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TECHNICAL BULLETIN

SBR Bead Wire

Thermax® N990 medium thermal carbon black is characterized by its large particle size and low level of particle agglomeration. Thermax® N990 is widely used in applications that require excellent dynamic properties and heat resistance. The large particle size (low surface area) and low structure allow for high rebound, low tan delta and low hysteresis, thereby maintaining the inherent elastomeric properties of the rubber compound. Thermax® N990 is also used in applications such as bead wire insulation because the inactive surface chemistry of the carbon black helps to prevent degradation of the adhesion of the bead wire to the rubber insulation.

Table 1: Effect of Carbon Black Particle Size in SBR

Particle Size Iodine Absorption, g/kg	N110 145	N220 121	N339 90	N351 68	N550 43	N660 36	N762 27	Thermax® N990 9
Physical Properties								
300% Modulus (MPa)	13.4	12.9	15.7	14.3	12.4	9.9	7.8	3.6
Tensile Strength (MPa)	27.4	27.5	25.6	25.6	20.2	21.4	22.5	12.6
Elongation (%)	500	530	440	470	480	540	630	730
Shore A Hardness	60	61	60	59	57	53	50	44
Dynamic Testing								
Rebound, Zwick (%)	44	46	50	53	58	60	61	63
Heat Build-up, C, Firestone	137	134	116	117	112	107	108	104
E Minutes (MPa)	9.8	8.7	8.2	7.8	6.6	5.8	5.2	4.4
E Seconds (MPa)	2.4	2.1	1.7	1.4	1.1	0.9	0.8	0.6
Loss Factor (tan delta)	0.25	0.24	0.2	0.19	0.17	0.15	0.15	0.14

Compound: Plioflex 1500C SBR – 100; Carbon Black – 50; Oil – 10; Zinc Oxide – 3; Stearic Acid – 2; Sulphur – 2; Agerite Stalite S – 1; Vanax NS – 1

Source: Concarb Division of Witco Corporation, D.T. Norman, Chapter 3, The Vanderbilt Handbook, Volume 13, 1990

Thermax® N990 was evaluated in an SBR bead wire insulation compound, at loadings of 40 phr and 70 phr.

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Formulation

SBR 1712	100.00
Thermax® N990	40/70
N660 Carbon Black	35.00
Rheogen E	10.00
Stearic Acid	5.00
Zinc Oxide	10.00
TMQ	0.75
Gum Rosin N	5.00
Rosin Oil	5.00
Sulphur	6.00
MBTS	1.75

Properties

Thermax® N990 Loading	**40 phr**	**70 phr**
Mooney Viscosity, 100°C		
M_L Initial	36.78	40.81
M_L + 4 minutes	22.01	27.13
Mooney Scorch, ASTM D1646-96, 125°C, M_L		
Minimum Torque	14.93	16.29
Minutes to 1 pt. rise	22.92	12.08
Minutes to 10 pt. rise	30.58	31.08
Minutes to 35 pt. rise	35.25	36.17
ODR, Monsanto R 100, ASTM D 2084-95		
Minimum (dNm)	2.6	3.1
Maximum (dNm)	33.2	35.6
T_c50 (min)	9.23	9.38
T_c90 (min)	21.39	21.93
Tensile Strength (MPa)	10.91	11.42
Shore A Hardness	62	68
100% Modulus (MPa)	3.38	4.72
200% Modulus (MPa)	7.73	9.82
Elongation at Break (%)	306	260
BFGoodrich Flexometer Model II, ASTM D623-93, 100°C, 25 minute run time		
Flexing Compression Set (%)	2.1	4.0
Static Compression Set (%)	22.3	19.0

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