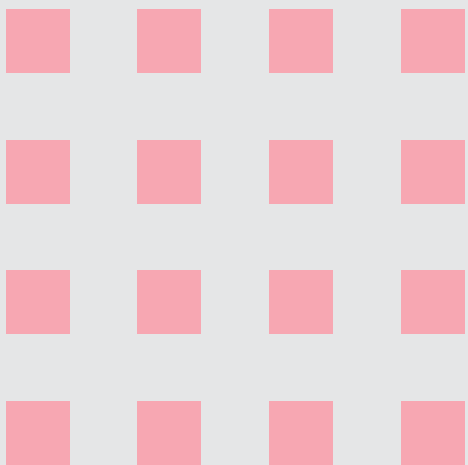


SINOPCC GROUP



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www.TinToll.com

ANTIOXIDANTS



Sustainable Innovation for a Better Future

TINTOLL STABILIZERS

As one of the leading specialty chemical companies in the innovative technology of performance additives, TINTOLL contributes to value creation by providing innovative and sustainable solutions to customers from many industries. Our product portfolio includes more than 100 distinctive UV absorbers, light stabilizers, antioxidants to enhance the performance and durability of materials such as plastics, coatings and cosmetics, and photoinitiators in energy curing coatings. Our goal is to be the world's most innovative provider of polymer stabilizing additives solutions.

We keep pursuing the outstanding goal by our professional experience and the excellent team work gathering with research and manufacture to keep delivering innovative green products to echo the voices from governments, customers and consumers.

We keep developing and innovating better polymer additives to improve the superior quality of working temperature, compatibility, anti-oxidation and weather resistance under high temperature or UV light to polymer. This would extend polymer's life time to reduce pollution and be more environmentally friendly to our world.

In order to guarantee the quality and availability customers expect, TINTOLL pursues a strategy of backward integration. Equipped with precise monitoring systems, our factories are run with state-of-the-art equipment and continuously upgraded.

We deliver the highest quality products in a timely manner according to the changing needs of our customers, leveraging our expertise and assets to generate economies of scale and increase efficiency and throughput. And, should your requirements exceed our current capacity or capabilities, we stand ready to invest in enhancing or expanding facilities, equipment or processes.

We are committed to improving our manufacturing processes, not only for operational efficiency, but also for the sustainability and safety of our operations and the surrounding environment. Our plants, with fully integrated by-product recovery and recycling, aim to achieve zero by-product or waste generation through a balanced plant concept.

We achieve sustainable growth by reducing energy consumption by developing new and innovative technologies around new and existing products. Our ISO-9001 certification further demonstrates our commitment to international quality standards. ISO-9001 certification further demonstrates our commitment to international quality standards.



Sustainable Innovation for a Better Future

POWERNOX ANTIOXIDANTS

As Polymers are easily oxidized when in contact with oxygen, leading to degradation. Thermal oxidation also occurs when high temperatures are used to manufacture end-use polymer products, affecting raw materials. Adding TINTOLL antioxidant additives during the manufacturing process is an effective solution to protect and stabilize polymer materials.

TINTOLL antioxidant is the most important additive in polyolefin, plastic, resin and other products. The purpose of antioxidants is to prevent or delay oxidation and to ensure the processing and use quality of products. Throughout the plastics production process, degradation and processing requirements can reduce the strength and stability of plastic parts.

TINTOLL antioxidants help to extend the useful life of plastics by minimizing changes in physical properties throughout thermal processing, including extrusion, injection molding, blow molding and rotational molding. Antioxidants for polyolefins improve the weatherability of UV stabilized systems and enhance the durability of plastics at moderate to high temperatures.

TINTOLL antioxidants can help maintain gloss and transparency, prevent yellowing, surface cracking and odor, and maintain critical mechanical properties such as impact resistance, elongation and tensile strength.

TINTOLL antioxidants work synergistically with other plastic additives such as UV stabilizers, absorbers and antistatic agents to make polymer products perform better for longer, promoting a circular economy and reducing plastic waste. Our broad product portfolio can help you extend product life by preventing premature product degradation, such as color fading or odor development, and increase the durability of products stored outdoors for long periods of time.



