06		
49	1	21.84	0.045788		4.08803E-06		
49	1	21.89	0.045683		4.07870E-06		
98.5	10	116.16	0.086088	0.085046	3.82358E-06	3.78502E-06	6.9513E-08
98.5	10	117.62	0.085020		3.77612E-06		
98.5	10	118.97	0.084055		3.73327E-06		
98	10	114.99	0.086964		3.88219E-06		
98	10	120.33	0.083105		3.70991E-06		

Table B6 10wt%PEG+20wt%Activated carbon/Silicone rubber coated on polysulfone (10wt%PEG+20wt%Act.C./SIL/PS MMM)

Gas : C_3H_8

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability (cm^3/cm^2 sec.cmHg)	Average Permeability	STDEV of Permeability
16	10	585.03	0.0170931	0.01696816	4.67375E-06	4.63957E-06	4.91592E-08
16	10	596.64	0.0167605		4.5828E-06		
16	10	595.35	0.0167968		4.59273E-06		
16	10	582.68	0.0171621		4.6926E-06		
16	10	587.26	0.0170282		4.656E-06		
27	10	216.67	0.0461531	0.04618656	7.47826E-06	7.48368E-06	2.47755E-08
27	10	216.71	0.0461446		7.47688E-06		
27	10	215.5	0.0464037		7.51886E-06		
27	10	217.18	0.0460448		7.4607E-06		
39.5	10	136.17	0.0734376	0.07342864	8.13364E-06	8.13264E-06	4.56016E-09
39.5	10	136.12	0.0734646		8.13662E-06		
39.5	10	136.27	0.0733837		8.12767E-06		
47.5	10	88.51	0.112982	0.113146	1.04058E-05	1.04684E-05	4.3179E-08
47.5	10	87.81	0.113882		1.04888E-05		
47.5	10	87.89	0.113779		1.04793E-05		
47.5	10	88.4	0.113122		1.04188E-05		
47	10	88.45	0.113058		1.05237E-05		
47	10	88.63	0.112829		1.05023E-05		
47	10	88.99	0.112372		1.04598E-05		

Gas : C_3H_6

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability (cm^3/cm^2 sec.cmHg)	Average Permeability	STDEV of Permeability
16.5	10	1817.29	0.0055027	0.00546116	1.459E-06	1.44799E-06	9.655E-09
16.5	10	1845.13	0.0054197		1.43699E-06		
16.5	10	1836.6	0.0054448		1.44366E-06		
16.5	10	1825.67	0.0054774		1.4523E-06		
26.5	10	706.23	0.0141597	0.01415921	2.33761E-06	2.33753E-06	2.83735E-09
26.5	10	705.42	0.014176		2.34029E-06		
26.5	10	707.44	0.0141355		2.33361E-06		
26.5	10	705.93	0.0141657		2.3386E-06		
37	10	312.11	0.03204	0.03180977	3.78838E-06	3.76116E-06	2.27177E-08
37	10	314.67	0.0317793		3.75756E-06		
37	10	317.29	0.0315169		3.72653E-06		
37	10	314.33	0.0318137		3.76163E-06		
37	10	313.49	0.0318989		3.77171E-06		
48	10	227.49	0.043958	0.043920	4.00645E-06	4.00299E-06	7.8856E-09
48	10	227.63	0.043931		4.00399E-06		
48	10	227.3	0.043995		4.00980E-06		
48	10	228.33	0.043796		3.99171E-06		

Gas : CO_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability (cm^3/cm^2 sec.cmHg)	Average Permeability	STDEV of Permeability
6	1	161.56	0.0061897	0.00618356	4.51313E-06	4.50869E-06	3.77941E-08
6	1	160.46	0.0062321		4.54407E-06		
6	1	163.16	0.006129		4.46888E-06		
10	1	49.67	0.0201329	0.0201601	8.80783E-06	8.81974E-06	7.7564E-08
10	1	50.07	0.019972		8.73747E-06		
10	1	49.23	0.0203128		8.88656E-06		
10	1	49.09	0.0203707		8.9119E-06		
10	1	49.97	0.020012		8.75496E-06		
20	10	200.99	0.0497537	0.04759828	1.08833E-05	1.04118E-05	4.13936E-07
20	10	212.09	0.0471498		1.03137E-05		
20	10	207.32	0.0482346		1.0551E-05		
20	10	220.97	0.045255		9.8992E-06		

