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APPENDICES

Appendix A Determination of the Point of Zero Charge (PZC) of CaCO₃

Table A1 The electrophoretic mobility of CaCO₃ particles in aqueous solution at various pH.

Sample	Electrophoretic Mobility (EM), micron-cm/volts-sec					
	pH = 7.94	pH = 8.95	pH = 10.05	pH = 10.93	pH = 12.05	pH = 12.43
1	2.993	2.453	1.463	0.829	-1.71	-2.53
2	2.964	2.508	1.469	0.913	-1.64	-2.32
3	2.986	2.594	1.377	0.926	-1.62	-2.31
4	2.964	2.414	1.377	0.869	-1.72	-2.69
5	2.986	2.589	1.35	0.962	-1.67	-2.59
Mean	2.9786	2.5116	1.4072	0.8998	-1.672	-2.488

Appendix B Determination of the Equilibrium Time for SDS Adsorption on CaCO_3

Table B1 The interfacial tension of standard SDS solutions at pH 8

[SDS] (μM)	IFT (mN/m)			
	1	2	3	Mean
10	71.93	71.84	71.82	71.86
50	71.22	71.33	71.27	71.27
100	70.58	70.62	70.14	70.45
200	68.39	68.58	67.82	68.26
400	64.87	64.95	64.85	64.89
600	62.24	62.24	62.24	62.24
800	58.35	58.37	58.53	58.42
1,000	53.93	54.09	53.84	53.95

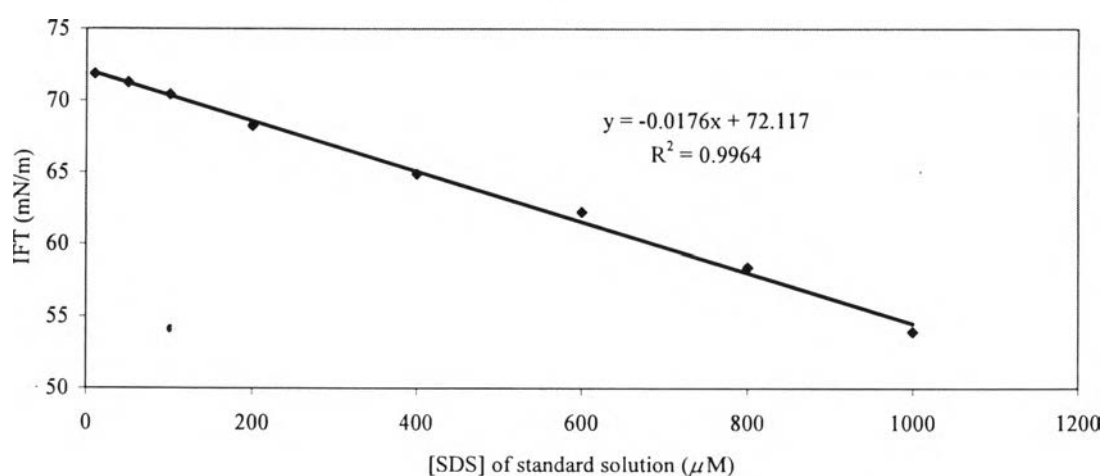


Figure B1 Calibration curve.

Table B2 The adsorption of SDS on CaCO₃ at various times

Time (h)	IFT of 1/20 diluted solution (mN/m)	[SDS] (μM)	SDS _{adsorption} ($\mu\text{mol/g}$ of CaCO ₃)
3	60.62	653.54	69.08
	60.53	658.65	68.06
	60.82	642.17	71.35
	60.03	687.07	62.42
	60.28	672.86	65.26
	60.22	676.27	64.58
6	59.19	734.82	52.95
	59.77	701.85	59.53
	59.92	693.33	61.24
	59.86	696.74	60.51
	60.03	687.07	62.44
	59.92	693.33	61.19
	Mean		
9	57.03	857.61	28.38
	58.95	748.47	50.14
	58.85	754.15	49.00
	58.46	776.32	44.67
	58.86	753.58	49.21
	58.50	774.05	45.13
	Mean		

Table B2 (cont.) The adsorption of SDS on CaCO₃ at various times

Time (h)	IFT of 1/20 diluted solution (mN/m)	[SDS] (μM)	SDS _{adsorption} ($\mu\text{mol/g}$ of CaCO ₃)
12	57.54	828.62	34.19
	58.00	802.47	39.41
	58.19	791.67	41.57
	57.54	828.62	34.14
	57.62	824.07	35.05
	57.69	820.09	35.84
	Mean		
18	58.17	792.80	41.32
	58.08	797.92	40.30
	58.20	791.10	41.66
	58.40	779.73	43.72
	58.73	760.97	47.45
	58.39	780.30	43.61
	Mean		
24	58.33	783.71	43.03
	57.94	805.88	38.62
	58.14	794.51	40.88
	58.06	799.06	39.95
	58.29	785.98	42.54
	58.17	792.80	41.19
	Mean		

Table B2 (cont.) The adsorption of SDS on CaCO₃ at various times

Time (h)	IFT of 1/20 diluted solution (mN/m)	[SDS] (μM)	SDS _{adsorption} ($\mu\text{mol/g}$ of CaCO ₃)
30	58.18	792.24	41.28
	58.27	787.12	42.29
	58.54	771.77	45.34
	57.94	805.88	38.62
	57.91	807.58	38.28
	58.03	800.76	39.64
	Mean		
34	57.70	819.52	36.00
	58.06	799.06	40.08
	57.76	816.11	36.68
	58.34	783.14	43.14
	57.94	805.88	38.62
	57.83	812.13	37.37
	Mean		

Appendix C The Effect of Electrolyte on the Adsorption of SDS on CaCO₃

Table C1 The interfacial tension of standard SDS solutions at 0.2 M NaCl concentration and pH 8

[NaCl] = 0.2 M [SDS] (μM)	IFT (mN/m)			
	1	2	3	Mean
100	62.73	62.81	62.60	62.72
200	57.63	57.66	58.04	57.78
400	51.98	51.49	51.81	51.76
600	46.94	47.36	47.40	47.24
800	43.23	43.81	44.31	43.79

Table C2 The interfacial tension of standard SDS solutions at 0.3 M NaCl concentration and pH 8

[NaCl] = 0.3 M [SDS] (μM)	IFT (mN/m)			
	1	2	3	Mean
100	63.64	63.72	63.51	63.63
200	58.54	58.57	58.95	58.69
400	52.89	52.40	52.72	52.67
600	47.85	48.27	48.31	48.15
800	44.14	44.72	45.22	44.70

Table C3 The interfacial tension of standard SDS solutions at 0.4 M NaCl concentration and pH 8

[NaCl] = 0.4 M [SDS] (μM)	IFT (mN/m)			
	1	2	3	Mean
100	64.37	64.45	64.24	64.35
200	59.27	59.30	59.68	59.42
400	53.62	53.13	53.45	53.40
600	48.58	49.00	49.04	48.87
800	44.87	45.45	45.95	45.42

Table C4 The interfacial tension of standard SDS solutions at 0.5 M NaCl concentration and pH 8

[NaCl] = 0.5 M [SDS] (μM)	IFT (mN/m)			
	1	2	3	Mean
100	64.91	64.99	64.78	64.90
200	59.81	59.84	60.22	59.96
400	54.16	53.67	53.99	53.94
600	49.12	49.54	49.58	49.42
800	45.41	45.99	46.49	45.97

