

THIOKOL™ TP-90B Plasticizer

Description

Rohm and Haas's TP-90B plasticizer is a highly compatible plasticizer designed to provide maximum low temperature flexibility to various types of elastomers, including natural rubber, SBR, chloroprene, nitrile, and epichlorohydrin rubbers.

Product Specifications	Limits
Color - Gardner (VCS) Scale	5.0 Max.
Water Content - Wt. %	0.20% Max.
Purity - Wt. %	95.0 Min.

Typical Properties

Specific Gravity @ 25°C	0.975 Max.
Viscosity @ 25°C	10 cps
Refractive Index @ 25°C	1.4344 - 1.4379
Volume Resistivity - ohm/cm	3.47×10^9
Dielectric Constant @ 1KC	6.6
Dissipation Factor @ 1KC	0.062

Optimum low temperature flexibility. Provides resistance to fungal growth in chloroprene rubber compounds.

Applications

TP-90B plasticizer is used to develop optimum low-temperature flexibility characteristics in fuel hose, wire jacketing, cellular rubber goods, friction compounds, and a wide variety of molded and extruded products. Used in only moderate concentrations (usually 20-30 phr), it functions effectively without seriously degrading the rubber's characteristic physical properties. Because of its rapid plasticizing action, TP-90B plasticizer is also useful for softening slightly scorched stocks with little effect on their ultimate physical properties.

Typical Product Characteristics

Chemical Type	Polyether
Molecular Weight	336
Color	Light Amber
Specific Gravity @ 23°C	0.97
Electrical	
Volume Resistivity , ohm/cm	3.47×10^9
Dielectric Constant @ 1KC	6.6
Dissipation Factor @ 1KC	0.062

Fungus Resistance

In tests performed according to military specification MIL-E-5272C (ASG), and in other evaluations Rohm and Haas's TP-90B plasticizer provides definite resistance to fungal growth and attack in chloroprene rubber compounds.

Compatibility With Elastomers

TP-90B plasticizer is easily dispersible, is not affected by curing, and does not degrade the physical properties of

the compound. Compatibility varies from very high with NR, SBR, chloroprene and nitrile rubbers, to somewhat less compatibility with EPT and butyl rubbers, as shown below:

Elastomer	TP-90B Plasticizer, max. phr.
Chloroprene	60
Nitrile	50
Natural Rubber	40
SBR	40
EPT or EBDM	20
Butyl	10

Table I - Typical Rubber Compounds Plasticized With TP-90B Plasticizer

Rubber Type				
Formulation, pbw	Nat. Rubber (Smoked sheet)	SBR (1500)	Chloroprene (Neoprene WRT)	Nitrile (Paracril BJ)
Elastomer	100.0	100.0	100.0	100.0
Zinc oxide	5.0	5.0	5.0	5.0
Elastomag 170	-	-	4.0	-
N774	50.0	60.0	-	100.0
SL90	-	-	50.0	-
Stearic acid	1.5	0.5	0.5	1.0
ETU, 75% MB	-	-	0.67	-
Agerite HP	1.0	-	-	-
BLE Powder	-	1.0	-	-
MBTS	1.0	1.25	-	1.5
TMTD	0.1	0.2	-	-
Amine Antioxidant	-	-	1.0	-
Amine Antioxidant	-	-	-	1.0
Sulfur	3.0	1.75	-	1.5
TB-90B plasticizer	30.0	30.0	30.0	30.0
Cure-min/°F (°C)	30/310 (154)	30/310 (154)	30/310 (154)	30/310 (154)
Original Properties at Room Temperature				
Hardness, Shore A	40	45	53	58
Tensile, psi (MPa)*	2200 (15.2)	1500 (10.3)	2200 (15.2)	2080 (14.3)
Elongation, %	530	380	335	370
Low Temp. Stiffness °F (°C)	-95 (-70)	-95 (-70)	-79 (-65)	-66 (-54)
10,000 psi (69 MPa)* (ASTM-D-1043)				
*MPa (Mega Pascal) (To convert psi to MPa, divide by 145)				

Table II - Properties of a TP-90B Plasticized Epichlorohydrin

Compound				
Formulation, pbw	1	2	3	4
Hydrin C	100	100	100	100
Red lead	5	5	5	5
ETU 75% MB	2.0	2.0	2.0	2.0
D-48	1.5	1.5	1.5	1.5
UV Chek AM104	1	1	1	1
N550	30	50	70	90
TP-90B	-	10	20	30
Cure: 45 minutes at 310°F				
Compatibility				
Uncured Compound	-	OK	OK	OK
Cured Sheets	-	OK	OK	OK
Original Physical Properties				
Hardness, Shore A	65	65	73	65
Tensile, psi (MPa)	1780 (12.3)	1925 (13.3)	1760 (12.1)	1335 (9.2)
Elongation, %	340	360	300	280
100% Modulus, psi (MPa)	400 (2.8)	425 (2.9)	590 (4.1)	385 (2.6)
Low Temp. Stiffness °F (°C) 10,000 psi (69 MPa) (ASTM-D-1043)	-42 (-41)	-53 (-747)	-58 (-50)	-68 (-56)

