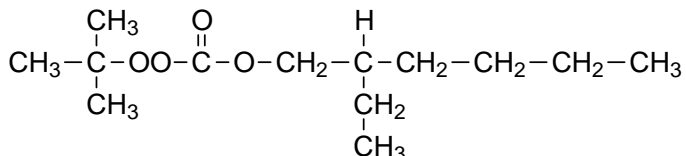


Chemical Name And Structure

OO-tert-Butyl O-2-(ethylhexyl) monoperoxy carbonate



Introduction

Luperox® TBEC is a room-temperature stable liquid organic peroxide. As this is a Monoperoxy carbonate Class of peroxide, it generates high-energy free radicals that provide both efficient and faster crosslinking of polymers and elastomers at lower processing temperatures compared to the Dialkyl Class of peroxide. Polymers and elastomers that can be crosslinked with Luperox® TBEC include but are not limited to: EVA, EPM, EPDM, PLA, VMQ (methyl vinyl silicone rubber), Vamac® and Engage®.

A general peroxide concentration range for the effective crosslinking of polymers and elastomers is approximately: 1.0 phr to 2.0 phr (parts per hundred resin) based upon the weight of the polymer used.

Properties

% Active Oxygen:	≥ 6.17%
% Assay:	≥ 95%
CAS No.	34443-12-4
Color:	Colorless to pale yellow
Flashpoint, SETA CC:	101°C (214°F)
Freezing Point:	<-60°C
Molecular Formula:	C ₁₃ H ₂₆ O ₄
Molecular Weight:	246.347 g/mole
Specific Gravity:	0.9267 g/ml at 25°C
Self-Accelerating Decomposition Temperature (SADT):	65°C (150°F) 35lb. Carton
Storage Temperature to Maintain % Assay for 6 months:	38°C (100°F); preferably 30°C (86°F)

Melt Compounding Of Luperox® TBEC Organic Peroxide Into Polymers And Elastomers

The melt compounding of Luperox® TBEC should be conducted using a time-temperature profile that will not significantly decompose any of the peroxide. Ideally, no more than 1% of the peroxide concentration should be allowed to decompose during the compounding operation.

The % peroxide remaining versus time at a specific temperature can be calculated from Arkema's copyrighted Half-Life spreadsheet. A general compounding profile for EVA and Luperox® TBEC could be constructed from 180°F (82°C) to 230°F (110°C) with a maximum residence time of 3 min, as an example. At 110°C approximately 1% of the total peroxide added would be decomposed in three minutes. This value was calculated using Arkema's copyrighted Half-life spreadsheet tool.

One must be aware that as more peroxide decomposes, the viscosity of the EVA in the extruder will increase. This will lead to further heat shear in the barrel and increased work-load on the extruder motor. So the basic concept is to choose your time-temperature profile and screw design to minimize the amount of peroxide decomposition during melt compounding.

Thus it is strongly recommended that customers determine the minimum processing temperature of their polymer system, prior to compounding in this peroxide. If high melt compounding temperatures and/or longer residence times are required to successfully compound the elastomer, a different, more thermally stable organic peroxide, may be required.

HALF LIFE TIME/TEMPERATURE DATA

Time	Degrees Celsius	Degrees Fahrenheit
100 hrs	80.4	176.8
10 hrs	99.6	211.3
1 hr	120.9	249.7
6 mins	144.9	292.7
1 min	165.6	330.1
1 sec	221.7	431.0

Crosslinking EVA

Below is a table of RPA (Alpha Technologies) Rheometer data comparing the performance of three different organic peroxides that possess significantly different thermal decomposition activity. These liquid room temperature stable organic peroxides are Luperox® 101, Luperox® TBEC and Luperox® 231 and are listed in order of decreasing thermal stability. Of the three, Luperox® 101 is the most thermally stable and belongs to the Dialkyl class of peroxide. Luperox® TBEC is a Monoperoxy carbonate type of peroxide and Luperox® 231 is the fast decomposing Peroxyketal class of peroxide.

The concentrations of these peroxides were adjusted to provide relatively the same level of crosslinking, based upon MH or maximum torque in deciNewton-meters (dN-m). When evaluating these peroxides at a constant temperature of 160°C, we see that the time to attain 90% of the final cure is quite long for Luperox® 101 as compared to Luperox® TBEC. Clearly Luperox® 231 is the fastest curing, but more must be used on a weight basis as it generates a combination of high energy and lower energy radicals. For that reason it is less efficient than Luperox® TBEC.

Of the three peroxides, Luperox® TBEC offers the best balance of thermal stability when compounding, along with good crosslinking efficiency and a short cure time when crosslinking. Note that the Evatane® EVA resin used below was crosslinked as supplied. No fillers, stabilizers or antioxidants were added to the EVA resin.

PHR Used		0.756 phr	1.50 phr	2.75 phr
Peroxide Used:		Luperox® 101	Luperox® TBEC	Luperox® 231
EVA Compound		Evatane® 33-45	Evatane® 33-45	Evatane® 33-45
Cure Temperature (°C)		160°C	160°C	160°C
S' @ Max S'(MH)	dN-m	6.15	6.95	5.85
S' @ Min S'(ML)	dN-m	0.036	0.071	0.10
ts0.4scorch time	min	1.3	0.48	0.35
Time@ 90% cure	min	22.43	4.37	2.05

For additional information, or to place an order or sample request, call 1.800.331.7654.

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Arkema Inc., Functional Additives R&D Campus

USA: 900 First Avenue, King of Prussia, PA 19406 Tel: (610)-878-6500