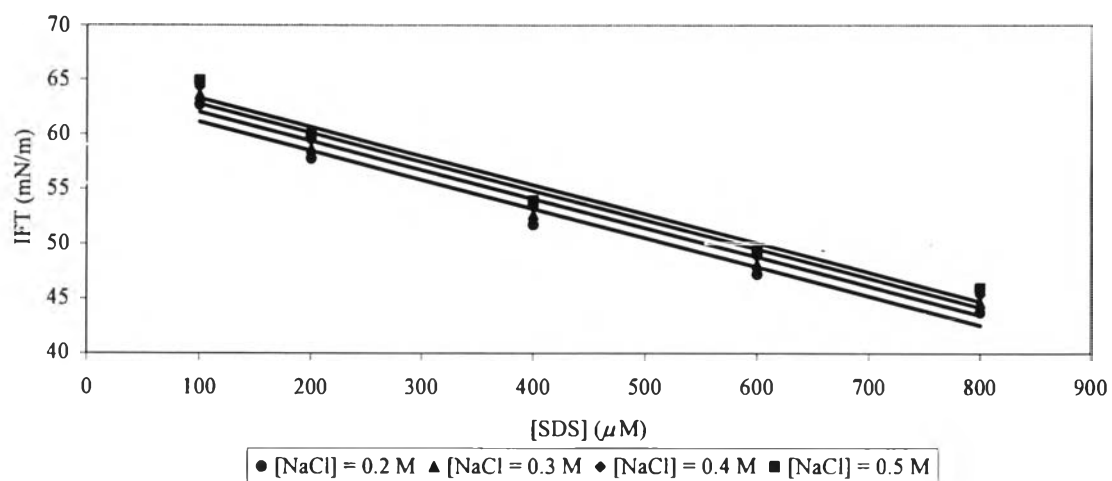


Figure C1 Calibration curve.

Table C5 The adsorption of SDS on CaCO_3 at various NaCl concentrations

[NaCl] (M)	IFT of 1/25 diluted solution (mN/m)	[SDS] (μM)	$\text{SDS}_{\text{adsorption}}$ ($\mu\text{mol/g}$ of CaCO_3)
0.2	50.78	582.72	54.29
	50.78	582.72	54.29
	50.92	577.58	55.58
	51.42	559.23	60.16
	51.44	558.50	60.34
	51.57	553.73	61.53
	Mean		

Table C5 (cont.) The adsorption of SDS on CaCO₃ at various NaCl concentrations

[NaCl] (M)	IFT of 1/25 diluted solution (mN/m)	[SDS] (μ M)	SDS _{adsorption} (μ mol/g of CaCO ₃)
0.3	52.28	527.73	68.00
	52.29	527.37	68.09
	52.43	522.23	69.37
	52.09	534.71	66.26
	52.28	527.73	68.01
	51.71	548.65	62.78
	Mean		
0.4	52.52	519.07	70.16
	52.50	519.81	69.97
	52.47	520.91	69.70
	52.15	532.65	66.82
	52.16	532.28	66.91
	52.04	536.69	65.81
	Mean		
0.5	52.52	518.94	70.15
	52.21	530.32	67.31
	52.68	513.07	71.61
	52.79	509.03	72.63
	52.55	517.84	70.43
	52.68	513.07	71.62
	Mean		

Appendix D Determination of the Adsorption Isotherm of SDS on CaCO₃

Table D1 The interfacial tension of standard SDS solutions at 0.3 NaCl concentration and pH 8

SDS (μM)	IFT (mN/m)					Mean
	1	2	3	4	5	
0	71.64	71.42	71.84	71.71	71.54	71.63
10	71.65	71.58	71.24	71.68	71.88	71.61
40	66.00	66.01	66.45	66.18	65.90	66.11
70	58.87	60.38	58.71	60.82	61.12	59.98
100	55.71	55.77	55.56	55.73	55.87	55.73
200	46.86	46.06	46.87	46.78	46.48	46.61
400	37.95	38.23	37.45	37.92	37.91	37.89
600	33.41	33.42	33.62	33.91	33.56	33.58

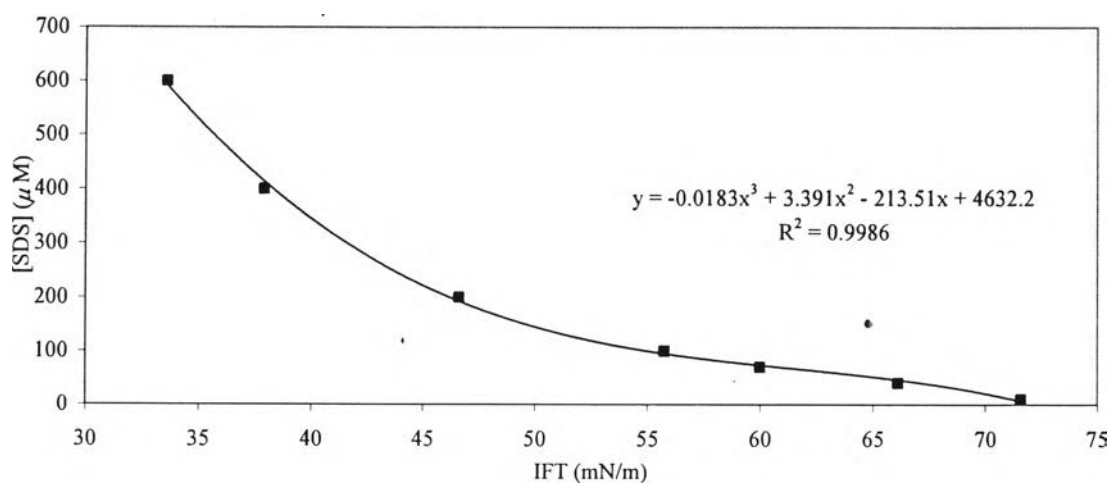


Figure D1 Calibration curve.

Table D2 The data of SDS adsorption isotherm (adsorption of SDS on CaCO₃ and equilibrium SDS concentration)

IFT (mN/m)						[SDS] _{equilibrium} (μ M)	SDS _{adsorption} (μ mol/g of CaCO ₃)
i	2	3	4	5	Mean		
66.65	66.39	66.47	64.95	65.55	66.00	36.24	0.64
64.08	63.97	64.58	63.09	63.85	63.91	45.91	1.54
55.45	55.47	56.14	56.74	55.50	55.86	85.81	3.14
49.45	49.71	49.53	50.25	48.97	49.58	141.87	5.58
46.10	46.09	46.71	47.06	47.18	46.63	182.89	8.17
41.82	42.02	42.01	42.38	41.96	42.04	272.10	17.27
32.47	32.70	32.88	32.64	31.94	32.53	590.88	34.08
39.25	39.75	39.68	40.09	40.22	39.80	3293.60*	37.03
40.58	40.48	40.00	40.87	40.69	40.52	6194.44**	37.99
39.77	40.38	39.61	40.32	40.28	40.07	16090.99***	39.07

Remark: * calculated from diluted solution (x10)

** calculated from diluted solution (x20)

*** calculated from diluted solution (x50)

Table D2 (cont.) The data of SDS adsorption isotherm (adsorption of SDS on CaCO₃ and equilibrium SDS concentration)

