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2004 05 28

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(71) , , , ,  
, 06749 , , ,

(72) , , 06410, , 250  
, , 06524, , 69  
, , 06756, , 252

(74)

:

(54) 가

; (e) 400 (a) 가 ; (b) ; (c) ; (d) - ,

,

,

가

, , ,

가 (rolling resistance) / . . . . . , (traction)

(frequencies) . . . 가 . . . , 60 가  
가 (processing safety) . . . .

가 (wet traction),  
가 . . . . .

가  
가

가 . . . . , / 가

가 , , , (DPG) 가  
DPG  
가 . 가  
가 .

가

; (d) - ; (e) 400 (a) ; (b) ; (c) 가

가

가

가 , , 400 (Mw)  
가 , 가 ,  
가 .  
'phr' , 100

가

1

[ 1 ]

ASTM (D-1765-82a)	(m <sup>2</sup> /g) (D-3765)
N-110	126
N-234	120
N-220	111
N-339	95
N-330	83
N-550	42
N-660	35

5 50phr

1

80phr

가

가

/

가

/

가

가

가

가

가

가

가

/

가

가

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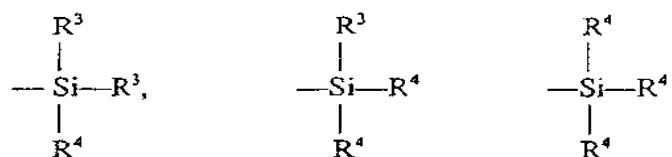
-

1

$$Z - R^1 - S_n - R^2 - Z$$

,  $Z$  ;

2



, R<sup>3</sup> 1 4 , , ; R<sup>4</sup> 1 8 1 18  
 , 5 8 ; R<sup>1</sup> R<sup>2</sup> 1 18  
 가 , n 2 8 .

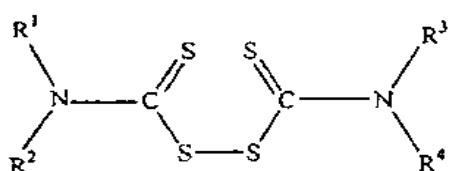
가

(starter) )

1 8phr , 가 . 1.5 7 phr , 0.5 10phr  
0.5 10 8 , 가  
1.1 5phr . 가 . 가 .

가 , 500 1250 . 가 800 400 1000

3



, R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup>, R<sup>4</sup>, 4, 30,

4 30  
, R 1 R 2 / R 3 R 4

가  
R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup>

$R^1, R^2, R^3, R^4$  가  $t$ -

R<sup>2</sup>, R<sup>3</sup> R<sup>4</sup> 8 18

R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub> R<sub>4</sub> 가 12 14

15 , 0.75phr . 가 0.20 0.10 0.50phr 1.0phr , 0.

가 가

, , , , (bushing), , , ,  
, , , , (seal) 가 , , , ,  
(mud flap).

,

A-D 1-3

2 3 ( 100 )  
 가 : 2 (internal mixer) 가  
 (incorporated) 160  
 (batch) 2 (pass)  
 3  
 93-105

[ 2 ]

1	/	A	B	C	D	1	2	3
SOLFLEX 1216 <sup>1</sup>	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00
BUDENE 1207 <sup>2</sup>	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
ZEOSIL 1165 <sup>3</sup>	44.00	44.00	44.00	44.00	44.00	44.00	44.00	44.00
N234 <sup>4</sup>	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00
SILQUEST A 1289 <sup>5</sup>	3.52	1.76	1.76	1.76	1.76	1.76	1.76	1.76
DEG(LIQUID)	0.00	1.76	0.00	0.00	1.76	0.00	0.00	0.00
	0.00	0.00	1.76	0.00	0.00	1.76	0.00	0.00
	0.00	0.00	0.00	1.76	0.00	0.00	1.76	
	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FLEXZONE 7P <sup>6</sup>	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
SUNDEX 8125 <sup>8</sup>	<u>40.00</u>							
MB1 :	224.02	224.02	224.02	224.02	224.02	224.02	224.02	224.02

(1) (Goodyear)

(2)

(3) (Rhodia)

(4) (Carbot Corp.)