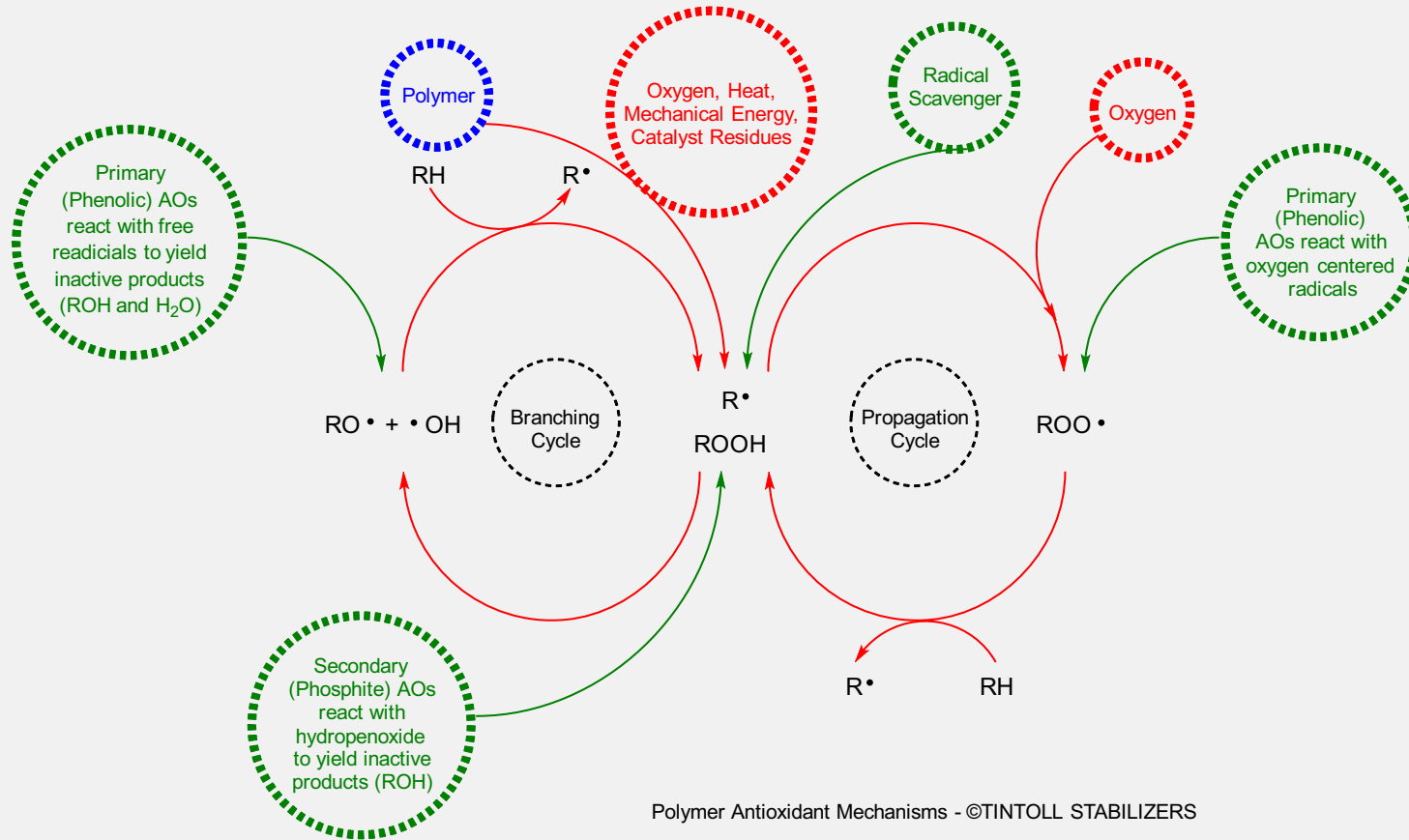
POWERNOX ANTIOXIDANTS



Antioxidants interrupt the degradation process in different ways, according to their structure. The major classifications of antioxidants are listed below:

- Primary Antioxidants: They work by scavenging peroxy free radicals formed during oxidation. The two main classes of primary antioxidants are hindered phenols and aromatic amines.
- Secondary Antioxidants: They react with hydroperoxides to yield non-radical, non-reactive products and are also called as hydroperoxide decomposers. Phosphites are most effective at the high temperatures of melt processing operations, while thioethers work best in the solid phase at long-term use temperatures.
- Multi-functional Antioxidant Blends: They combine both primary and secondary antioxidant functions in one compound.
- Metal Deactivators: They prevent oxidative degradation caused by copper or other metals by chelating them.

POWERNOX ANTIOXIDANT MECHANISMS



HINDERED PHENOLIC ANTIOXIDANTS

As Oxidation of polymers can lead to many undesirable effects including color changes, formation of rough surface morphology, changes in melt viscosity and reduction in mechanical properties, which can affect the service life of the polymer or the final product. Oxidation can occur at every stage of the polymer life cycle, during the production and storage of polymer resins, during high temperature melt processing operations, during the processing of resins into articles, and during the use of the articles. In addition, exposure to UV rays from sunlight also accelerates the oxidation process. Adding antioxidants can inhibit and delay the oxidation and degradation of polymer materials.

