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APPENDIX A

Pressure Drop of Ethylene during the Adsolubilization Process

Figure A1 Dissolution of ethylene into water for adsolubilization and admicellar polymerization steps.

Adsolubilization process		Admicellar polymerization process	
Time (h)	Pressure drop (psi)	Time (h)	Pressure drop (psi)
0	0	0	0
1	5	1	0
2	7	2	0
3	9	3	0
4	10	4	0
5	10	5	0
6	10	6	0
7	10	7	0
8	10	8	0
9	10	9	0
10	10	10	0
11	10	11	0
12	10	12	0
13	10	13	0
14	10	14	0
15	10	15	0
16	10	16	0
17	10	17	0
18	10	18	0
19	10	19	0
20	10	20	0
21	10	21	0
22	10	22	0
23	10	23	0
24	10	24	0

Figure A2 Pressure drop of ethylene (psi) in the adsolubilization step of 1:1 initiator:surfactant ratio for blank system and glass fiber/adsolubilization system.

Adsolubilization process (blank)				Adsolubilization process (with glass fiber present)				
Time (h)	Pressure drop (psi)			Time (h)	Pressure drop (psi)			
	No. 1	No. 2	Avg.		No. 1	No. 2	No. 3	Avg.
0	0	0	0.00	0	0	0	0	0.00
1	5	7	6.00	1	4	4	3	3.67
2	7	9	8.00	2	6	6	4	5.33
3	8	10	9.00	3	8	7	5	6.67
4	9	11	10.00	4	8	8	7	7.67
5	10	11	10.50	5	8	9	7	8.00
6	11	11	11.00	6	9	9	9	9.00
7	11	11	11.00	7	10	10	9	9.67
8	11	11	11.00	8	10	10	9	9.67
9	11	11	11.00	9	10	11	10	10.33
10	11	11	11.00	10	11	11	10	10.67
11	11	11	11.00	11	11	11	11	11.00
12	11	11	11.00	12	11	12	11	11.33
13	11	11	11.00	13	12	12	11	11.67
14	11	11	11.00	14	12	12	11	11.67
15	11	11	11.00	15	12	12	11	11.67
16	11	11	11.00	16	12	12	11	11.67
17	11	11	11.00	17	12	12	11	11.67
18	11	11	11.00	18	12	12	11	11.67
19	11	11	11.00	19	12	12	11	11.67
20	11	11	11.00	20	12	12	11	11.67
21	11	11	11.00	21	12	12	11	11.67
22	11	11	11.00	22	12	12	11	11.67
23	11	11	11.00	23	12	12	11	11.67
24	11	11	11.00	24	12	12	11	11.67

Figure A3 Pressure drop of ethylene (psi) in the adsolubilization step of 2:1 initiator:surfactant ratio for blank system and glass fiber/adsolubilization system.

Adsolubilization process (blank)				Adsolubilization process (with glass fiber present)				
Time (h)	Pressure drop (psi)			Time (h)	Pressure drop (psi)			
	No. 1	No. 2	Avg.		No. 1	No. 2	No. 3	Avg.
0	0	0	0.00	0	0	0	0	0.00
1	4	6	5.00	1	5	4	4	4.33
2	6	8	7.00	2	7	6	7	6.67
3	7	9	8.00	3	8	8	8	8.00
4	7	9	8.00	4	9	8	9	8.67
5	8	10	9.00	5	9	10	9	9.33
6	8	10	9.00	6	9	11	11	10.33
7	8	10	9.00	7	10	11	11	10.67
8	9	11	10.00	8	10	11	11	10.67
9	11	11	11.00	9	10	12	12	11.33
10	11	11	11.00	10	11	12	12	11.67
11	11	11	11.00	11	11	12	12	11.67
12	11	11	11.00	12	11	12	12	11.67
13	11	11	11.00	13	11	12	12	11.67
14	11	11	11.00	14	11	12	12	11.67
15	11	11	11.00	15	11	12	12	11.67
16	11	11	11.00	16	11	12	12	11.67
17	11	11	11.00	17	11	12	12	11.67
18	11	11	11.00	18	11	12	12	11.67
19	11	11	11.00	19	11	12	12	11.67
20	11	11	11.00	20	11	12	12	11.67
21	11	11	11.00	21	11	12	12	11.67
22	11	11	11.00	22	11	12	12	11.67
23	11	11	11.00	23	11	12	12	11.67
24	11	11	11.00	24	11	12	12	11.67

Figure A4 Pressure drop of ethylene (psi) in the adsolubilization step of 3:1 initiator:surfactant ratio for blank system and glass fiber/adsolubilization system.

