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APPENDICES

A. **Tensile and impact testing of PP3/2/y/10 composites to study the effect of the old method and the new method**

The tensile properties were studied using the Instron Universal Testing Machine model 4206 in the extension mode. Young's modulus, tensile strength at yield, percent elongation at yield and percent elongation at break were determined according to ASTM D638-91. The testing temperature was 26°C. The specimen were machined into dogbone shapes following the ASTM D638-91 type 1 for specimen dimensions, the width of narrow section was 13 mm and the gage length was 50 mm. The tests were performed at a crosshead speed of 50 mm/min with a 5 kN load cell.

Izod impact testing was done at 26°C with a notch specimen according to the specification of ASTM D256-92. The specimen was held as a vertical cantilever beam and was broken by a single swing of the pendulum with the line of initial contact at a fixed distance from the specimen clamp. By using Izod type, Zwick, the impact pendulum was a 2.7 joule pendulum. The specimens were cut into 12.75×63.5 mm and 2.5 mm notch.

A1. Data of Young's modulus of PP3/2/y/10 composites at 26°C prepared from the old method and the new method as shown in Figure 3.1

A1.1 The Old Method

Clay content (%)	Young's modulus (MPa)					Mean	Std.
	1	2	3	4	5		
0	1923.69	3582.23	3037.91	4513.35		3264.29	1081.62
2	3636.16	3550.69	3432.16	3179.97	3719.85	3503.77	209.994
5	3102.80	3540.56	3235.53	4557.72	4520.59	3791.44	700.899
10	3706.33	3452.35	3556.98			3571.89	127.644
20	3815.78	3787.73	4387.72	4078.72		4017.49	279.459
40	6538.90	6791.34	6429.34	4236.19	4635.67	5726.28	1193.62
60	5300.39	5675.66	7447.41			6141.15	1146.70
80	8092.62	5559.29				6825.96	1791.33

A1.2 The New Method

Clay content (%)	Young's modulus (MPa)					Mean	Std.
	1	2	3	4	5		
0	1923.69	3582.23	3037.91	4513.35		3264.29	1081.62
2	3076.98	3947.78	4487.99	4650.75	5248.32	4282.36	817.915
5	4080.91	4951.32				4516.11	615.477
10	5674.14	3898.86	3948.63			4507.21	1010.89
20	5240.03	3892.86	8202.09	5899.44	2928.52	5232.59	2022.76
40	6940.56	6078.43	5020.45	5261.08		5825.13	870.633
60	7529.84	6010.49	4327.01	8086.35		6488.42	1687.01
80	6491.78	10512	6026.44			7676.74	2466.40

A2. Data of tensile strength at yield of PP3/2/y/10 composites at 26°C prepared from the old method and the new method as shown in Figure 3.2

A2.1 The Old Method

Clay content (%)	Tensile strength at yield (MPa)					Mean	Std.
	1	2	3	4	5		
0	38.19	38.79	37.63	37.77	38.09	38.09	0.45
2	36.25	38.15	37.67			37.35	0.98
5	37.99	37.58	36.50			37.36	0.77
10	37.61	36.10				36.86	1.06
20	35.33	36.75	39.08	37.59		37.19	1.56
40	35.49	37.56				36.53	1.46
60	35.23	34.69				34.96	0.37
80	34.97	32.27	34.29			33.85	1.40

A2.2 The New Method

Clay content (%)	Tensile strength at yield (MPa)					Mean	Std.
	1	2	3	4	5		
0	38.19	38.79	37.63	37.77	38.09	38.09	0.45
2	38.73	36.99	38.52	38.66		38.22	0.83
5	38.53	37.61	36.26	38.95		37.84	1.19
10	37.63	38.23	38.35			38.07	0.38
20	37.79	38.28	37.91			37.99	0.25
40	33.89	35.02				34.45	0.79
60	32.30	33.69				33.00	0.98
80	30.87	31.58				31.23	0.50

A3. Data of percent elongation at yield of PP3/2/v/10 composites at 26°C prepared from the old method and the new method as shown in Figure 3.3

A3.1 The Old Method

Clay content (%)	Percent elongation at yield (%)					Mean	Std.
	1	2	3	4	5		
0	6.60	6.70	7.00	6.70	7.00	6.80	0.18
2	5.80	5.80	5.90	7.00		6.12	0.58
5	6.20	5.10	6.10	5.40	5.00	5.56	0.55
10	5.90	6.00	5.10	5.70		5.67	0.40
20	5.30	5.40	5.40	5.70		5.45	0.17
40	3.80	3.80	4.60			4.06	0.46
60	3.70	3.90				3.80	0.14
80	3.80	3.50	4.10			3.80	0.30

A3.2 The New Method

Clay content (%)	Percent elongation at yield (%)					Mean	Std.
	1	2	3	4	5		
0	6.60	6.70	7.00	6.70	7.00	6.80	0.18
2	6.00	5.70	6.10	6.20		6.00	0.21
5	5.8.0	5.90				5.85	0.07
10	6.00	6.40	5.70			6.03	0.35
20	6.40	5.90				6.15	0.35
40	4.30	4.50				4.40	0.14
60	2.80	3.50				3.15	0.49
80	3.30	2.90				3.10	0.28

A4. Data of percent elongation at break of PP3/2/y/10 composites at 26°C prepared from the old method and the new method as shown in Figure 3.4