IFT (mN/m)						[SDS] _{equilibrium} (μ M)	SDS _{adsorption} (μ mol/g of CaCO ₃)
1	2	3	4	5	Mean		
70.22	70.37	70.01	70.44	69.89	70.19	24.02	0.16
69.05	68.09	68.92	68.78	67.69	68.51	36.07	0.34
67.11	68.56	69.15	68.56	67.48	68.17	38.12	0.62
66.04	65.66	65.69	64.09	65.60	65.42	53.34	1.46
56.70	57.14	58.78	58.11	56.97	57.54	87.80	3.11
50.67	51.35	51.55	51.59	50.65	51.16	134.10	5.65
49.04	48.30	49.56	48.92	49.13	48.99	159.27	8.39
42.77	43.95	43.54	43.60	43.50	43.47	255.59	17.44
37.63	38.33	38.96	38.57	39.10	38.52	393.80	26.03
33.72	33.56	33.75	33.98	34.32	33.87	579.94	34.15
51.64	51.98	51.82	51.18	51.24	51.51	1299.51*	36.92
45.53	45.46	45.26	45.30	44.78	45.27	2183.80*	38.12
41.22	41.00	41.21	41.32	41.00	41.15	3131.91*	38.57
41.44	42.15	41.95	41.76	41.77	41.81	5910.73**	40.84
40.98	40.46	40.33	39.75	40.89	40.48	16610.51***	33.88

Remark: * calculated from diluted solution (x10)

** calculated from diluted solution (x20)

*** calculated from diluted solution (x50)

Table D2 (cont.) The data of SDS adsorption isotherm (adsorption of SDS on CaCO₃ and equilibrium SDS concentration)

IFT (mN/m)						[SDS] _{equilibrium} (μ M)	SDS _{adsorption} (μ mol/g of CaCO ₃)
1	2	3	4	5	Mean		
70.95	70.98	70.97	71.10	70.45	70.89	18.18	0.22
69.94	69.85	69.33	69.90	70.12	69.83	26.79	0.43
69.40	69.76	69.05	68.85	68.94	69.20	31.40	0.68
65.52	66.51	66.23	66.61	65.44	66.06	50.19	1.50
58.25	56.36	57.96	57.42	57.84	57.57	87.64	3.12
52.03	52.45	52.37	51.85	51.78	52.10	124.97	5.75
48.67	49.11	49.44	48.29	49.21	48.94	159.87	8.39
44.26	45.14	45.18	44.97	45.04	44.92	225.15	17.71
38.44	38.42	38.40	38.54	39.10	38.58	391.45	26.04
34.12	34.05	34.40	33.66	33.90	34.03	572.48	34.21
51.49	52.35	51.49	52.33	51.83	51.90	1268.50*	37.26
45.78	45.90	45.16	45.77	45.19	45.56	2128.97*	38.69
40.86	41.47	42.07	41.56	41.94	41.58	3018.01*	39.71
42.32	42.52	42.25	42.32	41.85	42.25	5687.72**	43.08
41.24	41.13	41.36	41.22	41.41	41.27	15492.91***	45.03

Remark: * calculated from diluted solution (x10)

** calculated from diluted solution (x20)

*** calculated from diluted solution (x50)

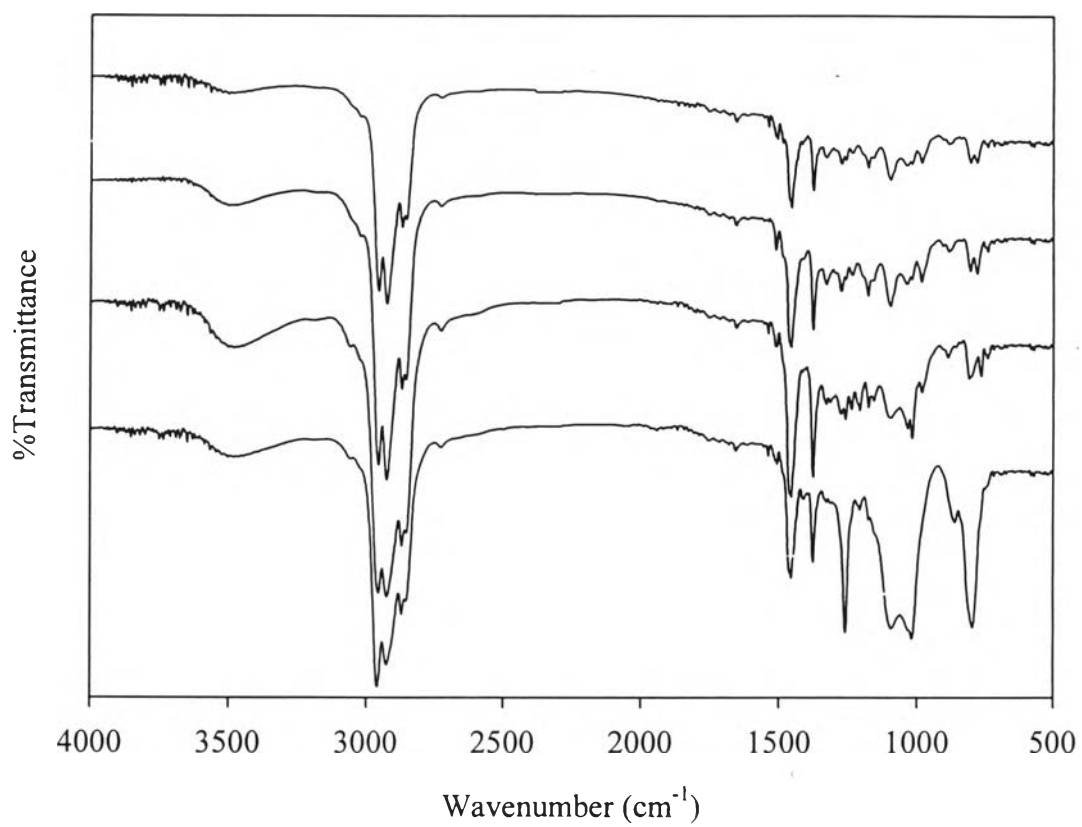
Table D2 (cont.) The data of SDS adsorption isotherm (adsorption of SDS on CaCO₃ and equilibrium SDS concentration)

IFT (mN/m)						[SDS] _{equilibrium} (μ M)	SDS _{adsorption} (μ mol/g of CaCO ₃)
1	2	3	4	5	Mean		
71.05	71.17	70.63	70.48	70.53	70.77	19.18	0.21
70.31	69.95	69.61	68.65	69.62	69.63	28.20	0.42
67.52	68.89	68.46	69.60	68.35	68.56	35.62	0.64
66.56	65.31	65.94	65.81	66.55	66.03	50.34	1.50
56.44	57.35	56.60	56.31	56.97	56.73	91.93	3.08
52.26	52.49	53.01	52.66	52.22	52.53	121.10	5.78
49.51	50.05	50.12	49.89	49.35	49.78	149.31	8.49
44.43	44.16	45.05	45.32	44.81	44.75	228.45	17.69
38.65	38.93	38.70	38.71	38.42	38.68	387.98	26.11
33.87	34.06	33.73	34.32	34.24	34.04	571.63	34.27
52.50	52.42	51.66	52.33	51.79	52.14	1245.90*	37.49
46.34	45.57	45.59	45.71	46.06	45.85	2075.29*	39.20
41.38	41.50	41.83	41.86	41.32	41.58	3017.10*	39.81
40.88	41.42	41.04	40.69	40.83	40.97	6363.11**	36.34
40.27	40.20	40.10	40.05	40.70	40.26	16920.36***	30.78

Remark: * calculated from diluted solution (x10)

** calculated from diluted solution (x20)

*** calculated from diluted solution (x50)

Appendix E Characterization of the Extracted Polymer by FT-IR Technique**Figure E1** The FT-IR spectra of extracted polymer.