(5) OSI (OSI Specialty Chemicals)

(6) (Uniroyal Chemical Company)

(7)

(8) (Sun Oil)

[ 3 ]

2	/	A	B	C	D	1	2	3
MB-1 <sup>9</sup>	224.02	224.02	224.02	224.02	224.02	224.02	224.02	224.02
	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Delac NS <sup>10</sup>	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00
ROYALAC 150 <sup>11</sup>	0.00	0.00	0.00	0.00	0.25	0.25	0.25	0.25
SULFUR 21-10 <sup>12</sup>	<u>2.00</u>							
	231.02	231.02	231.02	231.02	230.27	230.27	230.27	230.27

(9) MB-1 2

(10) N-t- -2-

(11) , 916 가 (C<sub>12</sub>-C<sub>14</sub>)

(12) C.P. (C.P. Hall)

가 (cure) 4  
 가 4  
 (Monsanto rheometer) ODR 2000(1° ARC, 100cpm) 4  
 : ML 4  
 (Scorch safety: t<sub>s</sub> 2) : MH  
 : 90% (t<sub>50</sub>) (ML) 2 (unit)  
 2 (t<sub>90</sub>)  
 90% (tensile strength), (Modulus) ASTM D-41  
 1-3 (elongation) (A-D)  
 2 (Modulus) A-D

[ 4 ]

/	A	B	C	D	1	2	3
160							
ML(lb-in.)	6.57	6.95	6.49	7.23	7.65	7.29	7.44
MH(lb-in.)	34.15	36.10	34.18	36.65	34.00	32.38	34.66
t <sub>5</sub> 2( )	3.07	2.82	3.35	2.65	5.42	5.97	5.24
t <sub>50</sub> ( )	4.71	4.32	5.01	4.15	7.95	9.11	7.69
t <sub>90</sub> ( )	10.23	8.52	9.25	8.43	11.71	13.88	11.41
160							
@ 160 ( )	15.0	15.0	15.0	15.0	17.5	20.0	17.5
100% (Mpa)	2.6	2.3	2.1	2.6	2.3	2.2	2.4
300% (Mpa)	11.9	10.2	9.3	11.0	10.2	8.8	9.8
(Mpa)	18.0	17.9	16.4	19.0	18.4	17.8	19.4
, %	410.0	490.0	490.0	490.0	490.0	520.0	540.0

, A	56.0	59.0	57.0	59.0	59.0	57.0	59.0
3Pt. (135 MS) ( )	10	9	10	8	23	27	22
ML <sub>1+4</sub> (100 ML <sub>1+4</sub> )	71	62	61	64	66	63	64
60 (10Hz) [RPA-2000]							
%							
0.7	0.106	0.118	0.115	0.110	0.110	0.126	0.122
1.0	0.111	0.134	0.136	0.128	0.121	0.137	0.140
2.0	0.139	0.171	0.173	0.153	0.157	0.174	0.161
5.0	0.168	0.187	0.189	0.185	0.176	0.189	0.179
7.0	0.168	0.190	0.194	0.187	0.176	0.186	0.182
14.0	0.158	0.185	0.191	0.184	0.173	0.182	0.178
(G', kPa)							
%							
0.7	3106	4200	4055	4376	3535	3596	3902
1.0	2902	3902	3727	4017	3295	3355	3601
2.0	2495	3090	3038	3358	2683	2670	2880
5.0	1874	2299	2242	2478	2092	2039	2248
7.0	1722	2066	2010	2222	1927	1869	2020
14.0	1427	1608	1560	1720	1519	1492	1597

