



KUMHO Specialty Rubber Chemicals

beyond
the best

KUMHO PETROCHEMICAL

Rubber Chemical Sales Team

TEL 82-2-6961-1701 ~3, 1706, 1709 **FAX** 82-2-6961-1719

R&BD CENTER Elastomer T/S Team(Specialty Chemicals)

TEL 82-42-865-8796, 8683 **FAX** 82-42-865-8791

Specialty Chemicals Research Team (Additives)

TEL 82-42-865-8731, 8703 **FAX** 82-42-865-8706

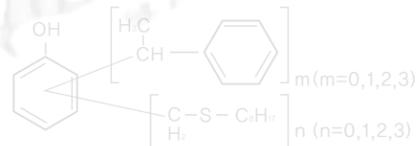
<http://www.kkpc.com>

beyond
the best

KUMHO PETROCHEMICAL

PRODUCT Information

Specialty Rubber Chemicals



Contents

03 ANTIOXIDANTS / ANTIOZONANTS

p-Phenylene diamines

KUMANOX 13
KUMANOX 3C

Phenol derivatives

KUMANOX SP/SP-N
KUMANOX 3020
KUMANOX 3020E
KUMANOX 5010L

07 VULCANIZING ACCELERATORS

Guanidines

KUMAC D

Thiazole derivatives

KUMAC NS

Thiurams

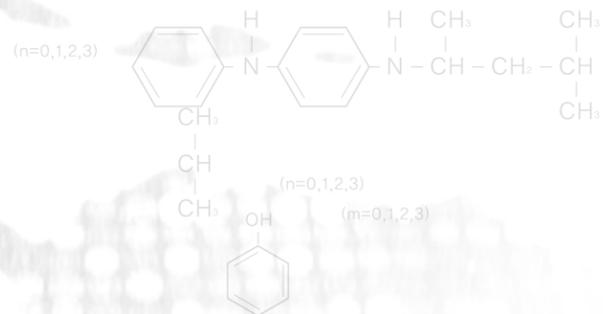
KUMAC TS

09 VULCANIZING AGENT

KUMISUL OT-20

10 ADDITIVES

KUMANOX-3110
KUMANOX-3111
KUMANOX-3120



ANTIOXIDANTS /
ANTIOZONANTS

VULCANIZING
ACCELERATORS

VULCANIZING
AGENT

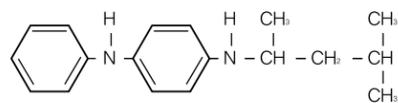
ADDITIVES

KUMHO
PETROCHEMICAL

ANTIOXIDANTS/ ANTIOZONANTS

KUMANOX 13 (6PPD)

Formula



▶ Chemical Name	▶ Molecular Weight 268
N-(1,3-Dimethylbutyl)-N'-phenyl-p-phenylenediamine	▶ CAS NO. 793-24-8

Product Properties

- Class	p-Phenylene diamines
- Appearance	brownish pastille dark brownish liquid
- Melting point (initial, °C)	min. 45.0
- Melting point (final, °C)	47.0 ~ 52.0
- Heat loss (%)	max. 0.2 at 70°C ± 5°C, 2 hrs.
- Ash (%)	max. 0.1
- Staining	Severe

Characteristics and Applications

- Used for an outstanding antioxidant, antiozonant and stabilizer for natural and synthetic elastomer such as SBR, NBR, BR, IR and CR.
- Provides excellent antioxidant and antiozonant properties with protection against oxidation, ozone attack, heat aging, fatigue, flexcracking and metal poisons to rubber goods.
- Gives higher rubber solubility due to its good dispersion in rubber compounds.
- Main Uses : tires, belts, hoses, cables, automotive mounts and goods for Industrial uses.
- The level of addition of KUMANOX 13 is 1~4 phr for resistance to ozone, oxygen and flexcracking.
- ※ phr : typical levels of addition based on 100 parts by weight of elastomer.

Solubility

- Soluble in toluene, acetone, ethanol, methylene chloride, ethyl acetate.
- Insoluble in water.