A4.1 The Old Method

Clay content (%)	Percent elongation at break_(%)					Mean	Std.
	1	2	3	4	5		
0	10.87	11.06	11.71	11.74	12.01	11.48	0.48
2	9.32	7.69	7.54	10.33	10.48	9.07	1.40
5	11.57	6.04	10.27	6.30		8.54	2.79
10	10.68	7.34	5.53	6.13		7.42	2.30
20	7.53	8.17	6.36	7.59		7.41	0.75
40	5.08	3.20	4.25	5.54	5.74	4.76	1.04
60	3.47	3.74	3.77	3.15	5.19	3.86	0.78
80	4.28	4.00	3.14			3.80	0.59

A4.2 The New Method

Clay content (%)	Percent elongation at break_(%)					Mean	Std.
	1	2	3	4	5		
0	10.87	11.06	11.71	11.74	12.01	11.48	0.48
2	7.047	10.02	6.80	9.40	10.48	8.75	1.71
5	10.32	6.17	7.66			8.05	2.10
10	10.17	7.98	7.00	6.57		7.93	1.60
20	7.42	3.94	8.40			6.59	2.34
40	4.51	4.87	3.94	5.38		4.67	0.60
60	2.63	3.42	4.35	3.45		3.46	0.70
80	3.58	3.44	3.35			3.46	0.11

A5. Data of impact strength of PP3/2/v/10 composites at 26°C prepared from the old method and the new method as shown in Figure 3.5

A5.1 The Old Method

Clay content (%)	Impact strength (J/m)					Mean	Std.
	1	2	3	4	5		
0	2.50	2.30	2.40	2.60	2.40	2.44	0.10
2	2.70	1.90	2.10	2.10	1.90	2.14	0.33
5	2.20	2.10	1.90	2.00	1.90	2.02	0.11
10	2.20	2.20	2.00			2.13	0.09
20	2.10	2.00	1.80	2.00	1.70	1.92	0.14
40	2.00	2.10	2.10	1.60	2.00	1.96	0.18
60	2.00	1.60	2.20	1.80	2.00	1.92	0.20
80	2.10	1.90	2.20	2.00	1.90	2.02	0.11

A5.2 The New Method

Clay content (%)	Impact strength (J/m)					Mean	Std.
	1	2	3	4	5		
0	2.50	2.30	2.40	2.40	2.60	0.08	0.11
2	2.10	2.20	2.00			0.06	0.10
5	2.00	2.10	2.10			0.04	0.05
10	1.90	2.10	2.20	2.80	2.00	0.24	0.35
20	2.00	2.40	2.20	2.00	1.80	0.17	0.22
40	2.10	2.30				0.10	0.14
60	2.00	2.10	2.00	2.10	2.20	0.06	0.08
80	2.10	2.20	2.00	2.10	1.90	0.08	0.11

B. XRD results to study the grafting reaction of clay, aminosilane coupling agent and maleic anhydride modified polypropylene.

X-ray diffraction was used to measure the intensity versus the diffraction angle of 2θ from 2° to 30° on the a X-ray diffractometer (model Philips PW3710). The diffractometer was equipped with $\text{CuK}\alpha$ radiation source operated at 40 kV and 30 mA. The scanning speed and the step size were 1° /min. Si was used as the calibration standard. The sample of x-ray diffraction spectroscopy is a powder.

B1. Data of the XRD results for pure clay, modified silicate clay containing 30 percent of aminosilane coupling agent and nanofiller containing 10 percent of clay content as shown in Figure 3.6 and Figure 3.8

2θ	Intensity of pure clay	Intensity of mod.clay	Intensity of nanofiller
3.00	292.00	441.00	306.00
3.10	269.00	424.00	279.00
3.20	256.00	424.00	299.00
3.30	256.00	467.00	279.00
3.40	262.00	445.00	276.00
3.50	253.00	471.00	250.00
3.60	237.00	467.00	262.00
3.70	246.00	548.00	269.00
3.80	240.00	566.00	262.00
3.90	225.00	600.00	262.00
4.00	219.00	635.00	253.00
4.10	219.00	692.00	196.00
4.20	193.00	686.00	231.00
4.30	219.00	729.00	216.00
4.40	196.00	713.00	196.00
4.50	196.00	773.00	202.00
4.60	213.00	835.00	199.00
4.70	216.00	961.00	199.00
4.80	188.00	1056.00	177.00
4.90	213.00	1156.00	193.00
5.00	237.00	1376.00	190.00
5.10	202.00	1459.00	172.00
5.20	204.00	1537.00	172.00
5.30	196.00	1459.00	204.00
5.40	210.00	1452.00	172.00

2 θ	Intensity of pure clay	Intensity of mod.clay	Intensity of nanofiller
5.50	185.00	1414.00	207.00
5.60	219.00	1340.00	199.00
5.70	234.00	1211.00	237.00
5.80	225.00	1253.00	276.00
5.90	262.00	1102.00	231.00
6.00	246.00	1063.00	177.00
6.10	279.00	1030.00	185.00
6.20	299.00	999.00	159.00
6.30	320.00	930.00	149.00
6.40	365.00	876.00	144.00
6.50	433.00	829.00	144.00
6.60	458.00	745.00	154.00
6.70	566.00	718.00	149.00
6.80	605.00	645.00	154.00
6.90	778.00	581.00	154.00
7.00	853.00	534.00	149.00
7.10	864.00	462.00	123.00
7.20	980.00	416.00	130.00
7.30	999.00	331.00	146.00
7.40	955.00	279.00	154.00
7.50	824.00	246.00	139.00
7.60	681.00	216.00	132.00
7.70	557.00	207.00	123.00
7.80	502.00	190.00	149.00
7.90	412.00	169.00	123.00