( 1-3 )  
 ( B - D ) DPG ( A ) DPG . 1-3 ( M )  
 ( ooney Scorch ) A - D .  
 , 1-3 100% 300% % A - D . , 1 phr  
 0.25phr ( C<sub>12</sub> - C<sub>14</sub> )  
 가

E-H 4-6

[ 5 ]

N234	5.00	5.00	5.00	5.00	5.00	5.00	5.00
SILQUEST A 1289	6.80	0.00	0.00	0.00	0.00	0.00	0.00
DEG/SILQUEST 1289 BLEND <sup>13</sup>	0.00	6.80	0.00	0.00	6.80	0.00	0.00
/ SILQUEST A 1289 BLEND <sup>13</sup>	0.00	0.00	0.00	6.80	0.00	0.00	6.80
/ SILQUEST A 1289 BLEND <sup>13</sup>	0.00	0.00	6.80	0.00	0.00	6.80	0.00
	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FLEXZONE 7P	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	44.00	44.00	44.00	44.00	44.00	44.00	44.00
NAUGARD Q <sup>14</sup>	<u>1.00</u>						
NB2 :	244.30	244.30	244.30	244.30	244.30	244.30	244.30

(13) / (Silquest) 가

(14) TMQ

5  
r 가 MB-2 MB-2 가 248.30phr 가 , 4.00 ph  
6

[ 6 ]

2							
/	E	F	G	H	4	5	6
MB-2 <sup>15</sup>	248.30	248.30	248.30	248.30	248.30	248.30	248.30
Delac NS <sup>16</sup>	1.50	1.50	1.50	1.50	1.50	1.50	1.50
	2.00	2.00	2.00	2.00	0.00	0.00	0.00
ROYALAC 150	0.00	0.00	0.00	0.00	0.25	0.25	0.25
SULFUR	<u>1.80</u>						
	253.60	253.60	253.60	253.60	251.85	251.85	251.85

(15) MB-2 5 4.00phr

(16) N-t- -2-

가  
가 7 7 ,

ODR 2000(1 ° ARC, 100cpm)  
 (t<sub>s</sub> 2) (ML) 2 (unit) : MH , : ML  
 50% (t<sub>90</sub>) 90% (t<sub>50</sub>)  
 ASTM D-412 . 4-6 .  
 E-H . .

[ 7 ]

/	E	F	G	H	4	5	6
160							
ML(lb-in.)	3.9	5.0	4.6	4.8	6.3	9.2	5.5
MH(lb-in.)	28.4	35.7	34.8	36.7	37.2	35.7	38.0
t <sub>2</sub> 5( )	1.6	0.5	0.9	0.3	1.6	2.9	0.3
t <sub>50</sub> ( )	5.6	3.7	4.5	4.6	5.8	5.1	7.1
t <sub>90</sub> ( )	22.0	14.5	16.2	13.7	16.8	11.9	17.7
160 /							
@160 ( )	25.0	17.0	19.5	17.0	19.5	15.0	20.5
100% (Mpa)	3.2	2.7	2.7	2.2	2.3	2.1	2.2
300% (Mpa)	14.4	11.2	11.0	8.5	9.7	8.5	9.3
(Mpa)	18.3	17.9	18.5	19.2	19.2	18.8	18.4
, %	350.0	430.0	440.0	560.0	500.0	520.0	490.0
, A	67.0	70.0	68.0	67.0	67.0	66.0	67.0
(135 MS)							
3Pt. ( )	15.0	9.4	11.9	13.6	16.9	14.6	23.5
18Pt. ( )	22.1	13.3	16.9	17.9	20.5	17.0	29.3
(100 ML <sub>1+4</sub> )	84	83	86	83	80	87	81
(%)	70.6	71.6	67.2	76.1	84.4	73.5	81.1
60 (10Hz)							
[RPA-2000]							
%							
0.7	0.088	0.061	0.063	0.051	0.052	0.037	0.053
1.0	0.096	0.060	0.075	0.062	0.058	0.040	0.058
2.0	0.119	0.086	0.084	0.084	0.076	0.061	0.081
5.0	0.156	0.141	0.134	0.136	0.132	0.125	0.130
7.	0.156	0.151	0.142	0.147	0.145	0.135	0.138
14.0	0.172	0.189	0.176	0.189	0.185	0.174	0.176
(G', Kpa)							
%							
0.7	4800	6687	6694	7620	8002	7161	6832
1.0	4497	6443	6399	7186	7782	6967	6547
2.0	3866	5768	5746	6451	6959	6476	5902
5.0	3020	4303	4069	4681	4945	4635	4281