Storage

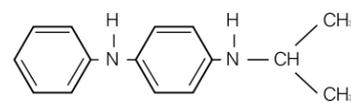
- Pastille : Store in cool, dry, well ventilated conditions, and avoiding exposure of the packed product to direct sunlight.
- Double stacking of palletized material and/or exceeding 35°C can result in unusual compaction of product.
- Liquid : Store under nitrogen condition to maximum 80°C. (preferred 60~70°C).

Packaging

- Liquid Bulk, Drum(200kg)
- Pastille Paper bag (20kg, 25kg), FIBC big bag(500kg,1,000kg)

KUMANOX 3C (IPPD)

Formula



▶ Chemical Name	▶ Molecular Weight 226
N-Isopropyl-N'-phenyl-p-phenylenediamine	▶ CAS NO. 101-72-4

Product Properties

- Class	p-Phenylene diamines
- Appearance	brownish pastille
- Melting point (initial, °C)	min. 70.0
- Heat loss (%)	max. 0.4 at 70°C ± 5°C, 2hrs.
- Ash (%)	max. 0.3
- Staining	Severe

Characteristics and Applications

- Used for outstanding antioxidant, antiozonant and stabilizer for natural and synthetic elastomer such as SBR, NBR, BR, IR and CR.
- Provides excellent antioxidant and antiozonant properties with protection against oxidation, ozone attack, heat aging, fatigue, flexcracking and metal poisons to rubber goods.
- Gives higher rubber solubility due to its good dispersion in rubber compounds.
- Main Uses : tires, electric cable, belts, hoses, cables, automotive mounts and goods for in industrial uses.
- The level of addition of KUMANOX 3C is 1~4 phr for resistance to ozone, oxygen and flexcracking.
- ※ phr : typical levels of addition based on 100 parts by weight of elastomer.

Solubility

- Soluble in toluene, acetone, ethanol, methylene chloride, ethyl acetate.
- Insoluble in water.

Storage

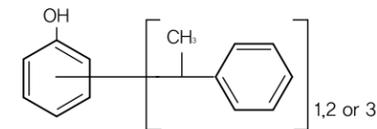
- Pastille : Store in cool, dry, well ventilated conditions, and avoiding exposure of the packed product to direct sunlight.
- Double stacking of palletized material and/or exceeding 35°C can result in unusual compaction of product.

Packaging

- Paper bag (25kg)

KUMANOX SP/SP-N

Formula



▶ Chemical Name	▶ Molecular Weight ca. 320
Styrenated phenol	▶ CAS NO. 61788-44-1

Product Properties

- Class	Phenol derivatives
- Appearance	liquid (SP) powder (SP-N)
	light amber transparent 70% powder on silica
	viscous liquid
- Heat loss (%)	max. 1.0 max. 5.0
	at 100 - 105°C, 2hrs
- Ash (%)	max. 0.3 28.0 ~ 32.0
- Viscosity (cps)	2,000 ~ 6,000 at 25 ± 0.2°C
- Refractive index (nD)	1.5985 ~ 1.6012 at 25 ± 0.2°C
- Staining	None

Characteristics and Applications

- Widely used for nearly all rubbers such as NR, SBR, BR, NBR, IR, CR and their latices.
- Not shows any tendency to discoloring or staining.
- Gives low volatile advantages for latex and solid rubber compounds, and a stabilizer for synthetic elastomer.
- Has no influence on vulcanization and gives rubber products with excellent heat and flex resistances.
- Suitable for white colored and transparent applications such as shoe soles, hoses, floor covering and mats due to its outstanding color stability and non-staining property.
- Provides good protection against light induced surface "crazing" cause by UV light.
- Easy to disperse in rubber compounds and latex compounds.
- The level of addition of KUMANOX SP is 0.5 ~ 2.0 phr.
- ※ phr : typical levels of addition based on 100 parts by weight of elastomer.

Solubility

- Soluble in acetone, ethanol, gasoline, methylene chloride.
- Insoluble in water.