2 θ	Intensity of pure clay	Intensity of mod.clay	Intensity of nanofiller
8.00	331.00	159.00	123.00
8.10	299.00	142.00	128.00
8.20	262.00	142.00	104.00
8.30	182.00	132.00	121.00
8.40	188.00	108.00	123.00
8.50	159.00	98.00	130.00
8.60	142.00	100.00	123.00
8.70	135.00	108.00	106.00
8.80	123.00	81.00	110.00
8.90	114.00	108.00	112.00
9.00	88.00	104.00	123.00
9.10	85.00	77.00	128.00
9.20	64.00	90.00	139.00
9.30	66.00	114.00	193.00
9.40	86.00	94.00	420.00
9.50	69.00	86.00	376.00
9.60	74.00	77.00	159.00
9.70	67.00	77.00	146.00
9.80	58.00	83.00	139.00
9.90	58.00	94.00	110.00
10.00	66.00	83.00	121.00
10.10	64.00	86.00	123.00
10.20	56.00	67.00	119.00
10.30	59.00	74.00	121.00
10.40	50.00	64.00	119.00

2θ	Intensity of pure clay	Intensity of mod. clay	Intensity of nanofiller
10.50	46.00	67.00	106.00
10.60	59.00	62.00	130.00
10.70	58.00	67.00	114.00
10.80	62.00	67.00	106.00
10.90	44.00	58.00	137.00
11.00	48.00	44.00	110.00
11.10	50.00	50.00	123.00
11.20	50.00	50.00	123.00
11.30	61.00	48.00	104.00
11.40	67.00	53.00	135.00
11.50	44.00	50.00	123.00
11.60	45.00	44.00	110.00
11.70	58.00	32.00	117.00
11.80	49.00	34.00	139.00
11.90	56.00	26.00	128.00
12.00	58.00	30.00	139.00
12.10	53.00	38.00	137.00
12.20	50.00	30.00	149.00
12.30	50.00	36.00	149.00
12.40	62.00	24.00	166.00
12.50	50.00	38.00	166.00
12.60	52.00	27.00	146.00
12.70	56.00	32.00	164.00
12.80	48.00	31.00	164.00
12.90	50.00	29.00	174.00

2 θ	Intensity of pure clay	Intensity of mod.clay	Intensity of nanofiller
13.00	53.00	36.00	185.00
13.10	59.00	34.00	196.00
13.20	50.00	35.00	199.00
13.30	45.00	35.00	182.00
13.40	64.00	34.00	213.00
13.50	76.00	46.00	222.00
13.60	76.00	48.00	253.00
13.70	76.00	52.00	269.00
13.80	72.00	56.00	266.00
13.90	88.00	53.00	339.00
14.00	77.00	62.00	342.00
14.10	104.00	90.00	350.00
14.20	104.00	69.00	357.00
14.30	104.00	66.00	328.00
14.40	94.00	96.00	320.00
14.50	94.00	92.00	266.00
14.60	96.00	104.00	276.00
14.70	86.00	110.00	276.00
14.80	79.00	108.00	286.00
14.90	102.00	110.00	272.00
15.00	85.00	104.00	269.00
15.10	77.00	112.00	266.00
15.20	79.00	117.00	272.00
15.30	76.00	102.00	272.00
15.40	64.00	114.00	253.00

2θ	Intensity of pure clay	Intensity of mod.clay	Intensity of nanofiller
15.50	69.00	114.00	246.00
15.60	74.00	114.00	246.00
15.70	79.00	92.00	243.00
15.80	50.00	100.00	243.00
15.90	59.00	108.00	250.00
16.00	69.00	96.00	262.00
16.10	77.00	88.00	246.00
16.20	79.00	102.00	250.00
16.30	62.00	106.00	286.00
16.40	62.00	90.00	234.00
16.50	69.00	94.00	259.00
16.60	58.00	88.00	299.00
16.70	50.00	83.00	246.00
16.80	62.00	74.00	289.00
16.90	76.00	81.00	262.00
17.00	77.00	72.00	299.00
17.10	62.00	62.00	266.00
17.20	53.00	72.00	272.00
17.30	59.00	69.00	253.00
17.40	77.00	76.00	262.00
17.50	72.00	71.00	246.00
17.60	66.00	94.00	237.00
17.70	66.00	81.00	246.00
17.80	58.00	69.00	250.00
17.90	66.00	76.00	234.00

2θ	Intensity of pure clay	Intensity of mod.clay	Intensity of nanofiller
18.00	59.00	74.00	234.00
18.10	59.00	62.00	259.00
18.20	66.00	61.00	253.00
18.30	66.00	83.00	266.00
18.40	59.00	76.00	269.00
18.50	67.00	66.00	246.00
18.60	59.00	81.00	243.00
18.70	71.00	76.00	250.00
18.80	86.00	85.00	246.00
18.90	85.00	66.00	259.00
19.00	67.00	76.00	276.00
19.10	85.00	74.00	246.00
19.20	69.00	90.00	250.00
19.30	83.00	79.00	225.00
19.40	108.00	88.00	272.00
19.50	119.00	94.00	237.00
19.60	207.00	121.00	237.00
19.70	400.00	210.00	262.00
19.80	681.00	185.00	246.00
19.90	562.00	174.00	234.00
20.00	462.00	139.00	243.00
20.10	365.00	144.00	253.00
20.20	353.00	121.00	225.00
20.30	324.00	110.00	246.00
20.40	296.00	112.00	266.00

