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APPENDIX

A1. Calculation of crystallinity by using DSC

The crystallinity of nanocomposite polypropylene sample were calculated by using the following equation.

$$\text{Crystallinity (\%)} = \left[\frac{\Delta H_f}{\Delta H_f^*} \right] \times 100$$

where ΔH_f is the heat of fusion of the sample (J/g) determined from DSC curve and ΔH_f^* is the heat of fusion of the 100 % crystalline polypropylene.

A2. Data for the interlayer spacing of modified silicate clay for the influence of stirring time on the grafting condition

Stirring time (min)	Interlayer spacing °A
10	17.9
30	17.6
60	17.85
90	18.3
120	18.0

A3. Data for the interlayer spacing of modified silicate clay for the influence of drying time on the grafting condition

Drying time (hr)	Interlayer spacing °A
12	18.2
24	17.82
48	17.9
72	17.94

A4. Data for the interlayer spacing of modified silicate clay for the influence of silane concentration on the grafting condition

wt % silane concentration	Interlayer spacing °A
0	12.39
2	12.44
5	12.91
16	12.87
25	17.9
30	16.9
40	17.3

A5. Data for the percent crystallinity of polypropylene nanocomposite as a function of filler content

wt % Filler content	% Crystallinity
0	50.7
10	48.67
20	43.68
30	42.44

A6. Data for the melting temperature of polypropylene nanocomposite as a function of filler content

wt % Filler content	T_m °C
0	170.4
10	169.9
20	166.6
30	167.8

A7. Data of tensile modulus for the effect of filler content at 26 °C

wt % filler	10 wt % clay content		60 wt % clay content	
	avg.	std.	avg.	std.
0	1.98	0.26	1.98	0.26
1	13.31	1.48	15.84	3.02
2	14.24	4.72	15.96	1.99
5	15.81	2.02	17.95	4.45
10	16.42	1.65	18.67	5.51
20	17.38	5	20.17	3.73
30	18.25	1.46	22.84	1.7

A8. Data of tensile strength for the effect of filler content at 26 °C

wt % filler	10 wt % clay content		60 wt % clay content	
	avg.	std.	avg.	std.
0	31.04	0.51	31.04	0.51
1	31.87	0.4	34.44	0.35
2	31.99	0.82	34.8	0.42
5	33.1	0.4	35.34	1.46
10	42.85	0.55	57.5	2.6
20	50.03	2.82	63.84	1.87
30	53.48	4.04	68.32	2.43

A9. Data of flexural modulus for the effect of filler content at 26 °C

wt % filler	10 wt %clay		60 wt %clay	
	avg.	std.	avg.	std.
0	1.226	0.077	1.226	0.077
1	1.347	0.0534	1.384	0.0688
2	1.436	0.1143	1.45	0.0288
5	1.454	0.1832	1.524	0.1266
10	1.523	0.1156	1.621	0.0308
20	1.584	0.0768	1.702	0.125
30	1.633	0.1152	1.748	0.0947

A10. Data of flexural strengths for the effect of filler content at 26 °C

wt % filler	10 wt %clay		60 wt %clay	
	avg.	std.	avg.	std.
0	44.41	1.61	44.41	1.61
1	54.52	1.61	53.76	1.47
2	54.42	1.75	55.85	1.54
5	55.4	1.37	59.58	4.54
10	56.07	3.87	65.07	2.24
20	59.91	2.54	64.17	6.00
30	60.83	2.27	66.26	1.47

A11. Data of impact strength for the effect of filler content at 26 °C

wt % filler	10 wt %clay		60 wt %clay	
	avg.	std.	avg.	std.
0	32.57	2.07	32.57	2.07
1	31.23	3.25	30.78	2.71
2	31.24	2.98	29.35	1.44
5	29.82	2.08	28.94	4.1
10	31.26	2.94	27.24	3.46
20	29.41	1.96	25.06	4.75
30	27.68	3.04	22.34	2.18

A12. Data of tensile modulus for the effect of clay content at 26 °C

wt % clay	10 wt %filler		30 wt %filler	
	avg.	std.	avg.	std.
0	1.98	0.26	1.98	0.26
1	13.31	1.18	14.00	1.59
2	14.15	3.24	14.57	1.07
5	15.53	2.68	16.48	0.69
10	16.42	1.65	18.05	0.52
20	17.89	1.72	20.44	0.37
40	17.99	3.14	22.52	2.83
60	19.43	3.68	24.62	2.65

A13. Data of tensile strength for the effect of clay content at 26 °C

wt % clay	10 wt %filler		30 wt %filler	
	avg.	std.	avg.	std.
0	31.04	0.51	31.04	0.51
1	31.1	0.37	32	1.42
2	32	1.94	32.54	0.45
5	33.09	1.20	34.8	0.34
10	42.85	0.55	45.15	1.10
20	53.31	2.13	58.52	1.04
40	53.89	4.07	62.71	3.95
60	64.35	3.70	75.15	6.79