Appendix F Particle Size Analysis of CaCO₃ Particles

Table F1 Diameter of CaCO₃ particles for the various types of surface-treated CaCO₃

Type of surface treated CaCO ₃	Diameter (μm)			
	1	2	3	Mean
As-received CaCO ₃	1.21	1.18	1.17	1.19 ± 0.02
Untreated CaCO ₃	1.14	1.2	1.24	1.19 ± 0.05
Admicellar-treated CaCO ₃ ([SDS] _{equilibrium} = 200 μM)	1.18	1.23	1.23	1.21 ± 0.03
Admicellar-treated CaCO ₃ ([SDS] _{equilibrium} = 500 μM)	1.18	1.2	1.2	1.19 ± 0.01

Appendix G Gravimetric Analysis (Percentage of Weight Loss)

Table G1 Percentage of weight loss of the various types of surface-treated CaCO₃

No.	Percentage of weight loss (%)				
	As-received CaCO ₃	Stearic acid-coated CaCO ₃	Untreated CaCO ₃	Admicellar-treated CaCO ₃ ([SDS] = 200 μM)	Admicellar-treated CaCO ₃ ([SDS] = 500 μM)
1	0.8615	5.7231	0.7651	0.7161	0.8395
2	0.7735	5.6900	0.7722	0.7044	0.7939
3	0.9805	5.7967	0.6618	0.7056	0.8386
4	-	4.9298	0.4819	0.6933	0.7034
5	-	5.8714	0.4444	0.5070	0.6894
6	-	5.7326	0.4039	0.5538	0.7346
7	-	6.1520	-	0.7462	0.7096
Mean	0.8568	5.6991	0.5882	0.6609	0.7584
S.D.	0.1092	0.3737	0.1652	0.0917	0.0645

Appendix H Determination of Tensile Properties of CaCO₃-filled iPP Composites

Table H1 The strain at yield values of various types of surface-treated CaCO₃-filled iPP composites

No.	Strain at Yield (%)				
	As-received CaCO ₃	Stearic acid-coated CaCO ₃	Untreated CaCO ₃	Admicellar-treated CaCO ₃ ([SDS] = 200 μM)	Admicellar-treated CaCO ₃ ([SDS] = 500 μM)
1	4.87	5.11	3.79	5.10	5.06
2	4.09	5.01	3.91	4.54	4.85
3	4.54	5.20	3.68	4.42	4.39
4	4.86	4.03	4.03	4.94	5.03
5	4.44	5.03	3.93	4.74	4.89
6	4.31	5.09	3.68	4.90	5.11
7	4.81	5.01	3.80	4.79	4.79
8	4.22	4.82	3.80	4.99	4.98
9	4.74	5.14	3.87	4.75	5.22
10	4.75	4.48	3.84	4.47	5.11
Mean	4.56	4.89	3.83	4.76	4.94
S.D.	0.28	0.36	0.11	0.23	0.24

Table H2 The load at peak values of various types of surface-treated CaCO₃-filled iPP composites

No.	Load at Peak (kN)				
	As-received CaCO ₃	Stearic acid-coated CaCO ₃	Untreated CaCO ₃	Admicellar-treated CaCO ₃ ([SDS] = 200 μM)	Admicellar-treated CaCO ₃ ([SDS] = 500 μM)
1	1.13	1.12	1.15	1.09	1.08
2	1.08	1.11	1.14	1.11	1.08
3	1.12	1.16	1.14	1.11	1.08
4	1.14	1.10	1.12	1.09	1.08
5	1.09	1.13	1.13	1.11	1.08
6	1.09	1.11	1.13	1.11	1.08
7	1.16	1.14	1.13	1.11	1.09
8	1.11	1.10	1.13	1.12	1.09
9	1.11	1.16	1.13	1.10	1.06
10	1.08	1.16	1.13	1.11	1.07
Mean	1.11	1.13	1.13	1.10	1.08
S.D.	0.03	0.02	0.01	0.01	0.01

Table H3 The tensile strength at yield values of various types of surface-treated CaCO₃-filled iPP composites

No.	Tensile Strength at Yield (Mpa)				
	As-received CaCO ₃	Stearic acid-coated CaCO ₃	Untreated CaCO ₃	Admicellar-treated CaCO ₃ ([SDS] = 200 μM)	Admicellar-treated CaCO ₃ ([SDS] = 500 μM)
1	26.66	26.49	27.03	25.91	25.63
2	25.55	26.31	27.15	26.20	25.65
3	26.31	27.35	26.85	26.25	25.63
4	26.76	26.13	26.56	25.98	25.66
5	25.70	26.78	26.70	26.18	25.59
6	25.83	26.30	26.65	26.14	25.49
7	27.46	26.94	26.69	26.22	25.85
8	26.14	26.02	26.67	26.58	25.91
9	26.12	27.46	26.70	26.11	25.18
10	25.46	27.34	26.70	26.14	25.38
Mean	26.20	26.71	26.77	26.17	25.60
S.D.	0.62	0.54	0.18	0.18	0.21

Table H4 The strain at break values of various types of surface-treated CaCO₃-filled iPP composites

No.	Strain at Break (%)				
	As-received CaCO ₃	Stearic acid-coated CaCO ₃	Untreated CaCO ₃	Admicellar-treated CaCO ₃ ([SDS] = 200 μM)	Admicellar-treated CaCO ₃ ([SDS] = 500 μM)
1	32.70	62.07	11.76	35.13	22.44
2	20.44	97.05	15.11	30.32	32.12
3	13.77	76.35	14.07	27.72	24.31
4	44.30	38.47	20.36	30.97	32.52
5	41.40	27.38	19.87	25.22	36.44
6	15.44	23.58	21.07	24.72	41.53
7	28.44	30.19	22.17	31.91	37.96
8	27.70	68.38	20.47	37.76	34.98
9	31.96	58.09	19.37	22.12	29.45
10	20.13	24.23	13.49	33.77	28.11
Mean	27.63	50.58	17.77	29.96	31.99
S.D.	10.33	25.50	3.75	4.98	6.03

Table H5 The Young's modulus values of various types of surface-treated CaCO₃ filled iPP composites

No.	Young's Modulus (MPa)				
	As-received CaCO ₃	Stearic acid-coated CaCO ₃	Untreated CaCO ₃	Admicellar-treated CaCO ₃ ([SDS] = 200 μM)	Admicellar-treated CaCO ₃ ([SDS] = 500 μM)
1	2194.09	2954.58	3172.33	2362.73	1890.07
2	2313.84	2491.42	2582.44	2617.62	2314.62
3	2555.95	2357.38	3282.89	2359.30	2606.06
4	2343.64	2106.28	3026.39	2961.95	2573.56
5	2593.16	2351.62	2504.95	3028.16	2346.40
6	2781.18	2603.58	2475.23	2687.83	2478.54
7	2410.41	2948.96	2562.80	2409.62	2495.32
8	2658.33	2887.06	2317.22	2617.48	2316.90
9	2401.37	2887.06	2907.68	2053.06	2823.69
10	2597.75	2894.94	3249.27	2599.35	2297.09
Mean	2484.97	2648.29	2808.12	2569.71	2414.23
S.D.	180.64	307.70	359.79	291.19	247.88

Table H6 The stress at automatic break values of various types of surface-treated CaCO₃-filled iPP composites