Antioxidants are generally divided into primary antioxidants and secondary antioxidants. Primary antioxidants work by scavenging peroxy free radicals formed during oxidation. The two main classes of primary antioxidants are hindered phenols and aromatic amines. They are effective over a wide temperature range, improving material processing and long-term thermal stability.

Secondary antioxidants, such as phosphites and thioethers, work through the decomposition of hydroperoxides. Phosphites are most effective at the high temperatures of melt processing operations, while thioethers work best in the solid phase at long-term use temperatures.

Hindered phenol stabilizers are the main antioxidants and act as hydrogen donors. They react with peroxy radicals to form hydroperoxides and prevent abstraction of hydrogen from the polymer backbone. Phenolic stabilizers are often used in combination with secondary antioxidants and come in a variety of molecular weights, product forms and functions. They are very effective during processing and long-term heat aging, and many are FDA-approved. These products are generally less prone to staining or discoloration. However, they may form quinoid structures when oxidized, resulting in yellowing. PowerNox™ Phenolic antioxidants include simple phenols, bisphenols, polyphenols and thioisphenols.

PowerNox™ 2640 (BHT) is the most commonly used primary antioxidant and is FDA-approved for food contact and is suitable as a long-term stabilizer in almost all cases. However, BHT is a relatively volatile material that is gradually being replaced by higher molecular weight antioxidants that resist migration.

Thioisphenols also act as peroxide decomposers (secondary antioxidants), which are often used in higher temperature applications.

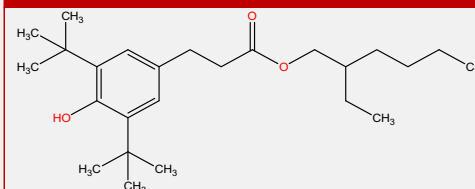
TINTOLL's hindered phenolic antioxidants have low volatility, high efficiency, resistance to air fading and hydrolysis, and can be implemented in a wide range of applications.

HINDERED PHENOLIC ANTIOXIDANTS

PowerNox™ 1000

CAS No.: 144429-84-5

Benzenepropanoic acid, 3,5-bis(1,1-dimethylethyl)-4-hydroxy-, 2-ethylhexyl ester



ANTIOXIDANTS

PHENOLIC ANTIOXIDANTS

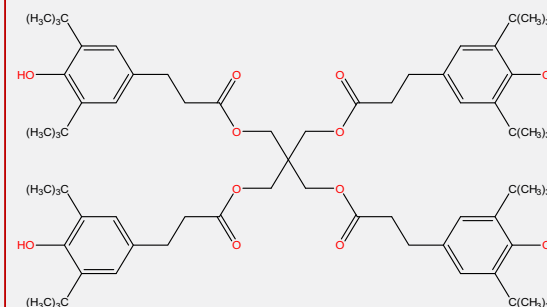
ANTIOXIDANTS

PHENOLIC ANTIOXIDANTS

PowerNox™ 1010

CAS No.: 6683-19-8

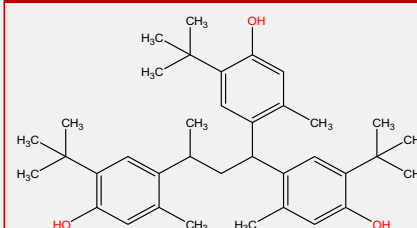
Tetrakis[methylene-3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate] methane



PowerNox™ 1030

CAS No.: 1843-03-4

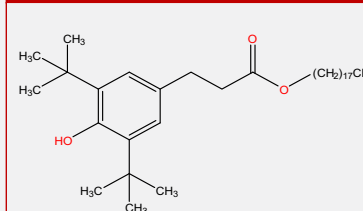
4,4',4''-(1-methylpropanyl-3-ylidene)tris[6-tert-butyl-m-cresol]



PowerNox™ 1076

CAS No.: 2082-79-3

Octadecyl-3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate



HINDERED PHENOLIC ANTIOXIDANTS

HINDERED PHENOLIC ANTIOXIDANTS

PowerNox™ 1035
 CAS No.: 41484-35-9
 Thiodiethylene bis[3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate]

ANTIOXIDANTS

PHENOLIC
ANTIOXIDANTS

PowerNox™ 1222
 CAS No.: 976-56-7
 3,5-Di-tert-butyl-4-hydroxybenzylphosphonic acid diethyl ester

PowerNox™ 1290
 CAS No.: 35958-30-6
 2,2'-Ethylidenebis(4,6-di-tert-butylphenol)

PowerNox™ 1098
 CAS 23128-74-7
 N,N'-Hexamethylenebis(3,5-di-tert-butyl-4-hydroxyhydrocinnamamide)

