Struktol Company of America
201 E. Steels Corners Road • P. O. Box 1649
Stow, Ohio 44224-0649 • www.struktol.com
Phone (330) 928-5188 • Fax (330) 928-8726

TECHNICAL DATA

CARSTAB® DSTDP

ANTIOXIDANT

COMPOSITION

CARSTAB DSTDP is a thioester synergist that is particularly effective as a long-term heat aging stabilizer when used in conjunction with primary antioxidants. CARSTAB DSTDP is highly effective in polypropylene, ABS, and high density polyethylene. CARSTAB DSTDP is a nonvolatile stabilizer and offers low oral and dermal toxicity.

TYPICAL PROPERTIES

Empirical Formula	$C_{42}H_{82}O_4S$
Molecular Weight	682
Appearance	White crystalline flake
Acid Number	1
Assay (%)	99
Color (% Transmission at 440 mu)	90
Freezing Point (ºC)	65
Specific Gravity at 80°C	0.858
Solubility at 25°C (g/100 grams)	
Acetone	2
Ethanol	0.5
Toluene	13
Heptane	2
Ethyl Acetate	1
Water	Insoluble

SAFETY INFORMATION

CARSTAB DSTDP is not considered hazardous material as defined by the Department of Labor. However, in keeping with good industrial practice, handle with care and avoid unnecessary personal contact.

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STANDARD PACKAGING

CARSTAB DSTDP is packaged in polyethylene lined 55-gallon fiber drums of 200 pounds net each, polyethylene lined 30 gallon fiber drums of 100 pounds net each, and polyethylene lined 15 gallon fiber drums of 50 pounds net each.

APPLICATIONS

1. CARSTAB DSTDP is especially recommended to protect polypropylene from oxidation in high temperature applications.
2. CARSTAB DSTDP is very effective in high density polyethylene and other polymers.
3. For applications requiring superior heat stability, a combination of a hindered phenolic antioxidant and CARSTAB DSTDP should be used. It has been found that a combination of three parts of CARSTAB DSTDP to one part of hindered phenolic antioxidant often provides optimum performance. Typical use levels are 0.15% of CARSTAB DSTDP and 0.05% of phenolic antioxidant. It is recommended that specific end use formulations be optimized with regard to thioester synergist ratio and use level.

FDA STATUS

CARSTAB DSTDP is one of a number of antioxidants listed in Section 181.24 of the Food Additives Regulations as having a “prior sanction” for use in the manufacture of food-packaging material. When so used, such substances are not considered “food additives” within the meaning of that term as used in the law. The only limitation on use is that prescribed for all similar antioxidants; namely, that such migration as may occur shall not result in the addition of more than 50 parts per million of the antioxidant to food.

CARSTAB DSTDP is also authorized for use in adhesives in section 175.105 of the Food Additives Regulations and as a component of resinous or polymeric coatings in Section 175.300 of the same regulations.

INTRODUCTION

The mechanism of oxidative polymer degradation is a radical chain process. The degradation process is initiated by the formation of a polymer free radical. This radical can be formed by the homolytic rupture of a chemical bond in the polymer. The initiation can be catalyzed by a variety of factors, such as ultraviolet radiation, ionizing radiation, heat and mechanical processing. Once the polymer radical has formed, it can react with oxygen to form a variety of oxygenated radical species. Initially, many of these species can propagate the decomposition process by yielding a radical which decomposes and by doing so can either cause oxidative chain scission or cross-linking.

The function of antioxidants is to inhibit the formation of the radical species. Hindered phenolic antioxidants are usually considered as chain terminators. Thioester synergists are believed to function in a variety of ways -- as hydroperoxide or peroxide decomposers and as a means of regenerating the primary antioxidant.

The term “synergist” is applied to CARSTAB DSTDP because when it is used in combination with a hindered phenolic antioxidant, the stability is much greater than the sum of the individual components.

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THERMAL STABILITY

CARSTAB DSTDP has been processed at temperatures as high as 600°F without excessive color formation or loss of stabilizer. CARSTAB DSTDP is thermally stable and little decomposition occurs after heating at 550°F for extended periods of time.

The resistance of CARSTAB DSTDP to discoloration and volatilization is important as temperatures in this range are being encountered in modern plastic processing.

CHEMICAL PROPERTIES

CARSTAB DSTDP is a relatively inert plastic additive and does not react with most commonly used plastic additives.

VOLATILITY

CARSTAB DSTDP is a relatively nonvolatile stabilizer. At elevated processing temperatures, losses via volatilization will be relatively low for CARSTAB DSTDP.

	WEIGHT LOSS (%)		
ADDITIVE	200°C	250°C	300°C
CARSTAB DSTDP	1	5	12
2,6-ditertiarybutyl p-cresol	50	90	95

COMPATIBILITY

Compatibility of plastic additives implies good solubility, non-migration to the surface and permanence under conditions of use.

Generally hindered phenolic antioxidants are quite compatible in polypropylene at their normal use levels, e.g., 0.02 to 0.3%. Thioesters differ in this respect with CARSTAB DSTDP approaching the limits of compatibility at levels above 0.4%.

The test specimens were stored at room temperature and examined for exudation. The first signs of exudation were recorded and are listed in the following table:

COMPATIBILITY OF CARSTAB DSTDP IN POLYPROPYLENE

ADDITIVE LEVEL (%)*	DAYS TO EXUDATION
0.4	30
0.6	20
0.8	12
1.2	10
1.4	2

*All sample contained 0.1% of a hindered phenolic antioxidant and 1% carbon black.

(02/23/07)MSF/mmm