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TECHNICAL DATA

CARSTAB® DLTDP

ANTIOXIDANT

COMPOSITION

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

PROPERTIES	*TYPICAL VALUES*
Empirical Formula	$C_{30}H_{58}O_4S$
Molecular Weight	514
Appearance	White pastille
Acid Number	0.5
Color (% Transmission at 440 mu)	95
Freezing Point (ºC)	40
Specific Gravity at 80°C	0.896
Solubility at 25°C (g/100 grams)	
Acetone	55
Ethanol	4
Toluene	65
Heptane	52
Ethyl Acetate	60
Water	Insoluble
Physiological Behavior	Refer to safety data sheet
Storage Stability	At least 2 years under normal storage conditions
Packaging	PE lined 15 gallon fiber drums of 50 pounds net each

RECOMMENDATIONS FOR APPLICATION

CARSTAB DLTDP is especially recommended to protect high density polyethylene and ABS from oxidation in high temperature applications. CARSTAB DLTDP is also very effective in polypropylene and other polymers.

For applications requiring superior heat stability, a combination of a hindered phenolic antioxidant and CARSTAB DLTDP should be used. It has been found that a combination of three parts of CARSTAB DLTDP to one part of hindered phenolic antioxidant often provides optimum performance. Typical use levels are 0.15% of CARSTAB DLTDP 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.

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.

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TECHNICAL DATA

INTRODUCTION - *continued*

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 DLTDP because when it is used in combination with a hindered phenolic antioxidant, the stability is much greater than the sum of the individual components.

THERMAL STABILITY

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

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

CHEMICAL PROPERTIES

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

VOLATILITY

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

	WEIGHT LOSS (%)		
ADDITIVE	**200°C**	**250°C**	**300°C**
CARSTAB DLTDP	1	4	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 DLTDP approaching the limits of compatibility at levels above 1.4%.

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 DLTDP IN POLYPROPYLENE

Additive Level (%)*	Days to Exudation
0.4	No exudation
0.6	No exudation
0.8	No exudation
1.2	No exudation
1.4	No exudation

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

FDA STATUS

According to **Section 182.3280** of the regulations to the Food Additives Amendment to the Federal Food, Drug and Cosmetic Act, dilaurylthiodipropionate is a substance that is generally recognized as safe when used as an antioxidant in edible fats and oils, provided the total concentration of all antioxidants present does not exceed 0.02 percent.

In **Section 181.24** of the regulations, dilaurylthiodipropionate is designated as a substance to which a prior sanction has been granted in the manufacture of food-packaging materials. The restriction on use in this case is that the antioxidant may not migrate to food in an amount to exceed a concentration of 0.005 percent in the food.

CARSTAB DLTDP is also authorized for use in **Section 175.300** as a component of resins or polymeric coatings.

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