2θ	Intensity of pure clay	Intensity of mod.clay	Intensity of nanofiller
20.50	269.00	110.00	269.00
20.60	272.00	85.00	259.00
20.70	234.00	104.00	272.00
20.80	228.00	100.00	282.00
20.90	246.00	117.00	289.00
21.00	202.00	86.00	292.00
21.10	188.00	72.00	276.00
21.20	172.00	76.00	331.00
21.30	169.00	66.00	320.00
21.40	156.00	59.00	339.00
21.50	151.00	92.00	269.00
21.60	164.00	62.00	313.00
21.70	172.00	66.00	331.00
21.80	146.00	55.00	324.00
21.90	164.00	62.00	306.00
22.00	161.00	61.00	286.00
22.10	151.00	69.00	286.00
22.20	146.00	59.00	272.00
22.30	142.00	69.00	231.00
22.40	146.00	61.00	256.00
22.50	156.00	58.00	234.00
22.60	166.00	67.00	237.00
22.70	146.00	61.00	240.00
22.80	139.00	69.00	188.00
22.90	123.00	56.00	213.00

20	Intensity of pure clay	Intensity of mod.clay	Intensity of nanofiller
23.00	151.00	72.00	207.00
23.10	144.00	66.00	202.00
23.20	123.00	55.00	231.00
23.30	119.00	90.00	196.00
23.40	146.00	55.00	202.00
23.50	139.00	77.00	222.00
23.60	121.00	67.00	202.00
23.70	135.00	74.00	225.00
23.80	137.00	72.00	182.00
23.90	135.00	67.00	222.00
24.00	139.00	77.00	188.00
24.10	110.00	94.00	193.00
24.20	132.00	76.00	199.00
24.30	121.00	102.00	185.00
24.40	123.00	100.00	182.00
24.50	146.00	90.00	182.00
24.60	125.00	117.00	216.00
24.70	130.00	114.00	210.00
24.80	114.00	125.00	222.00
24.90	142.00	125.00	196.00
25.00	137.00	102.00	216.00
25.10	137.00	117.00	216.00
25.20	112.00	123.00	193.00
25.30	130.00	90.00	169.00
25.40	130.00	85.00	202.00

20	Intensity of pure clay	Intensity of mod.clay	Intensity of nanofiller
25.50	137.00	81.00	185.00
25.60	104.00	86.00	185.00
25.70	139.00	77.00	177.00
25.80	125.00	90.00	185.00
25.90	144.00	85.00	177.00
26.00	130.00	88.00	196.00
26.10	149.00	90.00	196.00
26.20	114.00	96.00	174.00
26.30	137.00	94.00	207.00
26.40	144.00	106.00	177.00
26.50	169.00	117.00	159.00
26.60	234.00	182.00	182.00
26.70	246.00	135.00	174.00
26.80	156.00	92.00	164.00
26.90	144.00	96.00	172.00
27.00	130.00	86.00	190.00
27.10	130.00	85.00	172.00
27.20	139.00	102.00	161.00
27.30	112.00	94.00	185.00
27.40	139.00	117.00	161.00
27.50	139.00	96.00	185.00
27.60	164.00	108.00	164.00
27.70	164.00	110.00	161.00
27.80	182.00	100.00	151.00
27.90	182.00	104.00	154.00

2 θ	Intensity of pure clay	Intensity of mod.clay	Intensity of nanofiller
28.00	222.00	114.00	151.00
28.10	282.00	102.00	137.00
28.20	306.00	125.00	188.00
28.30	331.00	128.00	154.00
28.40	412.00	151.00	164.00
28.50	392.00	146.00	213.00
28.60	428.00	164.00	339.00
28.70	317.00	172.00	317.00
28.80	276.00	213.00	161.00
28.90	237.00	202.00	164.00
29.00	204.00	199.00	149.00
29.10	146.00	210.00	169.00
29.20	154.00	202.00	166.00
29.30	139.00	199.00	177.00
29.40	135.00	199.00	146.00
29.50	130.00	188.00	166.00
29.60	119.00	196.00	164.00
29.70	130.00	188.00	149.00
29.80	108.00	177.00	159.00
29.90	110.00	193.00	128.00

C. Tensile and impact testing of PP1 composites to study the effect of the filler content and clay content

C1. Data of Young's modulus of PP1 composites at 26°C for the effect of filler content and clay content as shown in Figure 3.12

C1.1 Data of Young's modulus of PP1/2/10/z composites

Filler Content(%)	Young's modulus (MPa)					Mean	Std.
	1	2	3	4	5		
0	2080.00	2171.00	2108.00	1919.00	1954.50	2046.50	106.10
1	2733.40	2381.00	2533.40			2549.31	176.75
2	2957.30	2742.70	2316.70			2672.29	326.04
5	2845.40	2845.00				2845.20	0.28
10	3398.20	2934.30	2813.10			3048.56	308.81
20	3038.20	3571.30				3304.77	376.96
30	3596.20	3305.40				3450.84	205.64

C1.2 Data of Young's modulus of PP1/2/60/z composites

Filler Content (%)	Young's modulus (MPa)					Mean	Std.
	1	2	3	4	5		
0.00	2080.00	2171.00	2108.00	1919.06	1954.56	2046.52	106.18
1.00	3023.95	3056.26	2199.03			2759.75	485.86
2.00	4365.58	2809.96	2620.37	2436.62	2462.47	2939.00	811.29
5.00	2940.33					2940.33	0.00
10.00	3044.52	4165.54				3605.03	792.68
20.00	3588.79	3957.09				3772.94	260.43
30.00	4343.55	4938.11				4640.83	420.42