Storage

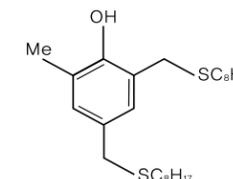
- Store in cool, dry, well ventilated conditions, and avoiding exposure of the packed product to direct sunlight and/or air.

Packaging

- SP Drum (200kg), Bulk
- SP-N Paper bag (25kg)

KUMANOX 3020

Formula



▶ Chemical Name	▶ Molecular Weight 425
4,6-bis[(octylthio)methyl]-o-cresol	▶ CAS NO. 110553-27-0

Product Properties

- Appearance	Light yellow, Liquid (solid under room temp.)
- Clarity of solution	Clear solution at 25°C
- Assay (%)	>96%
- Color (APHA)	< 100 at 25°C ± 5°C
- Viscosity (cps)	30 ~ 80 at 25°C ± 5°C
- Specific gravity	0.970 ~ 0.985 at 25°C ± 5°C
- Refractive Index (nD)	1.518 ~ 1.526 at 25°C ± 5°C

Characteristics and Applications

- Multifunctional phenolic antioxidant with primary/secondary anti-oxidative function.
- Non-staining, non-discoloring, low in volatility, stable to light and heat.
- Co-stabilizers (phosphites and thioethers) are not necessary.
- Easy to use, store, and handle.
- Able to use for emulsion and solution polymerized elastomers at low level.
- Effect: protect elastomers, plastics and rubber against thermo-oxidative degradation during processing and long term heat aging.
- Applicable polymers: SBR, NBR, BR, IR, SBS, SIS, latex, and natural rubber.
- Applications: elastomers, plastics, adhesives, sealants, oils and lubricants.
- Normal usage levels: 0.1 ~ 1.5 phr.
- ※ phr : typical levels of addition based on 100 parts by weight of elastomer.

Solubility

- >50% soluble in acetone, ethanol, methanol, toluene, chloroform, toluene, or n-hexane.
- < 0.01% soluble in water.

Storage

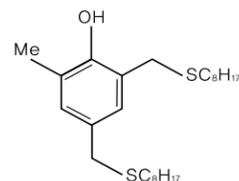
- Store in cool, dry, well ventilated conditions, and avoiding exposure of the packed product to direct sunlight and/or air.

Packaging

- Drum (180kg), Bulk

KUMANOX 3020E

Formula



► Chemical Name	► Molecular Weight 425
4,6-bis[(octylthio)methyl]-o-cresol	► CAS NO. 110553-27-0

Product Properties

- Appearance	Pale yellowish, viscous liquid~solid
- Clarity of solution	Clear solution at 25°C ± 5°C
- Color (APHA)	< 100 at 25°C ± 5°C
- Viscosity (cps)	60 ~ 100 at 25°C ± 5°C
- Specific gravity	0.960 ~ 0.995 at 25°C ± 5°C

Characteristics and Applications

- Multifunctional phenolic antioxidant with primary/secondary anti-oxidative function.
- Non-staining, non-discoloring, low in volatility, stable to light and heat.
- Co-stabilizers (phosphites and thioethers) are not necessary.
- Easy to use, store, and handle.
- Effect: protect elastomers, plastics and rubber against thermo-oxidative degradation during processing and long term heat aging.
- Applicable polymers: emulsion as well as suspension polymerized elastomer and plastics including SBR, NBR, BR, IR, SBS, and latex.
- Applications: elastomers, plastics, adhesives, sealants, oils and lubricants, paint.
- Lattices application : modified SBR, natural rubber latex, EVA, PVA, Acrylics.
- Normal usage levels: 0.1 ~ 2 phr.
- ※ phr : typical levels of addition based on 100 parts by weight of elastomer.

How to use

- Disperse in aqueous solution directly.

Storage

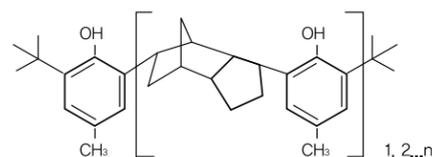
- Store in cool, dry, well ventilated conditions, and avoiding exposure of the packed product to direct sunlight and/or air.

