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APPENDICES

1. Data for Friedman's plot to determine the activation energy of PP at various heating rates

10°C/min		20°C/min		30°C/min	
ln (dα/dt)	1/T (K)	ln (dα/dt)	1/T (K)	ln (dα/dt)	1/T (K)
-13.8134	0.001804	-12.1427	0.001733	-10.6957	0.001659
-13.0517	0.001785	-11.5348	0.001716	-10.2412	0.001643
-12.6121	0.001766	-10.8912	0.001699	-9.8120	0.001627
-11.8307	0.001747	-10.2931	0.001682	-9.3521	0.001611
-11.0889	0.001729	-9.8647	0.001666	-8.5937	0.001596
-10.3422	0.001711	-9.3215	0.00165	-7.8933	0.001581
-9.8737	0.001693	-8.8851	0.001634	-7.3621	0.001566
-9.3623	0.001676	-8.3457	0.001619	-6.8712	0.001551
-8.9469	0.001659	-7.6391	0.001604	-6.2134	0.001537
-8.3184	0.001643	-7.1171	0.001589	-5.8667	0.001523
-7.8212	0.001627	-6.6781	0.001574	-5.3178	0.001509
-7.1839	0.001611	-6.2235	0.00156	-4.9375	0.001495
-6.6310	0.001596	-5.7175	0.001546	-4.2412	0.001482
-5.9737	0.001581	-5.0684	0.001532	-3.8924	0.001469
-5.3448	0.001566	-4.8367	0.001518	-3.2844	0.001456
-4.8321	0.001551	-4.2023	0.001505	-2.9827	0.001444
-4.3494	0.001537	-3.7071	0.001492	-2.6157	0.001432
-3.8836	0.001523	-3.1098	0.001479	-2.1423	0.00142

2. Data for Ozawa's plot to determine the activation energy of PP at various %conversion

ln(β)	1/T (K)			
	80%	60%	40%	20%
3.401197	0.001309	0.001323	0.001336	0.001359
2.995732	0.001327	0.001343	0.001358	0.001381
2.302585	0.001343	0.001357	0.001369	0.001391

3. Data for Friedman's plot to determine the activation energy of PP at various %starch content

5%		10%		15%		20%	
ln (dα/dt)	1/T (K)	ln (dα/dt)	1/T (K)	ln (dα/dt)	1/T (K)	ln (dα/dt)	1/T (K)
-6.8165	0.001466	-6.6237	0.001466	-6.9842	0.001479	-6.7537	0.001479
-6.5492	0.001454	-6.2142	0.001453	-6.5216	0.001467	-6.2418	0.001466
-6.2761	0.001442	-5.8927	0.001441	-6.1467	0.001454	-5.7591	0.001454
-5.9838	0.001430	-5.5412	0.001429	-5.7608	0.001442	-5.3434	0.001442
-5.6563	0.001418	-5.1853	0.001417	-5.3584	0.00143	-4.9823	0.00143
-5.2755	0.001407	-4.8749	0.001406	-5.0532	0.001419	-4.7069	0.001418
-4.8710	0.001395	-4.5513	0.001395	-4.7305	0.001407	-4.4180	0.001407
-4.4912	0.001384	-4.2291	0.001384	-4.3882	0.001396	-4.0141	0.001396
-3.9850	0.001374	-3.8730	0.001373	-4.0489	0.001385	-3.6518	0.001385

4. Data for Friedman's plot to determine the activation energy of PP at various %cellulose content

5%		10%		15%		20%	
ln (dα/dt)	1/T (K)	ln (dα/dt)	1/T (K)	ln (dα/dt)	1/T (K)	ln (dα/dt)	1/T (K)
0.001453	-6.3917	0.001454	-6.7165	0.001491	-7.4691	0.001466	-6.4729
0.001441	-6.1153	0.001441	-6.4088	0.001479	-7.2276	0.001454	-6.1919
0.001429	-5.8175	0.00143	-6.0577	0.001466	-6.9782	0.001442	-5.8812
0.001417	-5.4808	0.001418	-5.7136	0.001454	-6.6628	0.00143	-5.5186
0.001406	-5.1095	0.001406	-5.2874	0.001442	-6.3160	0.001418	-5.1772
0.001395	-4.7107	0.001395	-4.8443	0.00143	-5.8879	0.001407	-4.7991
0.001384	-4.3345	0.001385	-4.3857	0.001418	-5.5497	0.001396	-4.3559
0.001373	-3.8827	0.001454	-6.7165	0.001406	-5.0965	0.001385	-3.9521

