THIOKOL™ TP-95 Plasticizer

Description

TP-95 is a highly compatible plasticizer that has been especially designed to impart maximum low temperature flexibility to elastomers. It is particularly effective with nitrile rubbers – including the very high nitrile types: urethanes, polyacrylates and epichlorohydrin rubbers.

TP-95 plasticizer can also be used in vinyl resin formulations, either alone or in combination with other plasticizers. It is compatible with cellulose resins; such as ethyl cellulose, cellulose acetate propionate, and cellulose nitrate.

Product Specifications	Limits
Color - Gardner (VCS) Scale	2.0 Max.
Water Content - Wt. %	0.14 Max.
Acid Number - mg KOH/g	6.50 Max.

Typical Properties

Specific Gravity @ 25°C	1.010 - 1.015
Viscosity @ 22°C	10 cps
Refractive Index @ 25°C	1.4438 - 1.4460
Volume Resistivity - ohm/cm	1.80×10^{8}
Dielectric Constant @ 1KC	11.9
Dissipation Factor @ 1KC	0.368

FDA Clearance listed in the **Code of Federal Regulations, Section 177.2600 (C)(4) (IV), Rubber Articles Intended for Repeated Use**. Total usage is not to exceed 30 percent, by weight, of the rubber product.

Compatible with Synthetic Resins.

Low Volatility

Due to its low volatility, TP-95 plasticizer remains effective over a broad range of temperatures. While providing excellent plasticizing action, it does not seriously impair the physical properties of the compounds in which it is used.

Low Temperature Properties

Low temperature properties listed in Tables I through III show the effects produced by varying amounts of TP-95 plasticizer in compounds of nitrile, urethane, and epichlorohydrin rubbers.

Material Safety Data Sheet for hazardous ingredients, flammability, disposal, and related handling information.

Typical Characteristics

Chemical Type	Diester
Color	Light amber
Specific Gravity @ 23°C	1.02
Viscosity at 71°F (22°C), cps	10

FDA Clearance

TP-95 plasticizer has been listed as an approval material for use in contact with food. This approval is listed in the **Code of Federal Regulations, Section 177.2600 (C) (4)(IV), Rubber Articles Intended for Repeated Use**. The total usage is not to exceed 30 percent, by weight, of rubber product.

Compatibility with Elastomers

TP-95 plasticizer is easily dispersible and does not degrade the physical properties of rubber compounds. It has exceptionally good compatibility with nitrile, urethane, epichlorohydrin, polyacrylate and polysulfide rubbers, and somewhat lower compatibility with other elastomers, as shown below.

Elastomers	TP-95 Plasticizer - Max. phr.
Nitrole	30
Urethane	30
Epichlorohydrin	30
Polyacrylate	25
Polysulfide	15
EPM or EPDM	15
Chloroprene	10
Natural Rubber	10
SBR	20
Butyl	5

Compatibility with Synthetic Resins

TP-95 plasticizer, as illustrated in the table below, is compatible with many types of vinyl and cellulose resins, and can be effectively used to provide improved low temperature characteristic in formulations for many applications.

Ratio; TP-95 to Resin

Resin Type	1:1	1:4	1:9
Cellulose acetate	I	I	I
Cellulose acetate propionate	C	C	C
Cellulose butyrate acetate	I	PC	PC
Cellulose nitrate	C	C	C
Ethyl cellulose	C	C	C
Chlorinated rubber	C	C	C
Polyvinyl butryal	C	C	C
Polyvinyl acetate	C	C	C
Polyvinyl chloride-acetate	PC	C	C

I - Incompatible C - Compatible PC - Partially Compatible

Supplier References

Product	Type	Supplier
Activator 101	Activator	TSE Industries, Inc.
Millathane* 76	Millable gum urethane rubber	TSE Industries, Inc.
Hydrin* C	Epichlorohydrin rubber	Zeon Chemicals, L.P.
MBT	Accelerator, 2(3H) benzothiazolethione	Several
MBTS	Accelerator, 2,2'-dithiobis-benzothiazole	Several

Red lead	Activator	Several
UV Chek AM104	Antioxidant-nickel di-n-butyldithiocarbamate	Ferro Corp.
ETU MB	Accelerator	Several
Flectol* H	Antioxidant	Flexsys
Paracril* BJ	NBR rubber	Uniroyal Chemical Co.
N774	Carbon black	H.M. Royal, Inc.
N550	Carbon black	Several
Santocure*	Accelerator - N-cyclohexyl-2-benzothiazolesulfenamide	Flexsys
D-148	Processing aid	C.P. Hall Co.
TP-95*	Low-temperature plasticizer	Rohm and Haas
Caytur No.4	Activator for sulfur cure	Uniroyal Chemical Co.
N110	Carbon black	Several
Zinc Oxide	Activator	Several

* Registered trademark of respective companies listed

Table I

Effect of TP-95 Plasticizer in Nitrile Rubber
Cure: 45 minutes at 302 °F (150°C)

Formulations	**pbw**		
Paracril BJ	100		
N774	70		
Flectol H	1		
Zinc Oxide	5		
Stearic Acid	1		
Santocure	1		
Sulfur	1.5		
Plasticizer	**phr**		
	0	**10**	**30**
Resulting Physical Properties			
Tensile, psi (MPa)*	2875 (19.8)	2550 (19.8)	2775 (15.7)
Elongation, %	440	470	570
200% Modulus, psi (MPa)	1700 (11.7)	1370 (9.4)	900 (6.2)
Hardness, Shore A	70	65	50
Low Temperature Flexibility, °F (°C) G10,000 psi (69 MPa) (ASTM-D-1043)	-35 (-37)	-55 (-48)	-70 (-57)

* (To convert psi to MPa, divide by 145)

Table II

Effect of TP-95 Plasticizer in Urethane Rubber
Cure: 45 minutes at 287°F (142°C)

Formulation	**pbw**	
Millathane 76	100	
MBTS	4	
MBT	1	
Caytur No. 4	1	
Activator 101	0.5	
N110	30	
Sulfur	1.5	
Plasticizer	**phr**	
	0	**15**
Resulting Physical Properties		
Tensile, psi (MPa)*	5140 (35.4)	3950 (27.2)
Elongation, %	450	480
200% Modulus, psi (MPa)	1930 (13.3)	1100 (7.6)
Hardness, Shore A	79	68
Tear (Die C) pli (KN/m)	330 (57.8)	240 (49.0)
Low Temperature Flexibility, °F (°C) G10,000 psi (69 MPa) (ASTM-D-1043)	-6 (-21)	-28 (-34)

Table III

Effect of TP-95 Plasticizer in Epichlorohydrin Rubber
Cure: 45 minutes at 310 °F (154°C)

Formulations	**pbw**		
Hydrin C rubber	100		
Red lead	5		
ETU 75% MB	2		
D-148	1.5		
NBC	1		
N550	50		
Sulfur	1.5		
Plasticizer	**phr**		
	0	**10**	**20**
Tensile strength, psi (MPa)*	1780 (12.3)	1960 (13.5)	1710 (11.8)
Elongation, %	340	390	285
100% Modulus, psi (MPa)	400 (2.8)	400 (2.8)	645 (4.4)
Hardness, Shore A	63	64	74
Low Temperature Flexibility, °F (°C) G10,000 psi (69 MPa) (ASTM-D-1043)	-43 (-41)	-50 (-45)	-54 (-48)

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