Adsolubilization process (blank)				Adsolubilization process (with glass fiber present)				
Time (h)	Pressure drop (psi)			Time (h)	Pressure drop (psi)			
	No. 1	No. 2	Avg.		No. 1	No. 2	No. 3	Avg.
0	0	0	0.00	0	0	0	0	0.00
1	6	4	5.00	1	6	6	5	5.67
2	8	6	7.00	2	7	8	7	7.33
3	10	8	9.00	3	9	10	9	9.33
4	11	9	10.00	4	9	11	9	9.67
5	11	11	11.00	5	10	11	10	10.33
6	11	11	11.00	6	10	12	10	10.67
7	11	11	11.00	7	12	12	11	11.67
8	11	11	11.00	8	12	12	11	11.67
9	11	11	11.00	9	12	12	11	11.67
10	11	11	11.00	10	12	12	11	11.67
11	11	11	11.00	11	12	12	11	11.67
12	11	11	11.00	12	12	12	11	11.67
13	11	11	11.00	13	12	12	11	11.67
14	11	11	11.00	14	12	12	11	11.67
15	11	11	11.00	15	12	12	11	11.67
16	11	11	11.00	16	12	12	11	11.67
17	11	11	11.00	17	12	12	11	11.67
18	11	11	11.00	18	12	12	11	11.67
19	11	11	11.00	19	12	12	11	11.67
20	11	11	11.00	20	12	12	11	11.67
21	11	11	11.00	21	12	12	11	11.67
22	11	11	11.00	22	12	12	11	11.67
23	11	11	11.00	23	12	12	11	11.67
24	11	11	11.00	24	12	12	11	11.67

Pressure Drop of Ethylene during the Admicellar Polymerization Process

Figure A5 Pressure drop of ethylene (psi) in the admicellar polymerization step of 1:1 initiator:surfactant ratio for blank system and glass fiber present in the system. Reaction temperature 70°C.

Admicellar polymerization (blank)				Admicellar polymerization (with glass fiber present)				
Time (h)	Pressure drop (psi)			Time (h)	Pressure drop (psi)			
	No. 1	No. 2	Avg.		No. 1	No. 2	No. 3	Avg.
0	0	0	0.00	0	0	0	0	0.00
1	2	5	3.50	1	2	3	2	2.33
2	5	7	6.00	2	4	5	5	4.67
3	7	8	7.50	3	7	7	7	7.00
4	7	9	8.00	4	9	8	9	8.67
5	8	10	9.00	5	11	10	9	10.00
6	8	10	9.00	6	12	10	9	10.00
7	9	10	9.50	7	12	11	11	11.33
8	10	10	10.00	8	12	11	11	11.33
9	11	10	10.50	9	12	11	12	11.67
10	11	10	10.50	10	12	11	12	11.67
11	11	10	10.50	11	12	11	12	11.67
12	11	10	10.50	12	12	11	12	11.67
13	11	10	10.50	13	12	11	12	11.67
14	11	10	10.50	14	12	11	12	11.67
15	11	10	10.00	15	12	11	12	11.67
16	11	10	10.50	16	12	11	12	11.67
17	11	10	10.50	17	12	11	12	11.67
18	11	10	10.50	18	12	11	12	11.67
19	11	10	10.50	19	12	11	12	11.67
20	11	10	10.50	20	12	11	12	11.67
21	11	10	10.50	21	12	11	12	11.67
22	11	10	10.50	22	12	11	12	11.67
23	11	10	10.50	23	12	11	12	11.67
24	11	10	10.50	24	12	11	12	11.67

Figure A6 Pressure drop of ethylene (psi) in the admicellar polymerization step of 2:1 initiator:surfactant ratio for blank system and glass fiber present in the system. Reaction temperature 70°C.

Admicellar polymerization (blank)				Admicellar polymerization (with glass fiber present)				
Time (h)	Pressure drop (psi)			Time (h)	Pressure drop (psi)			
	No. 1	No. 2	Avg.		No. 1	No. 2	No. 3	Avg.
0	0	0	0.00	0	0	0	0	0.00
1	8	6	7.00	1	3	4	5	4.00
2	11	9	10.00	2	7	8	9	8.00
3	14	12	13.00	3	9	10	12	10.33
4	16	14	15.00	4	11	12	13	12.00
5	16	14	15.00	5	13	14	15	14.00
6	17	17	17.00	6	15	15	15	15.00
7	17	17	17.00	7	16	16	16	16.00
8	17	17	17.00	8	16	16	17	16.33
9	17	17	17.00	9	16	16	19	17.67
10	17	17	17.00	10	18	18	19	18.67
11	17	17	17.00	11	18	18	19	18.67
12	17	17	17.00	12	18	18	19	18.67
13	17	17	17.00	13	18	18	19	18.67
14	17	17	17.00	14	18	18	19	18.67
15	17	17	17.00	15	18	18	19	18.67
16	17	17	17.00	16	18	18	19	18.67
17	17	17	17.00	17	18	18	19	18.67
18	17	17	17.00	18	18	18	19	18.67
19	17	17	17.00	19	18	18	19	18.67
20	17	17	17.00	20	18	18	19	18.67
21	17	17	17.00	21	18	18	19	18.67
22	17	17	17.00	22	18	18	19	18.67
23	17	17	17.00	23	18	18	19	18.67
24	17	17	17.00	24	18	18	19	18.67

Figure A7 Pressure drop of ethylene (psi) in the admicellar polymerization step of 3:1 initiator:surfactant ratio for blank system and glass fiber present in the system. Reaction temperature 70°C.