C1.3 Data of Young's modulus of PP1/2/100/z composites

Filler Content (%)	Young's modulus (MPa)					Mean	Std.
	1	2	3	4	5		
0.00	2080.00	2171.00	2108.00	1919.06	1954.56	2046.52	106.18
1.00	3110.60	2848.66				2979.63	185.22
2.00	3144.80	3626.56	2768.70			3180.02	430.01
5.00	3352.54	3220.92				3286.73	93.08
10.00	3612.94	4390.51	3699.32			3900.92	426.19
20.00	6300.35	6046.17				6173.26	179.74
30.00	7426.16	7770.08				7598.12	243.19

C2. Data of tensile strength at yield of PP1 composites at 26°C for the effect of filler content and clay content as shown in Figure 3.13

C2.1 Data of tensile strength at yield of PP1/2/10/z composites

Filler Content (%)	Tensile strength at yield (MPa)					Mean	Std.
	1	2	3	4	5		
0.00	26.92	30.95	26.92	30.95		28.93	2.33
1.00	33.40	33.56				33.48	0.11
2.00	34.19	33.47	33.40			33.69	0.44
5.00	34.89	34.25				34.57	0.45
10.00	36.93	36.37	36.38	34.01		35.92	1.30
20.00	35.61	35.72	35.98	35.32	36.50	35.83	0.44
30.00	35.44	35.55	37.52			36.17	1.17

C2.2 Data of tensile strength at yield of PP1/2/60/z composites

Filler Content (%)	Tensile strength at yield (MPa)					Mean	Std.
	1	2	3	4	5		
0.00	26.92	30.95	26.92	30.95		28.93	2.33
1.00	34.21	33.48	33.07	33.96	33.38	33.62	0.46
2.00	34.24	33.05	34.11	33.48		33.72	0.56
5.00	36.02	33.89	33.93			34.61	1.22
10.00	34.28	34.42	35.31	34.22	34.96	34.64	0.47
20.00	34.95	33.00				33.98	1.38
30.00	31.00	30.15				30.57	0.60

C2.3 Data of tensile strength at yield of PP1/2/100/z composites

Filler Content (%)	Tensile strength at yield (MPa)				Mean	Std.
	1	2	3	4		
0.00	26.92	30.95	26.92	30.95	28.93	2.02
1.00	33.89	33.14	33.06	33.88	33.49	0.39
2.00	32.72	32.55	33.16		32.81	0.26
5.00	31.48	31.88	32.29	32.68	32.08	0.45
10.00	31.59	32.00	31.99		31.86	0.19
20.00	31.06	29.06			30.06	1.00
30.00	28.32	27.81			28.07	0.26

C3. Data of percent elongation at yield of PPI composites at 26°C for the effect of filler content and clay content as shown in Figure 3.14

C3.1 Data of percent elongation at yield of PP1/2/10/z composites

Filler Content (%)	Percent elongation at yield (%)					Mean	Std.
	1	2	3	4	5		
0.00	9.87	9.95	9.69	10.19	9.81	9.90	0.19
1.00	9.07	9.50	9.87			9.48	0.40
2.00	9.32	9.45	9.01			9.26	0.23
5.00	8.36	8.31	8.67	8.66	8.46	8.49	0.17
10.00	8.35	8.99	8.15	8.59	8.31	8.48	0.33
20.00	7.42	7.42	8.05	8.51	7.99	7.88	0.46
30.00	6.55	6.24	8.31	7.15	8.23	7.30	0.95

C3.2 Data of percent elongation at yield of PP1/2/60/z composites

Filler Content (%)	Percent elongation at yield (%)					Mean	Std.
	1	2	3	4	5		
0.00	9.87	9.95	9.69	10.19	9.81	9.90	0.19
1.00	9.60	9.21	9.41	8.82		9.26	0.33
2.00	9.17	9.57	8.74	9.13	9.03	9.13	0.30
5.00	8.56	8.36	7.97	8.23	7.83	8.19	0.30
10.00	6.07	5.49	5.97	6.58		6.03	0.45
20.00	4.34	4.35	4.20	4.59	5.00	4.50	0.32
30.00	2.60	3.57	3.30			3.16	0.50

C3.3 Data of percent elongation at yield of PP1/2/100/z composites

Filler Content (%)	Percent elongation at yield (%)					Mean	Std.
	1	2	3	4	5		
0.00	9.87	9.95	9.69	10.19	9.81	9.90	0.19
1.00	9.60	9.21	9.41	8.82		9.26	0.33
2.00	9.17	9.57	8.74	9.13	9.03	9.13	0.30
5.00	8.56	8.36	7.97	8.23	7.83	8.19	0.30
10.00	6.07	5.49	5.97			5.84	0.31
20.00	4.34	4.35	4.20	4.59		4.37	0.16
30.00	2.36	2.60	2.08			2.35	0.26

C4. Data of percent elongation at break of PP1 composites at 26°C for the effect of filler content and clay content as shown in Figure 3.15

C4.1 Data of percent elongation at break of PP1/2/10/z composites

Filler Content (%)	Percent elongation at break (%)					Mean	Std.
	1	2	3	4	5		
0.00	10.40	12.94	14.40	19.58		14.33	3.87
1.00	33.66	29.96	32.70			32.11	1.92
2.00	34.03	35.89	33.71			34.54	1.18
5.00	42.56	39.52				41.04	2.15
10.00	14.89	28.00				21.45	9.27
20.00	12.28	10.26	11.13	21.76	10.26	13.14	4.89
30.00	14.42	10.09	6.05	17.73	9.49	11.56	4.56

*C4.2 Data of percent elongation at break of PP1/2/60/z
composites*

Filler Content (%)	Percent elongation at break (%)					Mean	Std.
	1	2	3	4	5		
0.00	10.40	12.94	11.52	19.58	18.44	14.58	4.17
1.00	27.42	27.42				27.42	0.00
2.00	22.28	19.03				20.66	2.30
5.00	17.72	17.99	12.52			16.08	3.08
10.00	17.37	11.19	10.60	5.22		11.10	4.97
20.00	3.33	4.59	5.87	3.85		4.41	1.10
30.00	2.46	2.01	2.70			2.39	0.35