Packaging

- Drum (200kg), Bulk

KUMANOX 5010L

Formula



► Chemical Name	► Molecular Weight 650(Mn)
Butylated reaction product of p-cresol and dicyclopentadiene	► CAS NO. 68610-51-5

Product Properties

- Class	Cresol Derivatives
- Appearance	Off-White Powder (Powder Type) Yellow brownish pastille (Pastille Type)
- Heat loss (%)	max. 0.2 at 105 ± 5°C, 2hrs.
- Ash (%)	max. 0.1
- Melting point (initial, °C)	min. 105.0
- Specific gravity	1.0 ~ 1.15

Characteristics and Applications

- A highly effective polyphenolic additive with high activity and very low volatility.
- Non-discolouring and non-pinking.
- Ideally suited for the protection of light coloured, non-staining goods derived from natural rubber and latex, SBR and carboxylated SBR latices, ABS, NBR, BR, SBS and SIS in applications where the retention of appearance and elastic properties during storage and use are important requirements.
- Used in-process stabilization of polymers as well as use in manufactured goods such as elastic thread, carpet backing, foam rubber mattresses, household and surgical gloves, medical products, baby bottle teats, bath mats, hot water bottles, automotive components, household appliances (gaskets, liners, parts, housing, etc.), electronic appliance housings, and paper coatings.
- The level of addition of KUMANOX 5010L is 0.3 ~ 1.5 phr.
- ※ phr : typical levels of addition based on 100 parts by weight of elastomer.

Solubility

- Soluble in acetone, toluene.
- insoluble in water

Storage

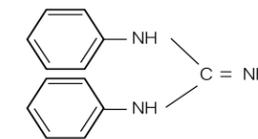
- Store in cool, dry, well ventilated conditions, and avoiding exposure of the packed product to direct sunlight.

Packaging

- Paper bag (20 kg)
- FIBC big bag (500kg, 1,000kg)

KUMAC D (DPG)

Formula



► Chemical Name	► Molecular Weight 211
1,3-diphenylguanidine	► CAS NO. 102-06-7

Product Properties

- Class	Guanidines
- Appearance	white to off white pellet
- Melting point (Final, °C)	min. 144.0
- Heat loss (%)	max. 0.3 at 105 ± 5°C, 1hour
- Ash (%)	max. 0.3
- Vulcanization accelerating power	Medium
- Staining	Some

Characteristics and Applications

- Used for NR, SBR, IR, BR, CR, NBR and polymer latex.
- A representative basic vulcanization accelerator.
- Used together with other acidic accelerators, with a critical temperature at around 140°C.
- Can be widely activated by thiazole or thiuram accelerators to display excellent effects on dark or black colored products.
- Unsuitable for the production of foodstuffs because of its imparting a slightly bitter taste.
- Acts, in some cases, as a plasticizer for CR.
- Provides good dispersion characteristics despite of its high melting point, and providing a high degree of crosslinking and reversion resistance.
- In latex application KUMAC D can be used as a secondary gelling agent. (foam stabilizer).
- The level of KUMAC D is 0.4 ~ 1.5 with additional accelerator such as 1.0 phr of thiazole or 1.0 of sulfenamide (KUMAC NS).
- Main uses : Tires, Rubber shoes, rigid rubber products and goods for industrial uses.
- Not cause blooming but may cause a brownish discoloration when exposed to light at high level, 1 ~ 2 phr.
- ※ phr : typical levels of addition based on 100 parts by weight of elastomer.

Solubility

- Soluble in benzene, chloroform and alcohol.
- Hardly soluble in water.
- insoluble in gasoline.

Storage

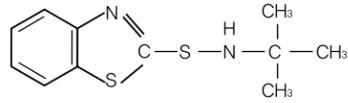
- Store in cool, dry, well ventilated conditions and avoiding exposure of the packed product to direct sunlight and high humidity and/or high temperature conditions.