5. Data for Friedman's plot to determine the activation energy of starch at various %additive content

0%		5%		10%		15%		20%	
ln (dα/dt)	1/T (K)	ln (dα/dt)	1/T (K)	ln (dα/dt)	1/T (K)	ln (dα/dt)	1/T (K)	ln (dα/dt)	1/T (K)
0.00181	-10.4146	0.00180	-9.0058	0.00183	-10.5184	0.00181	-8.8989	0.00179	-7.9310
0.00179	-9.5884	0.00178	-8.4263	0.00181	-9.8013	0.00179	-8.1677	0.00177	-7.1852
0.00177	-8.6039	0.00177	-7.7666	0.00179	-9.0320	0.00177	-7.2680	0.00175	-6.5357
0.00175	-7.7735	0.00175	-7.2030	0.00177	-8.0488	0.00175	-6.8344	0.00173	-6.0605
0.00173	-7.2545	0.00173	-7.0154	0.00175	-7.3315	0.00173	-5.9652	0.00172	-5.6236

6. Data for Friedman's plot to determine the activation energy of cellulose at various %additive content

0%		5%		10%		15%		20%	
ln (dα/dt)	1/T (K)	ln (dα/dt)	1/T (K)	ln (dα/dt)	1/T (K)	ln (dα/dt)	1/T (K)	ln (dα/dt)	1/T (K)
0.00169	-7.0229	0.00173	-7.4140	0.00172	-7.8129	0.00171	-7.2384	0.00172	-7.8129
0.00167	-6.5012	0.00172	-7.1604	0.00170	-7.2690	0.00170	-6.8842	0.00170	-7.2690
0.00166	-5.9782	0.00170	-6.8644	0.00168	-7.2194	0.00168	-6.4562	0.00168	-7.2194
0.00164	-5.4845	0.00168	-6.6045	0.00167	-6.9116	0.00166	-6.1006	0.00167	-6.9116
0.00162	-5.0277	0.00167	-6.0173	0.00165	-6.4730	0.00165	-5.9042	0.00165	-6.4730

7. Data to determine the reaction order and pre-exponential factor of PP at various %starch content

0%		5%		10%		15%		20%	
ln(1-α)	ln(dα/dt)/ exp(-E/RT)	ln(1-α)	ln(dα/dt)/ exp(-E/RT)	ln(1-α)	ln(dα/dt)/ exp(-E/RT)	ln(1-α)	ln(dα/dt)/ exp(-E/RT)	ln(1-α)	ln(dα/dt)/ exp(-E/RT)
-0.1708	30.10	-0.1473	32.15	-0.1257	35.21	-0.0523	36.02	-0.0095	36.03
-0.1798	29.96	-0.1500	32.08	-0.1346	34.95	-0.0549	35.97	-0.0119	35.96
-0.1904	29.92	-0.1533	32.06	-0.1454	34.92	-0.0584	35.94	-0.0149	35.92
-0.2033	29.88	-0.1577	32.04	-0.1586	34.85	-0.0626	35.91	-0.0197	35.88
-0.2191	29.84	-0.1633	32.02	-0.1760	34.81	-0.0681	35.88	-0.0260	35.84
-0.2388	29.81	-0.1709	32.01	-0.1983	34.75	-0.0755	35.85	-0.0354	35.81
-0.2639	29.76	-0.1818	31.98	-0.2275	34.71	-0.0860	35.82	-0.0493	35.76
-0.2967	29.72	-0.1977	31.96	-0.2668	34.65	-0.1020	35.79	-0.0683	35.72
-0.3413	29.68	-0.2216	31.94	-0.3212	34.62	-0.1251	35.76	-0.0959	35.68
-0.4051	29.64	-0.2583	31.92	-0.397	34.55	-0.1608	35.73	-0.1378	35.64