ANTIOXIDANTS

PHENOLIC
ANTIOXIDANTS

PowerNox™ 1330
 CAS No. 1709-70-2
 1,3,5-Trimethyl-2,4,6-tris(3,5-di-tert-butyl-4-hydroxybenzyl)benzene

PowerNox™ 1520
 CAS No.: 110553-27-0
 4,6-bis(octylthiomethyl)-o-cresol

PowerNox™ 1135
 CAS No.: 125643-61-0
 Octyl-3,5-di-tert-butyl-4-hydroxyhydrocinnamate

PowerNox™ 1150
 CAS No.: 33145-10-7
 2,2'-(2-methylpropylidene)bis[4,6-xyleneol]

PowerNox™ 1315
 CAS No.: 171090-93-0
 A mixture of: esters of C14-C15 branched alcohols with 3,5-di-tert-butyl-4-hydroxyphenyl propionic acid;
 C15 branched and linear alkyl 3,5-bis(1,1-dimethylethyl)-4-hydroxybenzenepropanoate;
 C13 branched and linear alkyl 3,5-bis(1,1-dimethylethyl)-4-hydroxybenzenepropanoate

ANTIOXIDANTS

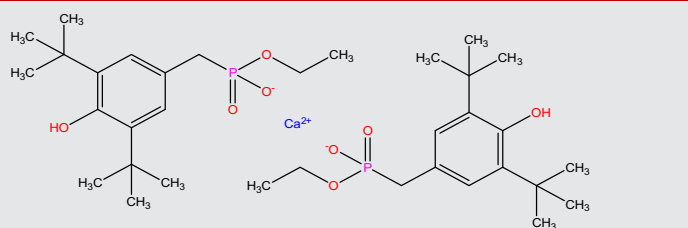
PHENOLIC
ANTIOXIDANTS

HINDERED PHENOLIC ANTIOXIDANTS

PowerNox™ 1425

CAS No.: 65140-91-2

Calcium diethyl bis[[[3,5-bis(1,1-dimethylethyl)-4-hydroxyphenyl]methyl]phosphonate]



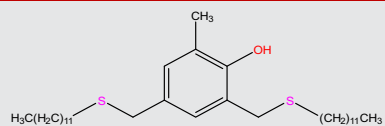
ANTIOXIDANTS

PHENOLIC
ANTIOXIDANTS

PowerNox™ 1726

CAS No.: 110675-26-8

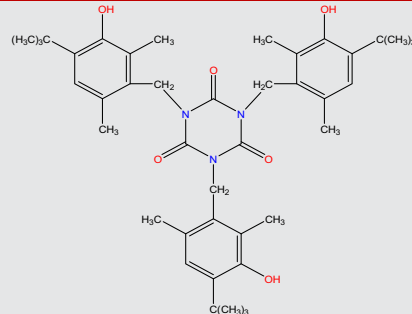
2,4-Bis(dodecylthiomethyl)-6-methylphenol



PowerNox™ 1790

CAS No.: 40601-76-1

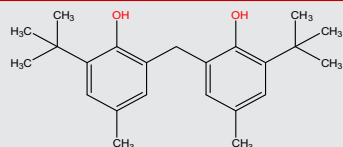
1,3,5-Tris(2,6-dimethyl-3-hydroxy-4-tert-butylbenzyl) isocyanurate



PowerNox™ 2246

CAS No.: 119-47-1

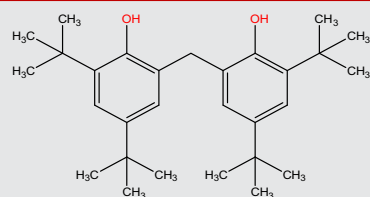
2,2'-Methylenebis(6-tert-butyl-4-methylphenol)