*C4.3 Data of percent elongation at break of PP1/2/100/z
composites*

Filler Content (%)	Percent elongation at break (%)					Mean	Std.
	1	2	3	4	5		
0.00	10.40	12.94	13.98	14.94	19.67	14.39	3.41
1.00	16.30	13.88	17.58	13.19	19.95	16.18	2.76
2.00	14.59	17.87	13.66	14.08	13.14	14.67	1.87
5.00	14.68	11.64	11.28	10.78		12.10	1.76
10.00	8.94	7.96	10.21			9.04	1.13
20.00	2.89	3.59				3.24	0.49
30.00	1.91	2.27	1.69			1.96	0.29

C5. Data of impact strength of PP1 composites at 26°C for the effect of filler content and clay content as shown in Figure 3.16

C5.1 Data of impact strength of PP1/2/10/z composites

Filler Content (%)	Impact strength (J/m)			Mean	Std.
	1	2	3		
0.00	40.30	37.00	39.10	38.80	1.67
1.00	32.4	33.20		32.80	0.57
2.00	32.80	32.70		32.75	0.07
5.00	31.10	32.20		31.65	0.78
10.00	32.90	30.00	34.20	32.37	2.15
20.00	31.80	34.30	32.80	32.97	1.26
30.00	29.60	28.50		29.05	0.78

C5.2 Data of impact strength of PP1/2/60/z composites

Filler Content (%)	Impact strength (J/m)				Mean	Std.
	1	2	3	4		
0.00	40.30	37.00	39.10		38.80	1.67
1.00	35.40	29.90	31.30		32.20	2.86
2.00	31.80	31.80	29.60	29.70	30.73	1.24
5.00	32.30	30.40	28.30	32.80	30.95	2.05
10.00	30.50	30.50			30.50	0.00
20.00	26.58	22.70	30.00	25.48	26.19	3.02
30.00	24.30	26.57			25.44	1.61

C5.3 Data of impact strength of PP1/2/100/z composites

Filler Content (%)	Impact strength (J/m)				Mean	Std.
	1	2	3	4		
0.00	40.30	37.00	39.10		38.80	1.67
1.00	35.20	33.20	26.90		31.77	4.33
2.00	30.80	28.75	31.87		30.47	1.59
5.00	30.70	26.10	26.70		27.83	2.50
10.00	32.80	28.70	31.70	22.50	27.94	4.57
20.00	23.40	22.50			22.95	0.64
30.00	23.40	22.80			23.10	0.42

D. Tensile and impact testing of PP1/2/y/10 composites and PP3/2/y/10 composites to study the effect of M_w

D1. Data of Young's modulus of 2/y/10 composites at 26°C as shown in Figure 3.17

D1.1 Data of Young's modulus of PP1/2/y/10 composites

Clay Content (%)	Young's modulus (MPa)				Mean	Std.
	1	2	3	4		
0.00	2477.82	2452.93			2465.38	17.60
5.00	2675.61	3350.56	3101.36	2527.86	2913.85	379.31
10.00	3170.51	2715.83			2943.17	321.51
20.00	3462.31	3513.98	2941.12	3484.25	3358.85	237.76
40.00	3656.17	4382.48	3938.05	3561.68	3884.60	368.42
60.00	3746.08	4348.60			4047.34	426.04
80.00	3630.61	4027.32			3828.96	280.51
90.00	3917.36	4023.69			3970.53	75.18

Clay Content (%)	Young's modulus (Mpa)				Mean	Std.
	1	2	3	4		
95.00	4151.66	4027.51			4089.58	87.79
100.00	3513.24	4359.95			3936.59	598.72

D1.2 Data of Young's modulus of PP3/2/y/10 composites

Clay Content (%)	Young's modulus (MPa)				Mean	Std.
	1	2	3	4		
0.00	2078.79	2477.33	2448.82		2334.98	222.33
5.00	2973.52	2741.57			2857.55	164.01
10.00	3168.79	2862.96	3189.95	2770.77	2998.12	212.83
20.00	3377.44	2725.24	2575.46	3473.13	3037.82	453.26
40.00	3615.65	3853.35			3734.50	168.08
60.00	3398.96	3438.39	3677.91	3813.74	3582.25	197.51
80.00	4024.05	3190.08	2915.98		3376.70	577.13
90.00	3830.65	3201.54			3516.09	444.85
95.00	3150.82	3758.84	3316.10		3408.59	314.39
100.00	3088.43	4284.81			3686.62	845.96

D2. Data of tensile strength at yield of 2/y/10 composites at 26°C as shown in Figure 3.18

D2.1 Data of tensile strength at yield of PP1/2/y/10 composites

Clay content (%)	Tensile strength at yield (MPa)					Mean	Std.
	1	2	3	4	5		
0.00	33.67	35.20	34.34	34.78		34.50	0.65
5.00	35.28	34.64	35.05	34.32	33.89	34.63	0.56
10.00	34.84	34.25	35.31	34.31	34.28	34.60	0.47
20.00	34.76	34.36	32.79	34.51	34.69	34.22	0.82
40.00	35.48	32.78	33.43	34.27	33.08	33.81	1.09
60.00	32.05	32.61	32.47	32.54	34.21	32.77	0.83
80.00	32.16	31.38	30.17	31.46	31.25	31.28	0.71
90.00	29.91	29.91	30.47	31.38	31.60	30.66	0.80
95.00	29.30	30.75				30.02	1.02
100.00	29.85	29.72	29.43	31.00		30.00	0.69