Gas : CO_2

Pressure (psia)	Volume (ml)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability (cm^3/cm^2 sec.cmHg)	Average Permeability	STDEV of Permeability
49.5	10	63.73	0.156912	0.157072	1.38680E-05	1.38822E-05	1.2008E-08
49.5	10	63.63	0.157159		1.38898E-05		
49.5	10	63.61	0.157208		1.38942E-05		
49.5	10	63.69	0.157011		1.38767E-05		

Gas : N_2

Pressure (psia)	Volume (ml)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability (cm^3/cm^2 sec.cmHg)	Average Permeability	STDEV of Permeability
10	1	388.51	0.002574	0.00256023	1.12606E-06	1.12006E-06	2.1521E-08
10	1	388.62	0.002573		1.12574E-06		
10	1	401.66	0.00249		1.08919E-06		
10	1	384.01	0.002604		1.13925E-06		
22.5	1	213.94	0.004674	0.00468124	9.08843E-07	9.1021E-07	9.7443E-09
22.5	1	214.19	0.004669		9.07782E-07		
22.5	1	209.81	0.004766		9.26733E-07		
22.5	1	214.41	0.004664		9.06851E-07		
22.5	1	215.84	0.004633		9.00842E-07		
40	1	124.41	0.008038	0.00803259	8.7912E-07	8.78535E-07	2.2097E-09
40	1	124.23	0.00805		8.80393E-07		
40	1	124.84	0.00801		8.76092E-07		
50	1	96.55	0.010357	0.010289	9.06235E-07	9.00289E-07	5.0745E-09
50	1	97.03	0.010306		9.01752E-07		
50	1	97.86	0.010219		8.94104E-07		
50	1	97.32	0.010275		8.99065E-07		
72	1	69.52	0.014384	0.014397	8.74019E-07	8.74775E-07	1.0686E-09
72	1	69.4	0.014409		8.75531E-07		
97.5	1	55.50	0.018018	0.017713	8.08473E-07	7.97338E-07	9.8629E-09
97.5	1	55.71	0.017950		8.05426E-07		
97.5	1	56.11	0.017822		7.99684E-07		
97	1	57.09	0.017516		7.90008E-07		
97	1	57.59	0.017364		7.83149E-07		
97	1	57.45	0.017406		7.85058E-07		
97	1	56.25	0.017778		8.01805E-07		
97	1	56.02	0.017851		8.05097E-07		

Gas : H_2

Pressure (psia)	Volume (ml)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability (cm^3/cm^2.sec.cmHg)	Average Permeability	STDEV of Permeability
9.5	1	132.25	0.007561	0.00767084	3.48212E-06	3.5325E-06	6.0767E-08
9.5	1	127.44	0.007847		3.61355E-06		
9.5	1	129.92	0.007697		3.54457E-06		
9.5	1	131.96	0.007578		3.48977E-06		
53	10	208.62	0.047934	0.047515	3.95668E-06	3.92212E-06	4.8885E-08
53	10	212.33	0.047097		3.88755E-06		
96	10	90.70	0.110254	0.110528	5.02441E-06	5.03693E-06	1.7715E-08
96	10	90.25	0.110803		5.04946E-06		

Table B7 15wt%PEG+20wt%Activated carbon/Silicone rubber coated on polysulfone (15wt%PEG+20wt%Act.C./SIL/PS MMM)

Gas : C_3H_8

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability (cm^3/cm^2 sec.cmHg)	Average Permeability	STDEV of Permeability
18.5	1	1980.43	0.000505	0.000487	1.19408E-07	1.15190E-07	5.9644E-09
18.5	1	2130.96	0.000469		1.10973E-07		
29.5	1	1029.45	0.000971	0.000971	1.44058E-07	1.44014E-07	1.9590E-09
29.5	1	1010.43	0.000990		1.46769E-07		
29.5	1	1039.86	0.000962		1.42615E-07		
29.5	1	1039.88	0.000962		1.42613E-07		
39	1	693.60	0.001442	0.00143141	1.61730E-07	1.60570E-07	1.0503E-09
39	1	702.49	0.001424		1.59683E-07		
39	1	699.80	0.001429		1.60297E-07		
48.5	1	430.69	0.002322	0.002264	2.09439E-07	2.04205E-07	4.2301E-09
48.5	1	444.78	0.002248		2.02804E-07		
48.5	1	439.58	0.002275		2.05203E-07		
48.5	1	452.43	0.002210		1.99375E-07		