PowerNox™ 2266

CAS No.: 14362-12-0

Bis(3,5-di-tert-butyl-2-hydroxyphenyl)methane

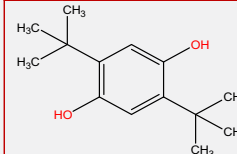


HINDERED PHENOLIC ANTIOXIDANTS

PowerNox™ 2500

CAS No.: 79-74-3

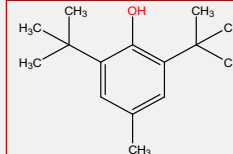
2,5-Di-tert-amylhydroquinone



PowerNox™ 2640

CAS No.: 128-37-0

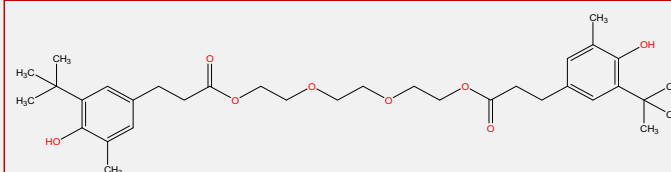
2,6-Di-tert-butyl-4-methylphenol



PowerNox™ 2450

CAS 36443-68-2

Triethylene glycol-bis-3-(3-tert-butyl-4-hydroxy-5-methylphenyl) propionate



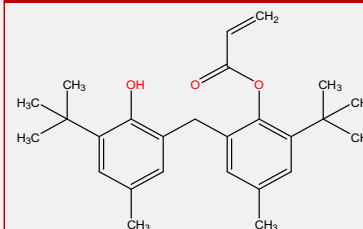
ANTIOXIDANTS

PHENOLIC
ANTIOXIDANTS

PowerNox™ 3052

CAS No.: 61167-58-6

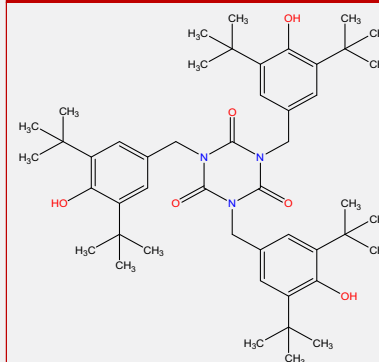
2,2'-Methylenebis(4-methyl-6-tert-butylphenol)acrylate



PowerNox™ 3114

CAS No.: 27676-62-6

Tris-(3,5-di-tert-butylhydroxybenzyl) isocyanurate

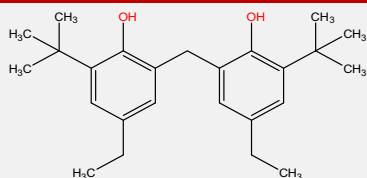


HINDERED PHENOLIC ANTIOXIDANTS

PowerNox™ 425

CAS No.: 88-24-4

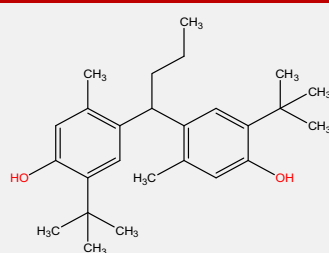
6,6'-di-tert-butyl-4,4'-diethyl-2,2'-methylene-diphenol



PowerNox™ 4425

CAS No.: 85-60-9

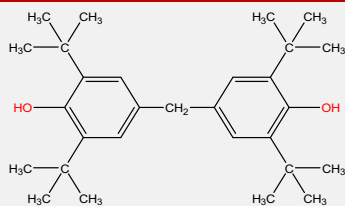
4,4'-Butylidene-bis-(6-butyl-3-methylphenol)



PowerNox™ 4426

CAS No.: 118-82-1

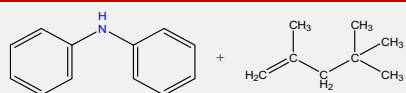
2,2',6,6'-tetra-tert-butyl-4,4'-methylene-diphenol



PowerNox™ 5057

CAS No.: 68411-46-1

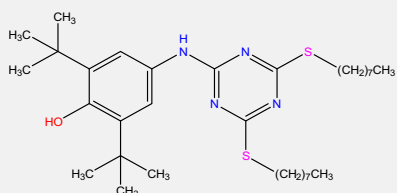
Benzenamine, N-phenyl-, reaction products with 2,4,4-trimethylpentene



PowerNox™ 565

CAS No.: 991-84-4

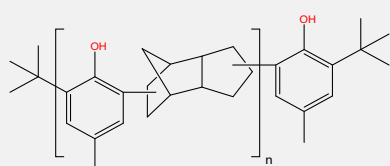
2,6-Di-tert-butyl-4-(4,6-bis(octylthio)-1,3,5-triazin-2-ylamino)phenol



PowerNox™ 616

CAS No.: 68610-51-5

Phenol, 4-methyl-, reaction products with dicyclopentadiene and isobutylene



PHOSPHITE ANTIOXIDANTS

Secondary antioxidants, such as phosphites and thioethers, decompose hydroperoxides into non-radical, non-reactive, and thermally stable products. Therefore, auxiliary antioxidants are also called hydroperoxide decomposers. Phosphites and thioethers antioxidants are widely used hydroperoxide decomposers. Phosphites are most effective at the high temperatures of melt processing operations, while thioethers work best in the solid phase at long-term use temperatures. Secondary antioxidants are used together with primary antioxidants to increase the stability of polymers.

Phosphite Antioxidants are secondary antioxidants that decompose peroxides and hydroperoxides into stable non-radical products. They are extremely effective stabilizers during processing and are often used in combination with primary antioxidant to provide good heat stability, color stability, process stability and weatherability to polymers.