D2.2 Data of tensile strength at yield of PP3/2/y/10 composites

Clay Content(%)	Tensile strength at yield (MPa)					Mean	Std.
	1	2	3	4	5		
0.00	34.12	34.76	31.94	34.70		33.88	1.33
5.00	36.22	37.55	37.55	38.73		37.51	1.03
10.00	34.70	37.90	37.17	37.14	37.23	36.83	1.23
20.00	37.37	36.30	37.40	36.73		36.95	0.53
40.00	36.80	35.99				36.39	0.57
60.00	35.50	34.61				35.06	0.63
80.00	34.70	33.88				34.29	0.58
90.00	33.05	34.44	33.59			33.69	0.70

Clay Content(%)	Tensile strength at yield (Mpa)					Mean	Std.
	1	2	3	4	5		
95.00	33.20	34.17				33.69	0.69
100.00	31.55	32.32	29.82			31.23	1.28

D3. Data of percent elongation at yield of 2/y/10 composites at 26°C as shown in Figure 3.19

D3.1 Data of percent elongation at yield of PP1/2/y/10 composites

Clay Content(%)	Percent elongation at yield (%)					Mean	Std.
	1	2	3	4	5		
0.00	8.98	9.28	9.20	9.29		9.18	0.14
5.00	8.64	7.99	8.23	7.60	7.80	8.05	0.41
10.00	7.99	8.22	8.50	7.77	8.16	8.13	0.27
20.00	7.58	6.97	6.89	7.62	7.33	7.28	0.34
40.00	6.26	6.09	5.91	5.89	6.00	6.03	0.15
60.00	5.54	5.20	5.60	6.58	6.11	5.80	0.54
80.00	5.61	5.46	5.58	5.54	5.07	5.46	0.22
90.00	5.02	5.20	4.39	5.30	4.95	4.97	0.35
95.00	4.20	5.60	4.60	4.98		4.84	0.59
100.00	4.16	4.37	3.88			4.14	0.25

D3.2 Data of percent elongation at yield of PP3/2/y/10 composites

Clay Content(%)	Percent elongation at yield (%)					Mean	Std.
	1	2	3	4	5		
0.00	8.46	8.52	7.84	8.05		8.22	0.33
5.00	4.89	5.81	4.87	5.79		5.34	0.53
10.00	4.35	5.09	4.67	5.01	4.13	4.65	0.41
20.00	5.28	4.30	4.89	4.77		4.81	0.40
40.00	3.66	4.50				4.08	0.59
60.00	3.45	3.06				3.26	0.28
80.00	3.52	3.05				3.28	0.33
90.00	3.41	3.61	3.09			3.37	0.26
95.00	3.05	3.46	2.58			3.03	0.44
100.00	3.29	2.69	2.88			2.95	0.31

D4. Data of percent elongation at break of 2/y/10 composites at 26°C as shown in Figure 3.20

D4.1 Data of percent elongation at break of PP1/2/y/10 composites

Clay Content(%)	Percent elongation at break (%)					Mean	Std.
	1	2	3	4	5		
0.00	11.41	14.35				12.88	2.08
5.00	19.13	12.62	14.81	8.52		13.77	4.42
10.00	12.54	11.80				12.17	0.52
20.00	14.16	8.05	11.89	10.71	14.12	11.79	2.56
40.00	12.47	10.13	8.15	12.12		10.72	2.00
60.00	8.67	6.67	14.19			9.84	3.89

Clay Content(%)	Percent elongation at break (%)					Mean	Std.
	1	2	3	4	5		
80.00	11.37	7.06	9.56	16.56	7.09	10.33	3.93
90.00	8.89	9.05				8.97	0.11
95.00	10.99	7.50				9.25	2.47
100.00	6.90	3.28	6.64			5.61	2.02

D4.2 Data of percent elongation at break of PP3/2/y/10 composites

Clay Content(%)	Percent elongation at break (%)				Mean	Std.
	1	2	3	4		
0.00	4.01	5.07			4.54	0.75
5.00	5.56	11.05	8.27		8.29	2.75
10.00	5.29	8.05	6.17		6.51	1.41
20.00	4.60	4.69	6.09		5.13	0.84
40.00	4.85	5.25			5.05	0.28
60.00	2.55	3.32	3.79	3.15	3.20	0.51
80.00	2.62	3.60	3.54	3.77	3.38	0.52
90.00	3.61	3.00			3.31	0.43
95.00	3.07	3.62	2.47		3.06	0.58
100.00	3.92	4.69	0.50		3.03	2.23

D5. Data of impact strength of 2/v/10 composites at 26°C as shown in Figure 3.21

D5.1 Data of impact strength of PP1/2/y/10 composites

Clay Content(%)	Impact strength (J/m)					Mean	Std.
	1	2	3	4	5		
0.00	32.50	20.90	23.00			25.47	6.18
5.00	27.70	27.70	26.90			27.43	0.46
10.00	26.00	27.90				26.95	1.34
20.00	26.10	27.60				26.85	1.06
40.00	25.30	26.20	25.00	25.00		25.38	0.57
60.00	26.90	26.50				26.70	0.28
80.00	25.10	24.20	27.40			25.57	1.65
90.00	26.40	24.40	26.00	26.50		25.83	0.97
95.00	26.60	27.00	24.50	25.60	25.30	25.80	1.01
100.00	25.50	24.70	27.40			25.87	1.39