Gas : C_3H_6

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability (cm^3/cm^2 sec.cmHg)	Average Permeability	STDEV of Permeability
30.5	1	582.63	0.001716	0.001720	2.46190E-07	2.46781E-07	4.3183E-09
30.5	1	583.16	0.001715		2.45966E-07		
30.5	1	592.78	0.001687		2.41975E-07		
30.5	1	587.20	0.001703		2.44274E-07		
30.5	1	592.50	0.001688		2.42089E-07		
30.5	1	562.01	0.001779		2.55223E-07		
30.5	1	569.75	0.001755		2.51756E-07		
30.5	1	579.79	0.001725		2.47396E-07		
30.5	1	582.69	0.001716		2.46165E-07		
41	1	354.75	0.002819	0.002792	3.00786E-07	2.97900E-07	3.2955E-09
41	1	357.95	0.002794		2.98097E-07		
41	1	364.89	0.002741		2.92427E-07		
41	1	358.03	0.002793		2.98030E-07		
41	1	355.49	0.002813		3.00159E-07		
51.5	1	259.61	0.003852	0.003841	3.27216E-07	3.26303E-07	1.3896E-09
51.5	1	260.67	0.003836		3.25885E-07		
51.5	1	259.32	0.003856		3.27582E-07		
51.5	1	261.76	0.003820		3.24528E-07		

Gas : CO_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability (cm^3/cm^2 sec.cmHg)	Average Permeability	STDEV of Permeability
6.5	1	1350.13	0.000741	0.000749	4.98511E-07	5.03982E-07	7.7377E-09
6.5	1	1321.13	0.000757		5.09453E-07		
10.5	1	608.13	0.001644	0.001586	6.85137E-07	6.76987E-07	7.0048E-09
10.5	1	618.75	0.001616		6.73378E-07		
10	1	653.59	0.001530		6.69357E-07		
10	1	643.29	0.001555		6.80074E-07		
20	1	66.99	0.014928	0.015074	3.26530E-06	3.29727E-06	4.4297E-08
20	1	65.29	0.015316		3.35032E-06		
20	1	66.82	0.014966		3.27361E-06		
20	1	65.49	0.015270		3.34009E-06		
20	1	67.16	0.014890		3.25704E-06		
49.5	10	125.83	0.079472	0.078612	7.02383E-06	6.94777E-06	5.6084E-08
49.5	10	127.70	0.078309		6.92097E-06		
49.5	10	127.99	0.078131		6.90529E-06		
49.5	10	128.12	0.078052		6.89829E-06		
49.5	10	126.43	0.079095		6.99050E-06		

Gas : N_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability (cm^3/cm^2 sec.cmHg)	Average Permeability	STDEV of Permeability
9.5	1	2121.78	0.000471	0.000473	2.17040E-07	2.17604E-07	7.9759E-10
9.5	1	2110.81	0.000474		2.18168E-07		
20	1	736.57	0.001358	0.001346	2.96975E-07	2.94493E-07	2.8242E-09
20	1	750.61	0.001332		2.91420E-07		
20	1	741.29	0.001349		2.95084E-07		
50	1	273.05	0.003662	0.003663	3.20443E-07	3.20490E-07	6.2124E-11
50	1	272.95	0.003664		3.20561E-07		
50	1	273.03	0.003663		3.20467E-07		
72	1	196.61	0.005086	0.005082	3.09047E-07	3.09496E-07	1.3157E-09
72	1	195.39	0.005118		3.10977E-07		
71.5	1	198.36	0.005041		3.08463E-07		
92.5	1	160.29	0.006239	0.006328	2.95063E-07	3.01700E-07	6.4473E-09
92	1	155.74	0.006421		3.05334E-07		
92	1	154.43	0.006475		3.07924E-07		
92	1	153.83	0.006501		3.09125E-07		
91	1	162.29	0.006162		2.96231E-07		
91	1	162.13	0.006168		2.96523E-07		

Gas : H_2

Pressure (psia)	Volume (ml.)	time (sec)	Flow rate (ml./sec)	Average flow rate	Permeability (cm^3/cm^2 sec.cmHg)	Average Permeability	STDEV of Permeability
14.5	1	160.40	0.006234	0.005921	1.88101E-06	1.88390E-06	4.0843E-09
13	1	178.36	0.005607		1.88679E-06		
48	1	26.95	0.037106	0.036527	3.38192E-06	3.32913E-06	5.2714E-08
48	1	27.73	0.036062		3.28679E-06		
48	1	27.07	0.036941		3.36693E-06		
48	1	27.78	0.035997		3.28088E-06		
97	10	140.89	0.070977	0.072793	3.20119E-06	3.28890E-06	9.8292E-08
97	10	137.91	0.072511		3.27036E-06		
96.5	10	133.53	0.074890		3.39514E-06		

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