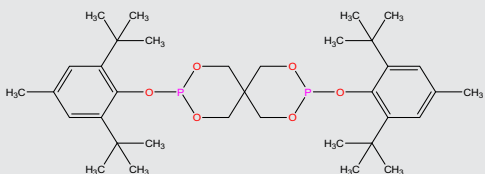
For more than 30 years, TINTOLL has been committed to providing innovative high-performance light stabilizers and antioxidant solutions to meet the growing and changing technical needs of the global plastics market.

TINTOLL's various antioxidants play an important role in inhibiting and delaying the oxidation and degradation of polymeric materials. TINTOLL is available in a variety of physical forms as well as standard and custom blends. The choice of antioxidant depends on factors such as compatibility, color and thermal stability, volatility and stabilizer efficiency.

PHOSPHITE ANTIOXIDANTS

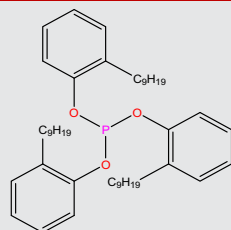
PowerNox™ 636

CAS No.: 80693-00-1
Bis(2,6-di-tert-butyl-4-methylphenyl)pentaerythritol diphosphate



PowerNox™ 1178

CAS No.: 26523-78-4
Tris(nonylphenyl) phosphite



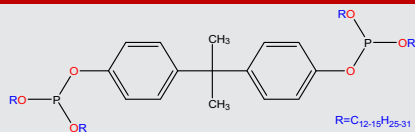
PowerNox™ 618

CAS No.: 3806-34-6
Distearyl pentaerythritol diphosphite



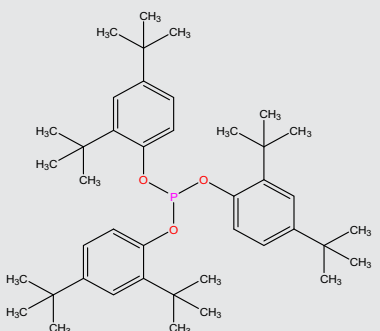
PowerNox™ 1500

CAS No.: 96152-48-6
4,4'-Isopropylidenediphenol C12-15 alcohol phosphite



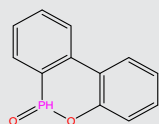
PowerNox™ 1680

CAS No.: 31570-04-4
Tris(2,4-di-tert-butylphenyl) phosphite



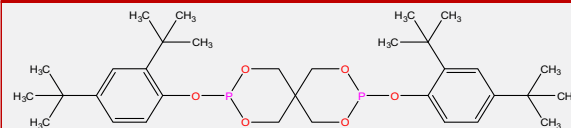
PowerNox™ 3030

CAS No.: 35948-25-5
9,10-Dihydro-9-oxa-10-phosphaphenanthrene-10-oxide



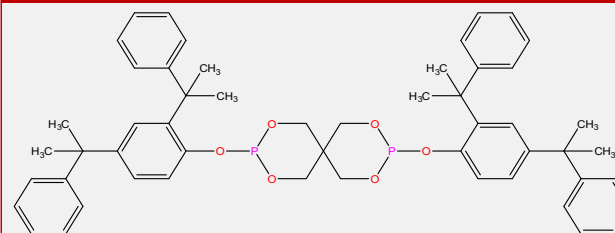
PowerNox™ 6260

CAS No.: 26741-53-7
Tetrakis[methylene-3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate] methane



