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Technical Information
THIOCURE® TEMPIC

Description

THIOCURE® TEMPIC is a trifunctional Polythiol with medium viscosity. It reacts with epoxy- and isocyanate groups as well as with double bonds of unsaturated compounds.

Chemical Description

Tris[2-(3-mercaptopropionyloxy)ethyl]isocyanurate

Applications

Radiation Curing Systems
In thermal or radiation cured thiol-ene systems THIOCURE® TEMPIC can be used as main binder in combination with acrylates, vinyl-, or allyl ethers (e.g. triallyl isocyanurate). Thiol-ene systems which react via radical initiation and step-growth polymerization do not show oxygen inhibition and provide lower shrinkage compared to standard UV cured systems reacting via chain-growth polymerization.
THIOCURE® TEMPIC can be used also as a modifier in standard radiation cured systems. A proportional mass of 5-10 % of the total formulation already reduces the oxygen inhibition and may have a positive influence on curing and adhesion.
When combined with unsaturated compounds the storage stability must be monitored. The use of a stabilizer like Irgastab® UV 22 (BASF) is recommended. Possibly a two-component formulation may be required.

Thiourethane-Systems
Coatings, castings etc. can also be formulated with polyisocyanates. THIOCURE® TEMPIC combined with aliphatic hardeners results in thiourethane- systems with very good UV-stability. THIOCURE® TEMPIC can be used as main binder or in combination with conventional polyols. Depending on the isocyanate used, a catalyst could be necessary. Particularly suitable is for example the aluminium complex K-Kat® 5218 (King Industries) or quarternary ammonium salts such as WorleeAdd 422 (WorléeChemie GmbH) or BYK®-ES 80 (BYK Additives). Similarly to the polyurethane systems, it is possible to inhibit the reaction, for example with phosphoric acid esters such as dibutylphophate or a boric acid ester such as tributyl borate.

Epoxy-Systems
THIOCURE® TEMPIC can be used as a hardener in epoxy resins (preferably based on Bisphenol A/F), for the formulation of solvent based and solvent free coatings, as well as in adhesives and sealants.
Catalysts such as tertiary amines (DABCO® LV-33/Air Products) are of essential importance in this process, but mixtures with THIOCURE® TEMPIC are prone to degradation reducing the shelf-life time significantly.

General Informations

THIOCURE® TEMPIC differs from THIOCURE® TMPMP which is also trifunctional by its higher viscosity, which enables straightforward manufacturing of highly viscos systems like adhesives.
Reactivity of thiourethane- and epoxy-systems with THIOCURE® TEMPIC tends to be lower compared to THIOCURE® TMPMP, only in thiol-ene systems the reactivity is higher. The adhesion on various substrates is positively influenced by THIOCURE® TEMPIC. The mechanical properties of castings, such as E-modulus and tensile strength are above the level of THIOCURE® TMPMP and PETMP based systems.

Solubility / Compatibility

THIOCURE® TEMPIC can be diluted with most organic solvents such as esters, glycol ethers and aromatic hydrocarbons. However, the solutions formed must be tested for their storage stability. THIOCURE® TEMPIC is not miscible with alcohols and water.
THIOCURE® TEMPIC can be mixed in any proportions with other THIOCURE® types, except with THIOCURE® PPGMP 2200, which is the only incompatible one.

Formulation and Processing Information

- Chemical conversion with double bonds (e.g. acrylate monomers, -oligomers etc.):

  1 mol SH per mol double bond

- Calculation of hardener content for Epoxy resins:

  THIOCURE® [g] = Epoxy value x SH-equivalent
  (Epoxy value = 100/EP-Equivalent weight)

- Calculation of required Isocyanate-hardener:

$$\text{Isocyanate [g]} = \frac{\text{amount THIOCURE® [g] x SH-content [\%] x 42}}{\text{33 x NCO-content [\%]}}$$

During the formulating and the processing of products containing THIOCURE® TEMPIC, care should be taken to avoid heavy metal contamination, especially with iron and nickel, which can lead to discoloration in clear coats.

Specifications

Parameter	Unit	Range	Method	SOP-No.
Appearance		clear, colorless to slight yellowish or reddish	Visual (5cm optical path)	
Content	%w/w	min. 95.0	Iodometric	PA-QW-303
Mercapto Sulfur	%w/w SH	17.93 – 18.87	Iodometric	PA-QW-303
Refractive Index n^{d}_{20}		1.532 – 1.539	Electr. Refractometer	PA-QW-014
Acid number	mg KOH/g	max. 2.0	Alkalimetric	PA-QW-302
Color Number	APHA	max. 100	Hazen	PA-QW-013

Other Properties

Parameter	Unit	Range	Method	SOP-No.
Density d^{20}_4	g/cm³	1.30 – 1.36	Oscillating Densitometer	PA-QW-005
H-Equivalentweight	g/mol	180 -184	calculated	--
Nonvolatile content	% w/w	> 99.0	DIN EN ISO 3251 (1h 125°C)	--
Viscosity	mPa·s	7500 +/- 1500	ISO 2555, Brookfield Mandrel S 64, 21°C	--

Handling, Storage conditions and Shelf-life

Consult the appropriate Material Safety Data Sheet for safety and handling guidelines for this product.

Storage at room temperature up to +25°C max. is recommended.

THIOCURE® TEMPIC can be stored for at least 12 month from the date of manufacture if kept closed in the original packaging. Expiration of shelf life time does not necessarily mean the product is no longer usable. However, prior to using THIOCURE® TEMPIC we recommend to testing it and verifying that it still meets the specification.

THIOCURE® TEMPIC should be stored in the original packaging. Alternatively, packaging in glass, HDPE, PP or inside-coated packaging can be used. Opened packaging should be closed tightly after use.

Standard Packing

41075	PE-Can	kg	40,0

Regulatory Status

Europe	Australia	China	Japan	Canada	Korea	New Zealand	Philip-pines	USA
REACh	AICS	IECSC	ENCS	DSL	ECL	NZIoC	PICCS	TSCA
Pre-registered	-	+	-	+	-	-	-	+

+ = registered
- = not registered
n/a = not applicable

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