D5.2 Data of impact strength of PP3/2/y/10 composites

Clay Content(%)	Impact strength (J/m)					Mean	Std.
	1	2	3	4	5		
0.00	23.10	22.70	22.40	24.40	23.30	23.18	0.77
5.00	22.70	23.00	23.10	23.20	23.20	23.04	0.21
10.00	22.00	22.20	22.70			22.30	0.36
20.00	22.90	23.70	22.50			23.03	0.61
40.00	22.20	21.90	21.50	21.10		21.68	0.48
60.00	23.80	22.90	22.50	22.60	21.80	22.72	0.73
80.00	21.30	23.10	23.30	22.80	20.40	22.18	1.27
90.00	22.70	23.70	22.40			22.93	0.68
95.00	21.80	22.00	22.30	21.80	22.40	22.06	0.28
100.00	22.30	21.80				22.05	0.35

E. Slow Crack Growth testing results

The crack growth behavior of pure PP1, pure PP3, PP1/2/20/10, PP3/2/20/10, PP1/2/60/10 and PP3/2/60/10 composites were investigated.

The crack opening displacement (COD) and the crack length (CL) were measured as a function of time. They were measured by the Zoom stereomicroscope with magnification 80× at room temperature of 24°C.

E1. Data of pure PP1

Time (min)	COD (μm)	CL (μm)
0.00	0.00	0.00
1450.00	25.97	311.69
2890.00	32.47	311.69
4440.00	38.96	441.56
5940.00	38.96	454.55
7080.00	45.45	649.00
8650.00	51.95	805.19
10980.00	51.95	1012.99
12480.00	64.94	1012.99
13800.00	64.94	1298.70
15350.00	77.82	1493.00
16810.00	90.91	1753.25
18190.00	103.90	2207.79
19790.00	116.89	2597.40
22545.00	142.86	3116.88

E2. Data of pure PP3

Time (min)	COD (μm)	CL (μm)
0.00	0.00	0.00
1440.00	51.95	753.25
2850.00	77.92	1207.79
4290.00	77.92	1350.65
7260.00	103.90	1649.35
8340.00	103.90	1701.30
11190.00	103.90	2000.00
11280.00	103.90	2051.95
12730.00	103.90	2103.90
14160.00	116.88	2181.82
15660.00	123.38	2220.78
17110.00	129.87	2246.75
18490.00	129.87	2584.42
19990.00	142.86	2662.34
21420.00	168.83	2779.22
22860.00	181.82	2935.06

E3. Data of PP1/2/20/10 composites

Time (min)	COD (μm)	CL (μm)
0.00	0.00	0.00
1500.00	25.97	116.88
2910.00	32.47	285.71
4345.00	38.96	415.58
5780.00	38.96	454.55
7200.00	38.96	623.38
8610.00	38.96	707.09
11580.00	51.95	909.09
12990.00	51.95	1077.92
14429.00	58.44	1103.90
15900.00	58.44	1233.77
17310.00	58.44	1298.70
20160.00	64.94	1363.64
21660.00	64.94	1428.57
22950.00	64.94	1428.57
24430.00	64.94	1428.57
25920.00	64.94	1428.57
27300.00	64.94	1428.57
28770.00	64.94	1428.57
33090.00	71.43	1493.51
34530.00	71.43	1493.51
35940.00	71.43	1532.47
37350.00	71.43	1532.47
38850.00	71.43	1558.44
40335.00	71.43	1558.44

E4. Data of PP3/2/20/10 composites

Time (min)	COD (μm)	CL (μm)
0.00	0.00	0.00
1470.00	38.96	142.86
2880.00	51.95	636.36
4380.00	64.94	636.36
7140.00	64.94	753.25
8550.00	64.94	753.25
10110.00	64.94	831.17
11520.00	77.92	1000.00
13020.00	77.92	1103.90
14430.00	84.42	1103.90
15840.00	84.42	1103.90
17310.00	90.91	1428.57
18720.00	103.90	1558.44
20170.00	103.90	1662.34
21600.00	110.39	1688.31
23060.00	110.39	1753.25
25920.00	110.39	1779.22
28880.00	116.88	1844.16
30360.00	123.38	1844.16

E5. Data of PP1/2/60/10 composites

Time (min)	COD (μm)	CL (μm)
0.00	0.00	0.00
1450.00	25.94	129.87
2940.00	32.47	350.65
4370.00	38.96	428.57
5825.00	38.96	519.48
7245.00	38.96	649.35
8785.00	51.95	750.00
10165.00	51.95	1038.96
11495.00	51.95	1064.94
14415.00	64.94	1324.68
15820.00	64.94	1363.64
17385.00	64.94	1363.64
21555.00	64.94	1363.64
22995.00	64.94	1402.60
24525.00	64.94	1415.58
27315.00	71.43	1467.53
28815.00	74.03	1519.48
30285.00	74.03	1623.38
31650.00	74.03	1649.35
33125.00	74.03	1662.34
34530.00	75.32	1688.31
36015.00	77.92	1688.31
37455.00	77.92	1714.29
38925.00	90.91	1896.10
40335.00	90.91	1896.10

Time (min)	COD (μm)	CL (μm)
43185.00	94.81	1948.05
44625.00	94.81	1961.04
47505.00	97.40	2077.92
50385.00	97.40	2077.92
51825.00	97.40	2090.91
54795.00	103.90	2142.86

E6. Data of PP3/2/60/10 composites

Time (min)	COD (μm)	CL (μm)
0.00	0.00	0.00
1495.00	38.96	142.86
2900.00	51.95	636.36
4365.00	64.94	714.29
5780.00	64.94	753.25
8680.00	77.92	844.16
10080.00	84.42	1155.84
11532.00	84.42	1155.84

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