Packaging

- Paper bag (20kg)

KUMAC NS (TBBS)

Formula



► Chemical Name

N-tert-butyl-2-benzothiazole
-sulfenamide

► Molecular Weight 238

► CAS NO. 95-31-8

Product Properties

- Class	Thiazole derivatives
- Appearance	white to off white pellet
- Melting point (Final, °C)	min. 106.0~112.0
- Heat loss (%)	max. 0.5 at 75 °C, 2hours
- Ash (%)	max. 0.5
- Assay (%)	min. 97.0
- Vulcanization accelerating power	high

Characteristics and Applications

- Primary accelerator with fast cure and good safety, and yielding higher modulus.
- Generally used alone or with secondary accelerator for NR, IR, BR, SBR, NBR and EPDM.
- Does not form carcinogenic N-nitrosamines.
- May cause a slight yellowing in white or light compounds, when exposed to light, but it is non-staining and non-discoloring.
- Based cure system can be boosted by thiurams, dithiocabamates and guanidines.

Solubility

- Soluble in acetone, toluene, chloroform, methylene chloride, ethyl acetate and ethanol Moderately soluble in n-hexane
- Insoluble in water

Storage

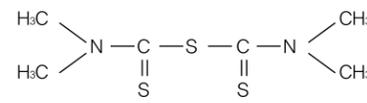
- Store in cool, dry, well ventilated conditions, and avoiding exposure of the packed product to direct sunlight and high humidity and/or high temperature conditions.

Packaging

- Paper bag (20kg, 25kg), FIBC big bag (400kg)

KUMAC TS (TMTM)

Formula



► Chemical Name

Tetramethyl thiuram monosulfide

► Molecular Weight 208

► CAS NO. 97-74-5

Product Properties

- Class	Thiurams
- Appearance	yellowish pellet
- Melting point (°C)	min. 103.0
- Heat loss (%)	max. 0.3 at 70 ± 5°C, 2hrs
- Ash (%)	max. 0.3
- Vulcanization accelerating power	Ultra
- Staining	None

Characteristics and Applications

- Used for NR, IR, BR, SBR, NBR, CR and EPDM.
- Acts as a secondary accelerator in combination with thiazoles, guanidines, sulfenamides.
- Has good processing safety, extremely curing activity.
- Acts as retarder of CR and as peptizer for the sulfur modified CR.
- Non-discoloring and non-staining to rubber articles and materials in contacts with them.
- Main uses : Transparent and colored products, industrial parts, wires and cables, footwears and general air-vulcanized products.

Solubility

- Soluble in acetone, alcohol, benzene, chloroform and ethylene dichloride. Hardly soluble in gasoline.
- Insoluble in water

Storage

- Store in cool, dry, well ventilated conditions and avoiding exposure of the packed product to direct sunlight and high humidity and/or high temperature conditions.

Packaging

- Paper bag (25kg)

KUMISUL OT-20

Formula

-(S)_n-

► Chemical Name

Polymerized Sulfur with Oil

► Molecular Weight Mixture

► CAS NO. Polymeric sulfur(9035
-99-8), Sulfur(7704-34-9),
naphthenic oil (Various)

Product Properties

- Appearance	Yellow Powder
- Odor	Slightly
- Bulk Density (kg/m ³)	600 - 700
- Viscosity (mPa.s)	Not Applicable
- Specific gravity	1.92 (20°C)
- Melting point (°C)	90 ~ 119
- Auto ignition temperature (°C)	> 330
- Boiling point (°C)	> 444.6
- Vapor pressure (mBar)	< 0.01 (20)

Product Specifications

- Insoluble sulfur (on total S)	(%) min.	95
- Total sulfur content	(%)	80.0 ± 1.0
- Oil content	(%)	20.0 ± 1.0
- High thermal stability (on total S)	(%) min.	75
- Acidity	(%) max.	0.05

Characteristics and Applications

- KUMISUL OT-20 is polymeric sulfur and is insoluble in elastomers.
- Non-blooming vulcanizing agent for radial tire and rubber.
- Able to retard bin scorch, prevent migration of sulfur.
- A metastable product which can revert to soluble sulfur if not stored under proper condition.
- Non-staining and non-discoloring.
- Widely used in the manufacture of the rubber chemistry such as shoes and tires.

