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APPENDIX

APPENDIX

Table A-1 The silica content and degree of conversion from alkylalkoxysilane to silica in the NR/silica dipped films prepared from various types of silane precursors and various maturation times.

Silane type and amount (phr)	Maturation time (day)	Silica content (phr)	Conversion (%)
TEOS 30 phr	0	2.3 ± 0.1	26 ± 1.1
	1	6.7 ± 0.3	77 ± 3.0
	2	6.3 ± 0.2	73 ± 2.4
VTOS 30 phr	0	1.5 ± 0.4	12 ± 3.4
	1	8.2 ± 0.4	65 ± 3.5
	2	8.2 ± 0.1	66 ± 1.1
ETOS 30 phr	0	0.7 ± 0.1	5 ± 1.0
	1	0.8 ± 0.2	6 ± 1.7
	2	0.8 ± 0.4	6 ± 3.0
MPS 30 phr	0	0.4 ± 0.1	2 ± 0.3
	1	4.0 ± 0.1	19 ± 0.6
	2	4.0 ± 0.1	19 ± 0.5

Table A-2 The Degree of swelling (%) of the dipped NR films filled with *in situ* silica generated by various types of alkoxysilane precursor and silica-free dipped rubber film (VNR).

Sample	1	2	3	Average \pm SD
VNR	396	390	405	397 ± 8
30T	308	327	322	319 ± 10
25T	326	332	328	329 ± 3
20T	337	329	336	334 ± 4
25T5V	328	333	331	331 ± 2
20T10V	318	315	321	318 ± 3
25T5E	409	418	404	410 ± 7
20T10E	403	416	406	409 ± 7
25T5M	365	360	363	363 ± 2
20T10M	363	346	349	353 ± 9
30T	165	173	171	170 ± 4

Table A-3 Silica content and tensile properties of the dipped films.

Sample code	Silica content (phr)	Modulus at 300% elongation (MPa)	Modulus at 500% elongation (MPa)	Tensile strength (MPa)	Elongation at break (%)
VNR	0	1.69 ± 0.50	3.69 ± 1.32	13.32 ± 3.78	687 ± 67
30T	6.7 ± 0.3	1.89 ± 0.17	4.65 ± 0.90	16.03 ± 1.96	694 ± 30
25T	5.1 ± 0.1	2.02 ± 0.41	4.41 ± 1.32	15.35 ± 2.32	685 ± 29
20T	4.0 ± 0.1	1.57 ± 0.15	3.66 ± 1.55	14.65 ± 2.63	749 ± 125
25T5V	5.6 ± 0.3	2.00 ± 0.28	4.40 ± 0.48	15.54 ± 2.90	684 ± 26
20T10V	5.2 ± 0.1	2.72 ± 0.42	8.00 ± 1.70	16.92 ± 4.44	626 ± 93
25T5E	5.0 ± 0.2	1.56 ± 0.19	3.62 ± 0.46	10.11 ± 4.63	704 ± 93
20T10E	4.8 ± 0.2	1.75 ± 0.29	3.68 ± 0.89	13.13 ± 2.45	683 ± 86
25T5M	5.2 ± 0.4	1.64 ± 0.06	3.68 ± 0.46	14.69 ± 3.64	736 ± 32
20T10M	4.9 ± 0.1	1.24 ± 0.14	3.10 ± 0.57	11.21 ± 3.67	691 ± 70
30V	8.2 ± 0.4	5.27 ± 0.86	-	7.19 ± 1.66	388 ± 32

Table A-4 The tension set (%) of the dipped rubber films filled with *in situ* silica generated by various types of alkoxysilane precursor and silica-free dipped rubber film (VNR).

Sample	1	2	3	Average ± SD
VNR	5.0	3.5	4.5	4.3 ± 0.8
30T	2.0	5.5	5.0	4.2 ± 1.9
25T	3.5	1.0	2.5	2.3 ± 1.3
20T	4.0	3.5	2.5	3.3 ± 0.8
25T5V	4.0	3.5	3.0	3.5 ± 0.5
20T10V	5.0	3.5	3.5	4.0 ± 0.9
25T5E	3.5	5.0	2.0	3.5 ± 1.5
20T10E	3.0	3.0	4.0	3.7 ± 0.6
25T5M	1.0	4.0	3.0	2.7 ± 1.5
20T10M	2.0	3.0	3.5	2.8 ± 0.8
30T	3.0	4.5	2.0	3.2 ± 1.3

Table A-5 Tear properties (N/mm) of the dipped films.

Sample	1	2	3	Average \pm SD
VNR	17.56	18.25	17.56	17.79 \pm 0.4
30T	22.06	22.17	22.53	19.91 \pm 0.6
25T	16.65	15.87	16.35	16.29 \pm 0.4
20T	19.02	17.96	18.14	18.37 \pm 0.6
25T5V	17.88	16.44	16.29	16.87 \pm 0.9
20T10V	20.15	20.50	24.58	21.74 \pm 2.5
25T5E	19.37	19.35	19.46	19.39 \pm 0.1
20T10E	22.26	18.58	22.15	21.00 \pm 2.1
25T5M	19.30	21.06	17.92	19.43 \pm 1.6
20T10M	18.28	20.40	15.36	18.01 \pm 2.5
30T	15.63	19.29	18.95	17.96 \pm 2.0



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