A14. Data of flexural modulus for the effect of clay content at 26 °C

wt % clay	10 wt %filler		30 wt %filler	
	avg.	std.	avg.	std.
0	1.226	0.0770	1.226	0.0770
1	1.414	0.0387	1.458	0.0552
2	1.481	0.1104	1.470	0.0269
5	1.489	0.1024	1.483	0.0436
10	1.523	0.1156	1.589	0.1097
20	1.568	0.0423	1.633	0.0353
40	1.602	0.0176	1.642	0.0225
60	1.628	0.1101	1.694	0.0516

A15. Data of flexural strength for the effect of clay content at 26 °C

wt % clay	10 wt %filler		30 wt %filler	
	avg.	std.	avg.	std.
0	44.41	1.61	44.41	1.61
1	53.79	0.55	56.83	0.92
2	55.22	1.18	58.09	2.49
5	56.23	1.56	60.03	0.13
10	56.07	1.39	60.38	1.87
20	57.57	1.37	63.58	2.45
40	58.96	1.37	64.02	0.35
60	59.64	2.89	22.34	1.36

A16. Data of impact strength for the effect of clay content at 26 °C

wt % clay	10 wt %filler		30 wt %filler	
	avg.	std.	avg.	std.
0	32.57	2.07	32.57	2.07
1	31.57	3.85	31.2	6.16
2	31.47	2.22	31.12	1.96
5	30.03	3.1	29.2	2.22
10	31.26	2.94	28.35	2.82
20	29.63	5.65	26.1	4.01
40	25.68	1.67	24.5	3.34
60	24.32	3.22	22.34	2.18

A17. Data of tensile modulus for the effect of silane concentration
at 26 °C

wt %silane	10 wt % clay		60 wt %clay	
	avg.	std.	avg.	std.
0	11.58	0.71	11.27	1.8
2	16.42	2.47	18.67	2.26
5	16.83	0.6	18.48	1.07
10	13.3	0.28	14.38	0.89
20	14.1	1.61	14.27	0.7
30	12.03	1.06	13.98	1.51

A18. Data of tensile strength for the effect of silane concentration
at 26°C

wt %silane	10 wt % clay		60 wt %clay	
	avg.	std.	avg.	std.
0	36.04	1.71	38.42	0.83
2	38.85	0.43	40.14	0.98
5	39.45	1.68	42.02	4.55
10	38.62	2.53	43.96	1.59
20	35.64	2.88	45.49	5.28
30	35.95	2.43	44.97	1.24

A19. Data of flexural modulus for the effect of silane concentration at 26 °C

wt %silane	10 wt % clay		60 wt %clay	
	avg.	std.	avg.	std.
0	1.297	0.0384	1.421	0.1097
2	1.523	0.1156	1.621	0.0308
5	1.498	0.0512	1.634	0.0271
10	1.229	0.1279	1.302	0.0583
20	1.241	0.0765	1.293	0.0832
30	1.167	0.0995	1.311	0.0276

A20. Data of flexural strength for the effect of silane concentration at 26 °C

wt %silane	10 wt % clay		60 wt %clay	
	avg.	std.	avg.	std.
0	54.21	2.47	58.57	5.55
2	56.076	1.39	65.07	2.24
5	57.57	3.41	65.95	2
10	56.53	3.19	65.07	1.62
20	57.86	2.2	62.32	3.13
30	57.02	1.68	60.64	4.78

A21. Data of impact strength for the effect of silane concentration
at 26 °C

wt %silane	10 wt % clay		60 wt %clay	
	avg.	std.	avg.	std.
0	26.75	4.31	24.5	3.34
2	31.26	2.94	27.24	3.46
5	33.68	3.63	31.6	2.85
10	32.52	3.41	30.62	4.31
20	30.77	1.9	26.48	3.67
30	30.21	4.63	22.85	1.63

A22. Data for slow crack growth testing results

Time (min)	pure PP	10 wt %filler		30 wt %
		avg.	std.	
1440	0	0	-	0
2880	0	0	-	0
4320	330	330	-	0
5760	528	330	-	132
7200	990	462	-	264
8640	1320	594	93.34	396
10080	3168	792	-	528
11520	3696	759	233.35	594
12960	5148	660	-	660
14400	7920	660	-	-
15840	-	1016	410.83	1452
17280	-	726	-	1848
18720	-	726	-	2376
20160	-	1049	364.16	-
21600	-	1307	-	3564
23040	-	1307	-	4488
24480	-	1379	-	-
26040	-	1544	102.53	-
27360	-	1586	335.87	-
28800	-	1600	-	-

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