Solubility

- Insoluble in water
- Slightly soluble in Organic liquids

Storage

- Store in cool, dry, well ventilated conditions, and avoiding exposure to direct sunlight.
- Store away from oxidizing agents and bases.

Packaging

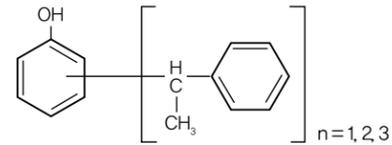
- Paper bag (25kg), Jumbo bag (500kg)



VULCANIZING AGENT

KUMANOX 3110

Formula



► Chemical Name
Styrenated phenol

► Molecular Weight 220(average)
► CAS NO. 61788-44-1

Product Properties

- Appearance	Slight yellow Viscous Liquid
- Color (G)	< 1.5
- OH value	230-260
- Water cont, %	< 0.2%
- Viscosity(cps)	Max 300-600 at 25 ± 0.2°C

Characteristics

- Good Color
- Low Viscosity, Non Volatile Contents.
- High OH Value
- Non-Toxic
- Hi Performance: easy processing and application
- Excellent Adhesion
- Excellent Solubility for most solvents

Applications

- Coatings: Industrial Epoxy Paints, Marine Paints, Anti-corrosion Paints.
- Primers, Sealants, Epoxy glue, Plasticizer, etc.
- Surfactant Intermediate

Storage

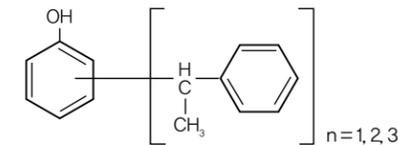
- Store in cool, dry, well ventilated conditions and avoiding exposure of the packed product to direct sunlight.

Packing

- Drum (200kg)

KUMANOX 3111

Formula



► Chemical Name
Styrenated phenol

► Molecular Weight 220(average)
► CAS NO. 61788-44-1

Product Properties

- Appearance	Viscous Liquid
- Color (G)	< 1.5
- OH value	230-260
- Water cont, %	< 0.5%
- Viscosity(cps)	Max 300-600 at 25 ± 0.2°C

Characteristics

- Good Color
- Low Viscosity, Non Volatile Contents.
- High OH Value
- Non-Toxic
- High performance : easy processing and application
- Excellent Adhesion
- Excellent Solubility for most solvents

Applications

- Coatings: Industrial Epoxy Paints (Transparent grade) Epoxy curing agent additive.
- Primers, Sealants, Epoxy glue, Plasticizer, etc.

Storage

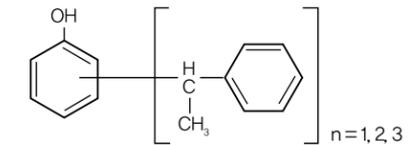
- Store in cool, dry, well ventilated conditions and avoiding exposure of the packed product to direct sunlight.

Packing

- Drum (200kg)

KUMANOX 3120 (TSP)

Formula



► Chemical Name
Styrenated phenol

► Molecular Weight 367(average)
► CAS NO. 61788-44-1

Product Properties

- Appearance	Clear, Slight yellow liquid
- Color (G)	< 1.5
- OH value	140-150
- Water cont, %	< 0.2%
- Viscosity(cps)	30,000-40,000 at 25±0.2°C
- Change of viscosity with temperature	

Temp.	Viscosity (cps)
100°C	16
90	28
80	60
70	108
60	185

Characteristics

- Good Color
- Phenol-free, Non Volatile Contents.
- Non-Toxic
- Excellent Solubility for most solvents

Applications

- Antioxidant in rubber Compounding, Surfactant Intermediate

Storage

- Store in cool, dry, well ventilated conditions and avoiding exposure of the packed product to direct sunlight

Packing

- Drum (200kg)

ADDITIVES