8. Data to determine the reaction order and pre-exponential factor of PP at various %cellulose content

0%		5%		10%		15%		20%	
ln(1-α)	ln(dα/dt)/ exp(-E/RT)	ln(1-α)	ln(dα/dt)/ exp(-E/RT)	ln(1-α)	ln(dα/dt)/ exp(-E/RT)	ln(1-α)	ln(dα/dt)/ exp(-E/RT)	ln(1-α)	ln(dα/dt)/ exp(-E/RT)
-0.1708	30.01	-0.2674	34.03	-0.1426	37.03	-0.0610	39.02	-0.0439	41.04
-0.1798	29.96	-0.2866	33.89	-0.1450	36.98	-0.0627	38.97	-0.0468	40.97
-0.1904	29.92	-0.3096	33.78	-0.1478	36.96	-0.0649	38.95	-0.0501	40.94
-0.2033	29.88	-0.3375	33.68	-0.1514	36.94	-0.0680	38.93	-0.0543	40.91
-0.2191	29.84	-0.3717	33.57	-0.1561	36.92	-0.0724	38.90	-0.0599	40.88
-0.2388	29.80	-0.4141	33.47	-0.1625	36.90	-0.0786	38.88	-0.0678	40.85
-0.2639	29.76	-0.4681	33.36	-0.1717	36.88	-0.0876	38.86	-0.0789	40.82
-0.2967	29.72	-0.5383	33.25	-0.1854	36.86	-0.1014	38.83	-0.0953	40.79
-0.3413	29.68	-0.6327	33.15	-0.2061	36.84	-0.1212	38.81	-0.1202	40.76
-0.4051	29.64	-0.7639	33.04	-0.2385	36.82	-0.1530	38.79	-0.1593	40.73

9. Data to determine product yields of PP composites in various compositions

Sample	Yield%		
	char	gas	Liquid
PP pure	0	33.9	66.1
PP05ST	0.43	35.7	63.9
PP10ST	0.9	36.4	62.7
PP15ST	1.5	36.7	61.8
PP20ST	2.7	37.8	59.5
PP05MC	0.21	35.7	64.1
PP10MC	0.74	36.3	63.0
PP15MC	1.44	36.6	62.0
PP20MC	2.32	36.9	60.8

10. Area of each peak of chromatogram to determine the product yield% of PP/STR

Products	Peak area of each product				
	PP	5%STR	10%STR	15%STR	20%STR
Propane	4043.834	3994.519	4093.149	4241.094	4389.039
Propene	9764.380	10158.91	10257.530	10356.161	10504.106
Butane	5424.656	5868.491	5967.121	6065.751	6164.381
Isobutane	246.575	394.520	493.151	641.096	838.356
1-butene	5079.450	5326.025	5424.656	5523.286	5621.916
Pentane	2416.437	2564.383	2613.698	2909.588	3008.218
Isopentane	838.356	1035.616	1134.246	1183.561	1282.191
2-methyl-1-butene	5375.340	5572.601	5671.231	5819.176	5917.806
1-pentene	1084.931	1084.931	1282.191	1380.821	1528.767
2-methyl pentane	1578.082	1726.027	1873.972	1923.287	2120.547
2-methyl-1-pentene	5868.491	6164.381	6312.326	6460.272	6608.217
Hexane	147.945	295.890	345.205	493.151	591.781
1-hexene	5819.176	6115.066	6213.696	6263.011	6361.641
benzene	0.000	197.260	246.575	394.520	493.151
2,4-dimethyl-1-pentene	7693.148	7298.627	7249.312	7101.367	6854.792
Heptane	5178.080	4980.82	4734.245	4635.615	4487.67
1-heptene	15682.186	15287.67	15238.350	15041.090	14843.83
4-methyl heptane	6657.532	6460.272	6410.957	6263.011	6115.066
octane	1183.561	1084.931	1035.616	887.671	690.4107
2-methyl-1-octene	1430.136	1183.561	1134.246	986.301	838.3559
2-methyl-4-octane	13561.639	13019.17	12821.913	12772.598	12673.97
2,4-dimethyl-1-heptene	5030.135	4882.19	4783.560	4635.615	4487.67
Cumene	0.000	147.945	197.260	295.890	443.8355
2,4,6-trimethyl-1-heptene	10701.366	10405.48	10257.530	10010.955	9912.325
2,4,6-trimethyl-1,6-heptadiene	5128.765	5178.08	4980.820	4832.875	4635.615
2.6-dimethyl-nonane	7791.778	7495.888	7446.573	7249.312	7150.682
2,4,6-trimethyl-1-nonene	12920.543	12673.97	12378.078	12230.132	12032.871

