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APPENDIX III : The O_2 gas permeability of PI, PI-clay (3 wt%), and PI-clay (6 wt%) with various thickness of 15, 25, and 35 μm

(Figure 4.9)

Samples		N(slope)		ermeability (cm^3/m^2.day.ba			
		#1	#2	#1	#2	Mean	SD
15 μm	PI	528.69	571.83	94.58	87.45	91.02	5.05
	PI-CLAY (3%)	1785.2	1721.4	28.01	29.05	28.53	0.73
	PI-CLAY (6%)	1953.7	1880.2	25.60	26.60	26.10	0.71
25 μm	PI	1047.4	1223.1	47.74	40.88	44.31	4.85
	PI-CLAY (3%)	2141.8	2236.7	23.35	22.36	22.85	0.70
	PI-CLAY (6%)	2559.4	2206.5	19.54	22.66	21.10	2.21
30 μm	PI	1700.2	1510.2	29.41	33.11	31.26	2.62
	PI-CLAY (3%)	2426.4	2996.3	20.61	16.69	18.65	2.77
	PI-CLAY (6%)	3426.4	3363.8	14.59	14.87	14.73	0.19

APPENDIX IV : The resistivity of polyimide and polyimide-clay hybrid with various clay contents

(Figure 4.11)

Samples	Temp	Electrical Resistivity (Ω.cm)			
		#1	#2	Average	SD
PI	50	6666666667	6976744186	6821705426	219257917
	100	549450549	519031142	534240846	21509769
	150	44247788	50505051	47376419	4424553
	200	12096774	8356546	10226660	2644741
	250	3039514	2918288	2978901	85720
	300	1509814	1943005	1726409	306313
	350	1336303	1084991	1210647	177704
PI-Clay 3%	50	11111111111	12500000000	11805555556	982092752
	100	602409639	581395349	591902494	14859347
	150	75566751	72992701	74279726	1820128
	200	9966777	11363636	10665207	987728
	250	3141361	3802281	3471821	467341
	300	1827040	1915709	1871375	62698
	350	1211143	1366743	1288943	110026
PI-Clay 6%	50	17647058824	16666666667	17156862745	693241942
	100	641025641	710900474	675963057	49408968
	150	107526882	82417582	94972232	17754956
	200	9615385	12048193	10831789	1720255
	250	4137931	3926702	4032316	149362
	300	2049180	2286585	2167883	167871
	350	1350135	1477105	1413620	89781
PI-Clay 9%	50	25000000000	30000000000	27500000000	3535533906
	100	967741935	833333333	900537634	95041234
	150	150753769	138888889	144821329	8389737
	200	9287926	7389163	8338544	1342628
	250	5847953	5093379	5470666	533565
	300	2666667	2371542	2519104	208685
	350	1364877	1525165	1445021	113341

APPENDIX V : Shear strength between polyimide-clay hybrid and silicon wafer

(1) Film thickness 15 μm

(Figure 4.14)

Samples	Shear Strength (MPa)			
	#1	#2	Average	SD
PI	7.99	8.66	8.33	0.47
PI-Clay (3%)	8.19	8.64	8.41	0.32
PI-Clay (6%)	9.50	10.04	9.77	0.38
PI-Clay (9%)	10.17	10.55	10.36	0.27

(2) Film thickness 25 μm

(Figure 4.14)

Samples	Shear Strength (MPa)			
	#1	#2	Average	SD
PI	7.47	8.59	0.79	0.47
PI-Clay (3%)	8.22	8.55	0.23	0.32
PI-Clay (6%)	9.47	10.00	0.37	0.38
PI-Clay (9%)	10.42	10.55	0.09	0.27

(3) Film thickness 35 μm

(Figure 4.14)

Samples	Shear Strength (MPa)			
	#1	#2	Average	SD
PI	8.03	8.64	8.33	0.43
PI-Clay (3%)	8.38	8.62	8.50	0.17
PI-Clay (6%)	9.60	8.93	9.26	0.47
PI-Clay (9%)	10.59	10.82	10.70	0.16

CURRICULUM VITAE

Name : Ms. Orasa Khayankarn

Date of Birth : 28 August 1976

Nationality : Thai

University Education:

1994-1998 Bachelor Degree of Science in Chemistry,
Second Class Honor, Prince of Songkla University