No.	Stress at Automatic Break (Mpa)				
	As-received CaCO ₃	Stearic acid-coated CaCO ₃	Untreated CaCO ₃	Admicellar-treated CaCO ₃ ([SDS] = 200 μM)	Admicellar-treated CaCO ₃ ([SDS] = 500 μM)
1	20.15	17.57	24.39	20.36	20.42
2	19.27	18.09	23.06	20.48	20.17
3	19.60	17.28	23.60	20.72	20.42
4	20.26	12.34	23.26	20.42	20.12
5	17.40	15.29	23.41	20.47	20.12
6	16.88	18.24	22.96	20.52	18.32
7	21.38	18.94	22.68	19.10	20.43
8	19.22	16.12	23.23	20.83	17.66
9	19.54	18.27	22.94	21.07	18.95
10	19.01	18.46	23.73	19.41	20.11
Mean	19.27	17.06	23.33	20.34	19.67
S.D.	1.32	2.00	0.49	0.61	1.00

Appendix I Determination of Flexural Properties of CaCO₃-filled iPP Composites

Table II The stress at yield (maximum load) values of various types of surface-treated CaCO₃-filled iPP composites

No.	Stress at Yield (Maximum Load) (Mpa)				
	As-received CaCO ₃	Stearic acid-coated CaCO ₃	Untreated CaCO ₃	Admicellar-treated CaCO ₃ ([SDS] = 200 μM)	Admicellar-treated CaCO ₃ ([SDS] = 500 μM)
1	37.27	36.30	39.45	37.64	36.36
2	36.63	36.56	39.90	37.64	36.24
3	35.23	34.17	40.27	38.40	36.15
4	34.92	36.09	40.70	37.39	37.15
5	35.34	36.78	40.17	37.33	36.76
6	34.20	35.94	39.71	38.18	36.59
7	35.20	36.62	38.68	34.82	36.18
8	35.23	37.86	40.76	36.86	36.62
9	35.94	36.21	40.46	35.63	37.15
10	36.39	35.55	40.60	35.37	36.59
11	36.27	36.30	40.43	35.60	37.39
12	36.03	36.41	40.73	34.34	36.30
13	34.97	37.39	42.46	35.97	36.56
14	35.14	35.37	41.79	35.58	37.21
15	35.14	36.36	41.28	35.75	35.63
Mean	35.53	36.26	40.49	36.43	36.59
S.D.	0.75	0.85	0.92	1.27	0.48

Table I2 The strain at yield (maximum load) values of various types of surface-treated CaCO₃-filled iPP composites

No.	Strain at Yield (Maximum Load) (mm/mm)				
	As-received CaCO ₃	Stearic acid-coated CaCO ₃	Untreated CaCO ₃	Admicellar-treated CaCO ₃ ([SDS] = 200 μM)	Admicellar-treated CaCO ₃ ([SDS] = 500 μM)
1	0.34	0.33	0.34	0.32	0.32
2	0.34	0.33	0.34	0.33	0.33
3	0.34	0.33	0.34	0.32	0.33
4	0.34	0.34	0.33	0.33	0.33
5	0.34	0.33	0.33	0.33	0.33
6	0.34	0.33	0.33	0.32	0.33
7	0.34	0.33	0.34	0.33	0.33
8	0.34	0.33	0.34	0.32	0.33
9	0.33	0.34	0.33	0.33	0.33
10	0.34	0.33	0.33	0.33	0.33
11	0.34	0.33	0.34	0.33	0.32
12	0.34	0.33	0.34	0.34	0.33
13	0.34	0.33	0.33	0.33	0.33
14	0.34	0.32	0.32	0.33	0.33
15	0.32	0.34	0.33	0.32	0.34
Mean	0.34	0.33	0.33	0.33	0.33
S.D.	0.01	0.00	0.01	0.01	0.01

Table I3 The Young's modulus values of various types of surface-treated CaCO₃-filled iPP composites

No.	Young's Modulus (Mpa)				
	As-received CaCO ₃	Stearic acid-coated CaCO ₃	Untreated CaCO ₃	Admicellar-treated CaCO ₃ ([SDS] = 200 μM)	Admicellar-treated CaCO ₃ ([SDS] = 500 μM)
1	703.66	647.90	750.80	661.78	639.60
2	621.68	654.36	707.81	661.75	619.12
3	640.45	580.19	804.80	651.06	600.77
4	595.92	645.64	701.24	590.06	668.99
5	631.01	579.93	752.23	627.83	608.08
6	742.42	631.62	678.83	638.24	682.82
7	619.86	661.60	756.08	625.78	680.29
8	618.52	592.30	731.23	668.06	672.16
9	630.76	694.69	706.68	591.23	576.34
10	642.82	639.13	755.94	561.11	700.75
11	646.20	585.68	682.19	695.70	628.88
12	597.11	645.44	705.66	594.90	530.88
13	662.41	612.90	725.28	637.84	658.30
14	627.97	597.20	799.55	731.36	675.02
15	637.07	673.30	754.85	577.04	662.24
Mean	641.21	629.46	734.21	634.25	640.28
S.D.	38.22	36.13	38.22	46.49	46.41

Table I4 The energy to yield point values of various types of surface-treated CaCO₃-filled iPP composites

No.	Energy to Yield Point (J)				
	As-received CaCO ₃	Stearic acid-coated CaCO ₃	Untreated CaCO ₃	Admicellar-treated CaCO ₃ ([SDS] = 200 μM)	Admicellar-treated CaCO ₃ ([SDS] = 500 μM)
1	1.74	1.67	1.78	1.60	1.60
2	1.67	1.64	1.83	1.63	1.61
3	1.65	1.52	1.80	1.65	1.60
4	1.66	1.66	1.77	1.68	1.66
5	1.65	1.64	1.74	1.64	1.68
6	1.59	1.59	1.72	1.66	1.66
7	1.61	1.60	1.72	1.59	1.66
8	1.61	1.67	1.78	1.66	1.66
9	1.66	1.61	1.75	1.58	1.63
10	1.68	1.55	1.79	1.60	1.65
11	1.62	1.60	1.76	1.62	1.60
12	1.69	1.61	1.79	1.60	1.59
13	1.67	1.68	1.81	1.63	1.64
14	1.62	1.53	1.79	1.66	1.65
15	1.57	1.61	1.79	1.60	1.64
Mean	1.65	1.61	1.77	1.63	1.63
S.D.	0.04	0.05	0.03	0.03	0.03

Table 15 The toughness values of various types of surface-treated CaCO₃-filled iPP composites

No.	Toughness (MPa)				
	As-received CaCO ₃	Stearic acid-coated CaCO ₃	Untreated CaCO ₃	Admicellar-treated CaCO ₃ ([SDS] = 200 μM)	Admicellar-treated CaCO ₃ ([SDS] = 500 μM)
1	1.04	0.99	1.06	0.96	0.95
2	1.00	0.98	1.10	0.97	0.96
3	0.98	0.90	1.07	0.98	0.95
4	0.98	0.99	1.06	1.00	0.99
5	0.98	0.98	1.03	0.98	1.01
6	0.95	0.94	1.03	0.98	0.99
7	0.96	0.95	1.03	0.95	0.99
8	0.96	1.00	1.07	0.99	0.99
9	0.98	0.96	1.04	0.94	0.96
10	1.00	0.93	1.07	0.95	0.98
11	0.96	0.95	1.05	0.97	0.95
12	1.00	0.96	1.07	0.95	0.95
13	0.99	1.00	1.07	0.97	0.98
14	0.96	0.91	1.07	0.99	0.98
15	0.93	0.96	1.06	0.96	0.98
Mean	0.98	0.96	1.06	0.97	0.97
S.D.	0.03	0.03	0.02	0.02	0.02

Appendix J Determination of Impact Properties of CaCO₃-filled iPP Composites

Table J1 The impact strength values of various types of surface-treated CaCO₃-filled iPP composites