PowerNox™ 9228

CAS No.: 154862-43-8
Bis(2,4-dicumylphenoxy) pentaerythritol diphosphite

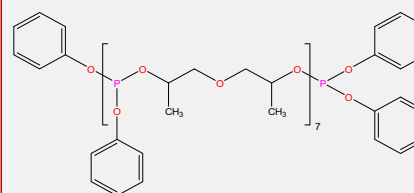


ANTIOXIDANTS

PHOSPHITE
ANTIOXIDANTS

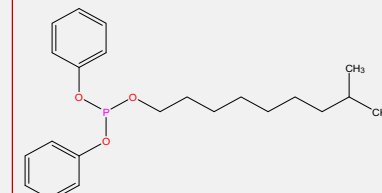
PowerNox™ DHOP

CAS No.: 80584-86-7
Poly(dipropylene glycol)phenyl phosphite



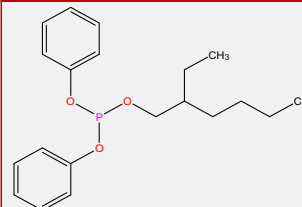
PowerNox™ DPDP

CAS No.: 26544-23-0
Isodecyl diphenyl phosphite



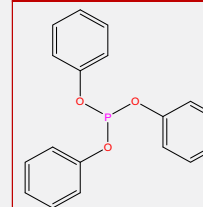
PowerNox™ EHDPP

CAS No.: 15647-08-2
2-Ethylhexyl diphenyl phosphite



PowerNox™ TPP

CAS No.: 101-02-0
Triphenyl phosphite



THIOETHER ANTIOXIDANTS

Secondary antioxidants, such as phosphites and thioethers, decompose hydroperoxides into non-radical, non-reactive, and thermally stable products. Therefore, auxiliary antioxidants are also called hydroperoxide decomposers. Phosphites and thioethers antioxidants are widely used hydroperoxide decomposers. Phosphites are most effective at the high temperatures of melt processing operations, while thioethers work best in the solid phase at long-term use temperatures. Secondary antioxidants are used together with primary antioxidants to increase the stability of polymers.

Although thiosynergists do not improve the melt stability of polymers during polymer processing, they are very effective for long-term heat aging applications. Sulfur-based hydroperoxide decomposers are mainly used in combination with hindered phenolic antioxidants.

For more than 30 years, TINTOLL has been committed to providing innovative high-performance light stabilizers and antioxidant solutions to meet the growing and changing technical needs of the global plastics market.

TINTOLL's various antioxidants play an important role in inhibiting and delaying the oxidation and degradation of polymeric materials. TINTOLL is available in a variety of physical forms as well as standard and custom blends. The choice of antioxidant depends on factors such as compatibility, color and thermal stability, volatility and stabilizer efficiency.



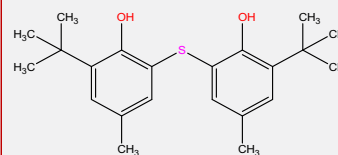
Sustainable Innovation for a Better Future

THIOETHER ANTIOXIDANTS

PowerNox™ 1081

CAS No.: 90-66-4

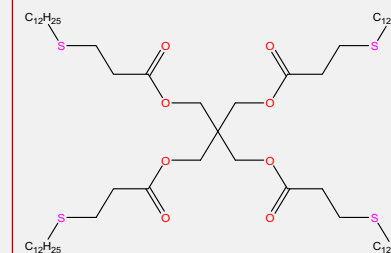
2,2'-Thiobis(6-*t*-butyl-4-methylphenol)



PowerNox™ 4120

CAS No.: 29598-76-3

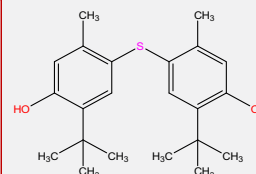
Pentaerythrityl tetrakis(3-laurylthiopropionate)



PowerNox™ 4150

CAS No.: 96-69-5

4,4'-Thiobis(2-*tert*-butyl-5-methylphenol)



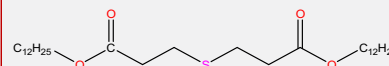
THIOESTER ANTIOXIDANTS

THIOESTER ANTIOXIDANTS

PowerNox™ DLTDP

CAS No.: 123-28-4

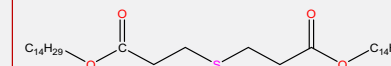
Dilauryl thiodipropionate



PowerNox™ DMTDP

CAS No.: 16545-54-3

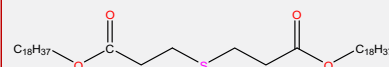
Dimyristyl thiodipropionate



PowerNox™ DSTDP

CAS No.: 693-36-7

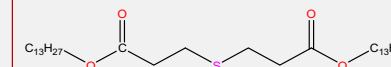
Distearyl thiodipropionate



PowerNox™ DTTDP

CAS No.: 10595-72-9

Di(tridecyl) thiodipropionate



ANTIOXIDANT BLENDS

ANTIOXIDANT BLENDS

TINTOLL Antioxidant Blends are composed of hindered phenolic primary antioxidants and phosphite secondary antioxidants, which work synergistically to provide excellent processing and in-use stability for polyolefins and other polymers.

TINTOLL Antioxidant Blends are easy to use and the mixing ratio can be adjusted to meet specific requirements.

For more than 30 years, TINTOLL has been committed to providing innovative high-performance light stabilizers and antioxidant solutions to meet the growing and changing technical needs of the global plastics market.

TINTOLL's various antioxidants play an important role in inhibiting and delaying the oxidation and degradation of polymeric materials. TINTOLL is available in a variety of physical forms as well as standard and custom blends. The choice of antioxidant depends on factors such as compatibility, color and thermal stability, volatility and stabilizer efficiency.