Admicellar polymerization (blank)				Admicellar polymerization (with glass fiber present)				
Time (h)	Pressure drop (psi)			Time (h)	Pressure drop (psi)			
	No. 1	No. 2	Avg.		No. 1	No. 2	No. 3	Avg.
0	0	0	0.00	0	0	0	0	0.00
1	14	12	13.00	1	7	7	8	7.33
2	18	16	17.00	2	13	12	12	12.33
3	20	18	19.00	3	17	15	15	15.67
4	22	20	21.00	4	20	18	18	18.67
5	23	23	22.00	5	22	21	20	21.00
6	23	21	22.00	6	24	23	22	23.00
7	23	21	22.00	7	24	23	22	23.00
8	23	23	23.00	8	24	24	24	24.00
9	23	23	23.00	9	25	25	24	24.67
10	23	23	23.00	10	25	26	24	25.00
11	23	23	23.00	11	25	26	26	25.67
12	23	23	23.00	12	25	26	26	25.67
13	23	23	23.00	13	25	26	26	25.67
14	23	23	23.00	14	25	26	26	25.67
15	23	23	23.00	15	25	26	26	25.67
16	23	23	23.00	16	25	26	26	25.67
17	23	23	23.00	17	25	26	26	25.67
18	23	23	23.00	18	25	26	26	25.67
19	23	23	23.00	19	25	26	26	25.67
20	23	23	23.00	20	25	26	26	25.67
21	23	23	23.00	21	25	26	26	25.67
22	23	23	23.00	22	25	26	26	25.67
23	23	23	23.00	23	25	26	26	25.67
24	23	23	23.00	24	25	26	26	25.67

APPENDIX B

Mechanical Properties of Glass Fiber Reinforced HDPE Composites

Tensile strength at yield of glass fiber reinforced HDPE composites

Table B1 The tensile strength values of various types of surface modified glass fiber reinforced HDPE composites.

No.	Tensile strength at yield of glass fiber/HDPE composite (MPa)				
	Untreated glass fiber	As-received glass fiber	Admicellar-treated glass fiber (1:1)	Admicellar-treated glass fiber (2:1)	Admicellar-treated glass fiber (3:1)
1	22.852	22.191	23.129	23.416	25.175
2	23.664	23.357	22.573	24.553	26.473
3	23.090	23.421	22.460	23.405	26.144
4	22.983	22.499	22.500	23.155	27.414
5	23.017	21.985	23.765	24.247	25.796
6	22.081	22.134	21.346	23.031	25.757
7	21.763	23.124	21.876	23.383	25.557
8	22.481	21.933	22.159	24.165	26.097
9	22.716	22.320	22.140	22.183	26.003
10	22.332	22.491	21.737	23.252	26.720
Mean	22.7	22.5	22.4	23.5	26.1
SD	0.5	0.5	0.7	0.7	0.6

Flexural strength at yield of glass fiber reinforced HDPE composites

Table B2 The flexural strength values of various types of surface modified glass fiber reinforced HDPE composites.

No.	Flexural strength at yield of glass fiber/HDPE composite (MPa)				
	Untreated glass fiber	As-received glass fiber	Admicellar-treated glass fiber (1:1)	Admicellar-treated glass fiber (2:1)	Admicellar-treated glass fiber (3:1)
1	22.534	23.625	24.928	26.884	24.800
2	25.696	24.276	25.376	27.565	27.638
3	24.360	23.809	24.485	26.784	27.459
4	23.967	24.565	25.339	26.617	26.119
5	25.274	24.549	24.575	25.513	26.399
6	22.614	22.921	25.281	26.274	27.474
7	23.204	23.922	24.452	27.366	27.772
8	24.565	23.295	25.624	25.795	28.293
Mean	24.0	23.9	25.0	26.6	27.0
SD	1.2	0.6	0.5	0.7	1.1

Impact strength of glass fiber reinforced HDPE composites

Table B3 The impact strength values of various types of surface modified glass fiber reinforced HDPE composites.

No.	Impact strength of glass fiber/HDPE composite (KJ/m^2)				
	Untreated glass fiber	As-received glass fiber	Admicellar-treated glass fiber (1:1)	Admicellar-treated glass fiber (2:1)	Admicellar-treated glass fiber (3:1)
1	7.6	8.2	6.0	5.9	6.2
2	7.8	7.8	6.1	6.1	6.0
3	8.1	8.6	6.4	6.1	5.9
4	7.3	8.8	6.7	6.1	5.9
5	8.2	8.3	6.3	6.1	6.1
6	7.7	8.0	6.7	6.1	5.8
7	7.5	8.3	6.6	5.9	6.0
Mean	7.7	8.3	6.4	6.0	5.9
SD	0.3	0.3	0.3	0.1	0.1

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