No.	Impact Strength (J/m)				
	As-received CaCO ₃	Stearic acid-coated CaCO ₃	Untreated CaCO ₃	Admicellar-treated CaCO ₃ ([SDS] = 200 μM)	Admicellar-treated CaCO ₃ ([SDS] = 500 μM)
1	31.00	41.00	34.80	32.80	31.10
2	33.60	39.20	27.60	35.50	40.20
3	38.10	42.00	30.30	27.40	37.40
4	37.20	40.00	30.30	33.70	28.40
5	33.60	39.10	27.50	34.60	35.60
6	28.30	36.40	33.80	31.90	31.00
7	38.10	40.00	28.40	36.40	33.70
8	34.60	40.90	32.00	33.70	37.30
9	31.90	38.20	25.70	27.40	29.20
10	31.90	37.30	25.70	28.30	30.10
11	32.80	39.10	30.20	28.30	38.20
12	34.60	39.10	32.90	25.70	30.10
13	29.20	38.20	27.50	31.90	32.80
14	37.30	45.50	24.80	36.40	32.80
15	33.70	45.50	35.60	39.10	26.60
Mean	33.73	40.10	29.81	32.21	32.97
S.D.	3.04	2.62	3.44	3.99	4.01

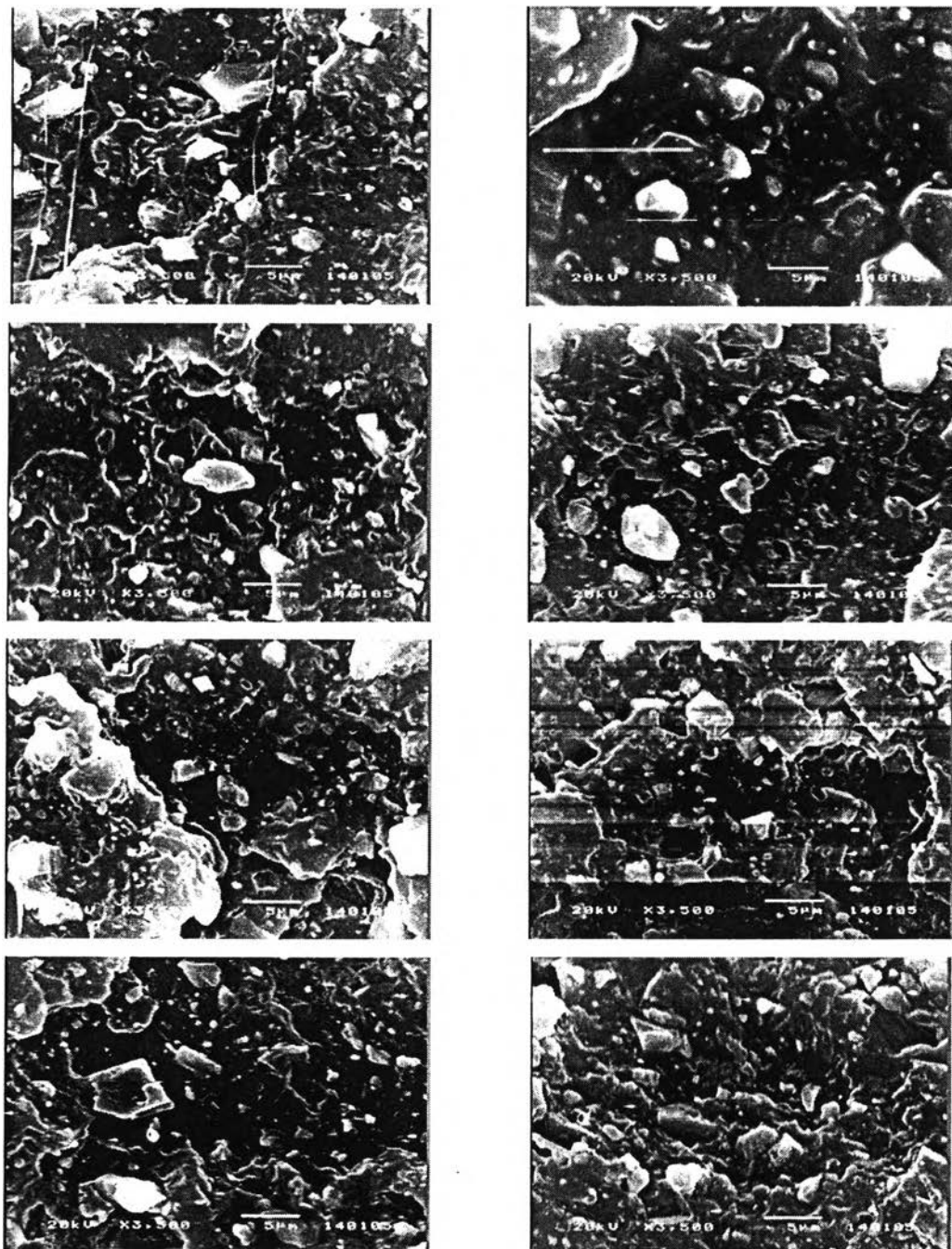
Appendix K Morphology of Fracture Surface of CaCO₃-filled iPP Composites

Figure K1 SEM micrographs of the fractured surface of selected impact test specimens for as-received CaCO₃-filled iPP composites.