Table III - Effects of TB-90B Plasticizer on Low-Temperature Chloroprene Wire Jacketing Compounds

Rubber Type	Neoprene WD	Neoprene WRT
Formulation, pbw		
Elastomer	100	100
Octamine	2	2
Elastomag 170	4	4
SL90	-	10
N220	30	-
N880	60	-
N990	-	60
Hard Clay	-	50
Microcrystalline wax	4	3
Zinc oxide	5	5
ETU 75% MB	1.0	1.3
TP-90B plasticizer	35	15
Cure: 45 minutes at 310°F (154°C)		
Physical Properties		
Hardness, Shore A	62	73
Tensile, psi (MPa)	2000 (13.8)	1600 (11.0)
Elongation, %	280	360
100% Modulus, psi (MPa)	400 (2.7)	600 (4.1)
Low Temperature Stiffness, ASTM-D-1043		
Original 10,000 psi (69 MPa) °F (121°C)	-71 (-59)	-51 (-46)
Aged, 70 hrs. @ 250°F (121°C)	-24 (-31)	-22(-30)
Low Temperature Brittle Point ASTM-D-2137		
Original °F (°C)	-72 (-58)	-54 (-48)
Aged, 70 hrs. @ 250°F (121°C)	-27 (-33)	-27 (-33)

Table IV - Effects of Varying YP-90B Plasticizer Levels on Nitrile Rubber Compounds

Formulation, pbw						
Paracril BJ	100.0					
Zinc oxide	5.0					
N774	100.0					
Stearic acid	1.0					
MBTS	1.0					
N880	60					
Amine Antioxidant	1.0					
Sulfur	1.5					
TB-90B plasticizer	(as noted below)					
Cure: 25 minutes at 320°F (160°C)						
TP-90B Plasticizer, phr	0	10	20	30	40	50
Original Physical Properties						
Hardness, Shore A	75	70	65	58	50	45
Tensile, psi (MPa)	2500 (17.2)	2675 (18.4.)	2450 (16.9)	2080 (14.3)	2075 (14.3)	1850 (12.8)
Elongation, %	240	260	320	370	450	425
200% Modulus, psi (MPa)	2500 (17.2)	2675 (18.4)	2450 (16.9)	2080 (14.3)	2075 (14.3)	1850 (12.8)
Low Temperature Stiffness, °F (°C) 10,000 psi (69 MPa) (ASTM-D-1043)	-10 (-23)	-35 (-37)	-60 (-51)	-66 (-54)	-70 (-56)	-75 (-59)
Heated Aged Physical Properties (70 hrs. at 212°F (100°C))						
Hardness, Shore A	85	80	70	65	55	55
Tensile, psi (MPa)*	3125(21.6)	2775 (19.1)	2200 (15.2)	2400 (16.6)	1675 (11.6)	1875 (12.9)
Elongation, %	170	170	260	320	280	270
200% modulus, psi (MPa)	-	-	1550 (10.7)	1475 (10.2)	1125 (7.8)	1125 (7.8)

Proprietary Products*

Elastomag 170	acid acceptor	Rohm and Haas
N220	carbon black	Several
Sulfur	vulcanizer	Several
Dixie clay	mineral filler	R. T. Vanderbilt Company, Inc.
AgeRite HP	antioxidant	R. T. Vanderbilt Company, Inc.
Microcrystalline wax	petroleum wax blend	Several
ETU 75% MB	accelerator	Several
Neoprene	CR	DuPont
Paracril BJ	NBR	Uniroyal Chemical Co.
Octamine	antioxidant	Uniroyal Chemical Co.
Hydrin C	ECO	Zeon Chemicals, L. P.
Red lead (Litharge)	activator	Several
UV Chek AM104	antioxidant	Ferro Corp.
D-148	processing aid	C.P. Hall
N550	carbon black	Several
Zinc oxide	vulcanizer	H. M. Royal, Inc.
SL90	carbon black	Degussa
Stearic acid	activator, softener	Several
BLE 25 Powder	antioxidant	Uniroyal Chemical Co.
MBTS	accelerator	Several
TMTD	accelerator	Several
N990	carbon black	R. T. Vanderbilt Company, Inc.

*Does not represent an endorsement of materials mentioned in this bulletin

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