Sustainable Innovation for a Better Future

PowerNox™ 2777
 CAS No.: 40601-76-1, 31570-04-4
 Blend of PowerNox™ 1790 and PowerNox™ 1680 at ratio of 1:2.

PowerNox™ 2888
 CAS No.: 40601-76-1, 31570-04-4
 Blend of PowerNox™ 1790 and PowerNox™ 1680 at ratio of 1:3.

PowerNox™ 4000
 CAS No.: 40601-76-1, 154862-43-8
 Blend of PowerNox™ 1790 and PowerNox™ 9228.

PowerNox™ 9215
 CAS No.: 6683-19-8, 26741-53-7
 Blend of PowerNox™ 1010 and PowerNox™ 6260 at ratio of 1:2.

PowerNox™ 9225
 CAS No.: 6683-19-8, 26741-53-7
 Blend of PowerNox™ 1010 and PowerNox™ 6260 at ratio of 1:1.

PowerNox™ B1171
 CAS No.: 23128-74-7, 31570-04-4
 Blend of PowerNox™ 1098 and PowerNox™ 1680 at ratio of 1:1.

PowerNox™ B1411
 CAS No.: 27676-62-6, 31570-04-4
 Blend of PowerNox™ 3114 and PowerNox™ 1680 at ratio of 1:1.

PowerNox™ B1412
 CAS No.: 27676-62-6, 31570-04-4
 Blend of PowerNox™ 3114 and PowerNox™ 1680 at ratio of 1:2.

PowerNox™ B215
 CAS No.: 6683-19-8, 31570-04-4
 Blend of PowerNox™ 1010 and PowerNox™ 1680 at ratio of 1:2.

PowerNox™ B220
 CAS No.: 6683-19-8, 31570-04-4
 Blend of PowerNox™ 1010 and PowerNox™ 1680 at ratio of 1:3.

PowerNox™ B225
 CAS No.: 6683-19-8, 31570-04-4
 Blend of PowerNox™ 1010 and PowerNox™ 1680 at ratio of 1:1.

PowerNox™ B561
 CAS No.: 6683-19-8, 31570-04-4
 Blend of PowerNox™ 1010 and PowerNox™ 1680 at ratio of 1:4.

PowerNox™ B900
 CAS No.: 2082-79-3, 31570-04-4
 Blend of PowerNox™ 1076 and PowerNox™ 1680 at ratio of 1:4.

PowerNox™ B921
 CAS No.: 2082-79-3, 31570-04-4
 Blend of PowerNox™ 1076 and PowerNox™ 1680 at ratio of 1:2.

AMINE ANTIOXIDANTS

Aromatic secondary amines can act as primary antioxidants and are excellent hydrogen donors. Aromatic amines also come in a variety of molecular weights and product forms and are generally more reactive than hindered phenols. However, aromatic amines are more prone to staining and discoloration than hindered phenols, especially when exposed to light or combustion gases, and have limited FDA approval for use in contact with food. Amines antioxidants are commonly used in the rubber industry, but are also used in wire and cable formulations and applications such as polyurethane polyols.

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AMINE ANTIOXIDANTS

PowerNox™ 420

CAS No.: 143925-92-2

Bis(hydrogenated tallow C16-18-alkyl)hydroxylamine

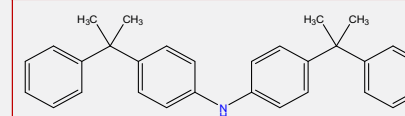


R: C₁₆-C₁₈ Alkyl Chains

PowerNox™ 445

CAS No.: 10081-67-1

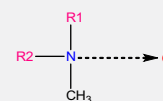
Bis[4-(2-phenyl-2-propyl)phenyl]amine



PowerNox™ EP

CAS No.: 204933-93-7

Amines, bis(hydrogenated rape oilalkyl)methyl, N-oxides

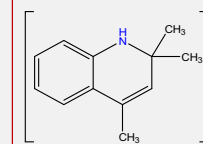


R1, R2: C₁₄-C₂₄ Alkyl Chains

PowerNox™ TMQ

CAS No.: 26780-96-1

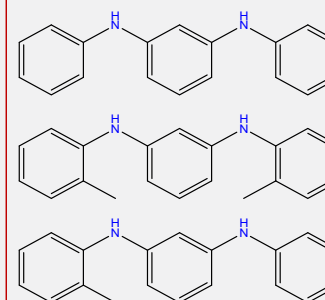
Poly(1,2-dihydro-2,2,4-trimethylquinoline)



PowerNox™ PA100

CAS No.: 68953-84-4

Mixture of Diaryl-p-phenylenediamines (DTPD)



AMINE ANTIOXIDANTS

AMINE ANTIOXIDANTS