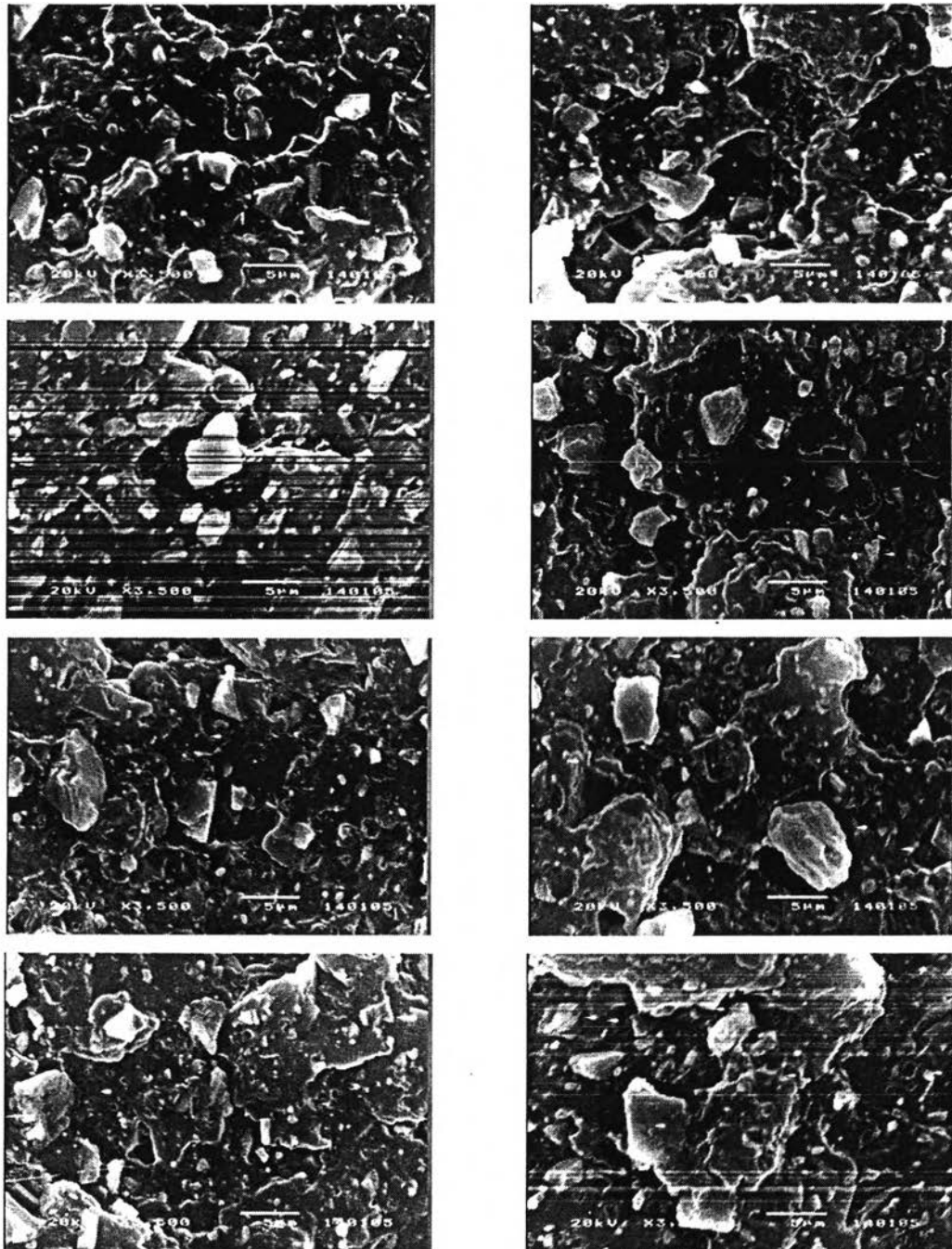


Figure K2 SEM micrographs of the fractured surface of selected impact test specimens for untreated CaCO₃-filled iPP composites.

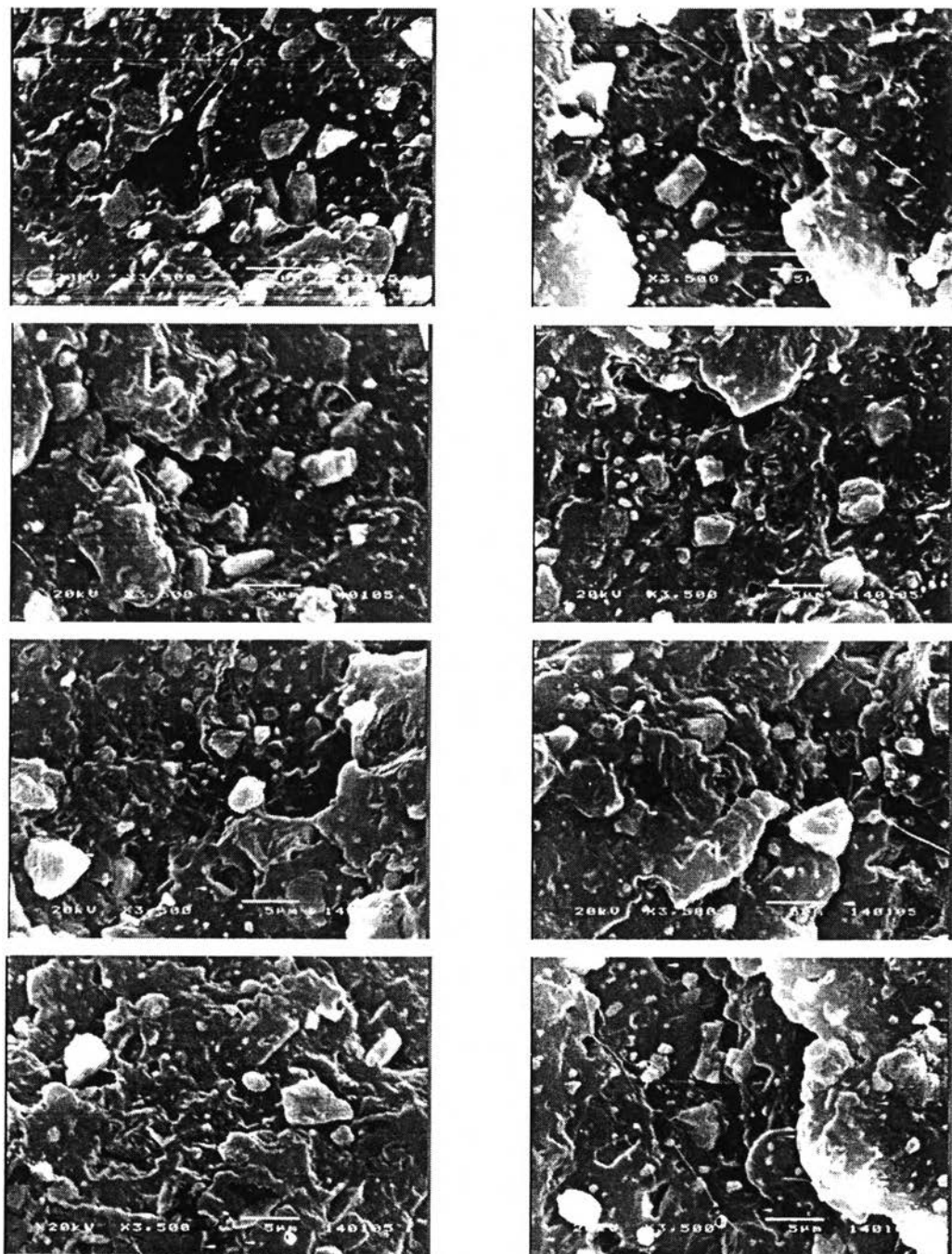


Figure K3 SEM micrographs of the fractured surface of selected impact test specimens for admicellar-treated ($[SDS]_{\text{equilibrium}} = 200 \mu\text{M}$) CaCO_3 -filled iPP composites.