11. Area of each peak of chromatogram to determine the product yield% of PP/MCC

Products	Peak area of each product				
	PP	5%MCC	10%MCC	15%MCC	20%MCC
Propane	4043.834	4043.834	4142.464	4290.409	4339.724
Propene	9764.380	10109.585	10208.215	10405.476	10553.421
Butane	5424.656	5671.231	5819.176	6065.751	6213.696
Isobutane	246.575	690.411	739.726	789.041	936.986
1-butene	5079.450	5227.395	5375.340	5473.971	5621.916
Pentane	2416.437	2663.013	2663.013	2810.958	3057.533
Isopentane	838.356	936.986	1035.616	1183.561	1380.821
2-methyl-1-butene	5375.340	5523.286	5720.546	5819.176	6016.436
1-pentene	1084.931	1134.246	1232.876	1282.191	1430.136
2-methyl pentane	1578.082	1676.712	1824.657	2021.917	2071.232
2-methyl-1-pentene	5868.491	6016.436	6065.751	6164.381	6312.326
Hexane	147.945	246.575	394.520	542.466	641.096
1-hexene	5819.176	6164.381	6213.696	6312.326	6361.641
benzene	0.000	246.575	295.890	345.205	394.520
2,4-dimethyl-1-pentene	7693.148	7495.888	7545.203	7298.627	7150.682
Heptane	5178.080	4882.190	4832.875	4684.930	4536.985
1-heptene	15682.186	15336.981	15238.350	14942.460	14695.885
4-methyl heptane	6657.532	6509.587	6558.902	6361.641	6263.011
octane	1183.561	1134.246	936.986	789.041	690.411
2-methyl-1-octene	1430.136	1134.246	1035.616	986.301	838.356
2-methyl-4-octane	13561.639	13068.488	13019.173	12920.543	12772.598
2,4-dimethyl-1-heptene	5030.135	4832.875	4635.615	4536.985	4290.409
Cumene	0.000	197.260	147.945	394.520	493.151
2,4,6-trimethyl-1-heptene	10701.366	10454.791	10306.845	10158.900	10060.270
2,4,6-trimethyl-1,6-heptadiene	5128.765	5079.450	4882.190	4635.615	4438.355
2,6-dimethyl-nonane	7791.778	7545.203	7495.888	7347.942	7150.682
2,4,6-trimethyl-1-nonene	12920.543	12575.338	12230.132	12082.187	11884.927

CURRICULUM VITAE

Mr. Eakkapon Aramrusmevanich was born in Bangkok, Thailand, on October 21, 1982. He received a Bachelor Degree of Science in Chemistry, Mahidol University in 2004. Then, he continued his post-graduate study in Applied Polymer Science and Textile Technology Major at the Department of Materials Science, Faculty of Science, Chulalongkorn University in 2004, and ultimately completed the degree of Master of Science in Applied Polymer Science and Textile Technology in May 2006.