7.0	2750	3736	3522	4001	4246	3989	3792
14.0	2068	2309	2390	2517	2733	2639	2455
<u>Din</u>							
(mm)	84.3	93.5	92.4	103.2	99.9	102.7	92.0
	147.2	132.8	134.2	120.1	124.2	120.8	134.8

( F - H) DPG ( F) DPG ( 4 - 6)

5 6 G H , 가 ,  
가 . 5 6 , G H ,

가

(57)

1.

(a)  $\frac{1}{2}$  ; (b)  $\frac{1}{2}$  ; (c)  $\frac{1}{2}$  ; (d)  $\frac{1}{2}$  ; (e) 400

2.

3

1 , , , , , ( - ),  
 , , , , , , , ,  
 - , , , , , ( - ), - ,

4

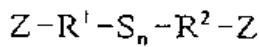
5

1. 가

6

5. - 가

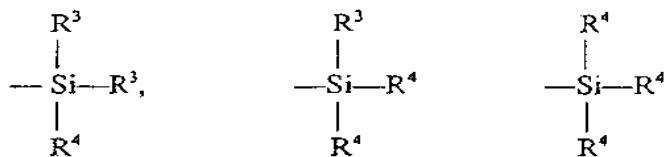
1



, 2

3

2



, R 3 1 4  
, 5 8  
가

n 2 8

; R 4 1 8  
; R 1 R 2 1 18

7

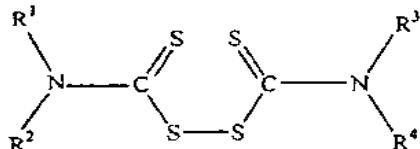
8.

1 ,

가

■

3



• R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup> R<sup>4</sup>

4 30

4 30

8

8 R 1 R 2 R 3 R 4

8 18

10.

8 , R <sup>1</sup> , R <sup>2</sup> , R <sup>3</sup> R <sup>4</sup> 12 14

11.

8 , R 1 , R 2 , R 3 R 4  
12 14 .

12.

1 , 5 100phr  
, 0.5 10 phr

0.5 10 phr  
0.1 1.0phr

13.

11 , 5 100phr , - 0.5 10 phr  
, 0.5 10 phr , 0.1 1.0phr

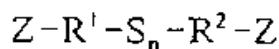
14.

(a) ; (b) ; (c) ; (d) - ; (e) 400  
가  
가 . ,

15.

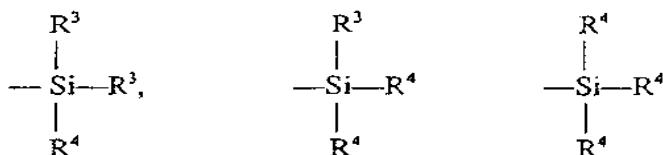
14 , 가 -

1



, Z

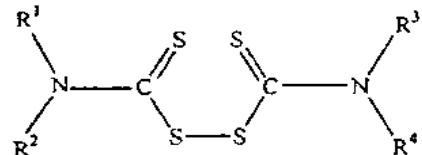
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16.

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3



$$, R^1, R^2, R^3 \quad R^4 \quad , \quad R^1 \quad R^2 \quad / \quad R^3 \quad R^4 \quad 4 \quad 30 \quad ,$$

17. R<sup>1</sup> R<sup>2</sup> R<sup>3</sup> R<sup>4</sup> 8 18