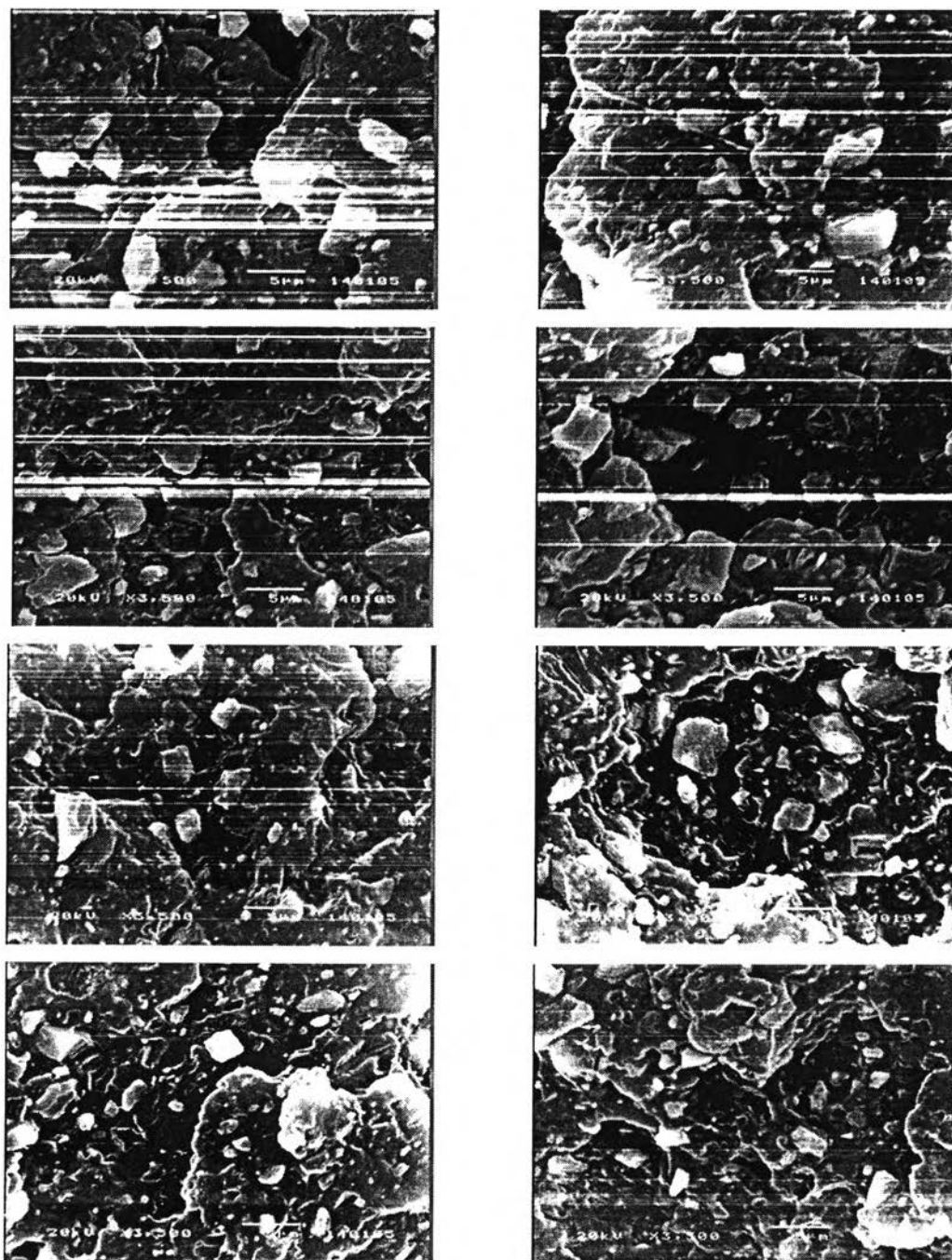


Figure K4 SEM micrographs of the fractured surface of selected impact test specimens for admicellar-treated ($[SDS]_{\text{equilibrium}} = 500 \mu\text{M}$) CaCO_3 -filled iPP composites.

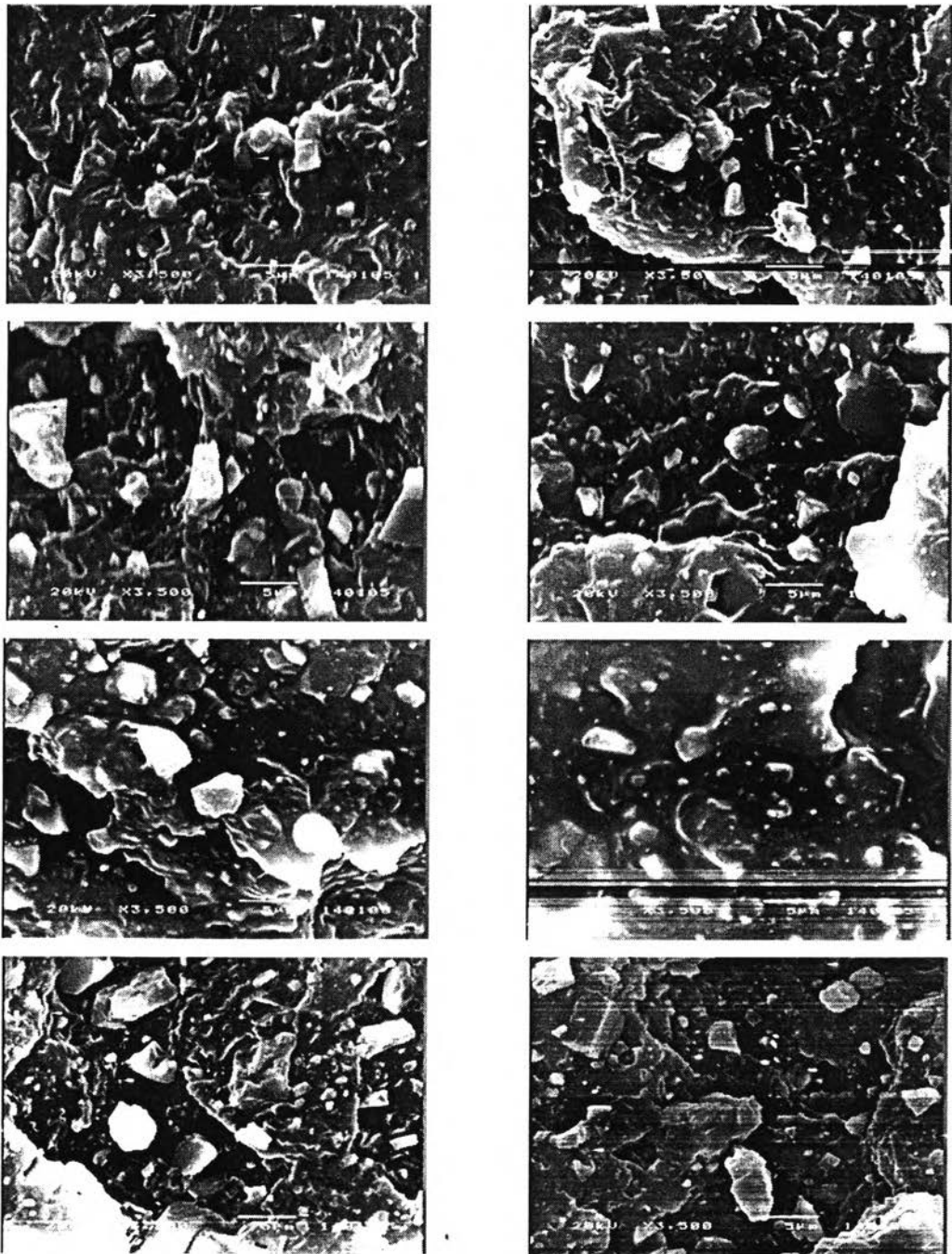


Figure K5 SEM micrographs of the fractured surface of selected impact test specimens for stearic acid-coated CaCO₃-filled iPP composites.

Table K1 The percentage of area values of various types of surface-treated CaCO_3 on iPP matrix of the fractured surface of impact test specimens for 30 wt.% CaCO_3 -filled iPP composites

No.	Percentage of area of CaCO_3 on iPP matrix (%)				
	As-received CaCO_3	Stearic acid-coated CaCO_3	Untreated CaCO_3	Admicellar-treated CaCO_3 ([SDS] = 200 μM)	Admicellar-treated CaCO_3 ([SDS] = 500 μM)
1	8.51	9.56	7.74	8.93	9.46
2	8.25	8.97	7.73	8.51	8.34
3	7.80	9.98	8.42	8.09	9.38
4	9.00	9.76	7.18	8.34	8.71
5	8.53	9.78	7.64	8.83	8.59
6	8.39	9.06	8.78	8.10	9.39
7	8.47	9.99	7.08	7.78	8.59
8	7.25	9.40	7.68	9.34	9.20
Mean	8.28	9.56	7.78	8.49	8.96
S.D.	0.53	0.39	0.57	0.52	0.45

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1. Rungruang, P., Supaphol, P., and Grady, B.P. (2004, December 1-3).
Preparation of surface-modified CaCO_3 for isotactic polypropylene by
admicellar polymerization technique. Poster presented at International
Conference on Smart Materials (SmartMat-'04), Chiang Mai, Thailand.