TETRAETHYLENE GLYCOL DIACRYLATE

Document History
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I. IDENTIFICATION[1]

Chemical Name: 2-Propionic acid. oxybis (2, 1-ethane-diyoxy-2, 1-ethanediol) ester. CAS 17831-71

Synonyms: Tetraethylene Glycol Diacrvlate; TTEGDA; acrylate ester; MFA (multi-functional acrylate); MFM (Multi Functional Monomer).

Formula: C14H2·O7

Molecular Weight: Mixture; Formula Weight = 302

II. CHEMICAL AND PHYSICAL PROPERTIES

A. Chemical Properties

Mainly a mixture of mono- and di- acrylate esters of tetraethylene glycol with some dimers and trimers, inhibited with 100 ppm (±25 ppm) of free radical polymerization inhibitor MEHQ (monomethyl ester of hydroquinone). Rapid and violent polymerization possible at temperatures above 32 °C. Exposure to light, free radical initiators, oxidizing agents such as peroxides, iron, rust, and strong bases, and storage beyond expiration date may initiate polymerization.

Cross linking occurs after exposures to ultraviolet light at 300-400 nm.'[21]

B. Physical Properties[1]

Amber liquid with low volatility and odor.
Flash Point: > 93.3 °C (200 °F) (PMCC). Note reactions in II.A.
Boiling Point: more than 315 °C (599 °F) at 760 mm Hg.
Melting Range: < 0 °C (32 ° F)
Vapor Pressure: estimate < 1 mm Hg at 150 °C (302 °F).
Solubility in Water: estimate at 1-5% by weight.
Specific Gravity: 1.11 at 25 °C (77 °F).

III. USES AND CONSUMPTION

Major use in ultraviolet cured inks, coatings and adhesives. Some MFAs are also used in dental sealants[2] Production of all types of MFAs may be several million pounds per year depending on demand.[3]

IV. SUMMARY OF TOXICOLOGIC AND USE EXPERIENCE

A. Toxicology Data

1. *Animal Data*[4]

a. Acute Toxicity

Rat Oral LD50: 813.2 mg; kg (SD ± 126.4 mg/ kg)

Rabbit Skin LD50: > 3000 mg; kg at 24 hours

"Lab Animals" Inhalation: 6-hour exposure to air saturated by sparging through TTEGDA at 60 °C (140 °F) caused no deaths.

Rabbit Primary skin irritation: moderately irritating.

Rabbit Eye irritation: extremely irritating.

b. Sub-chronic Toxicity

Guinea Pig Standard test on Sensitization: animals with undiluted TTEGDA did not cause sensitization (10 animals).

Rabbit Two week '300 mg/ kg undiluted dermal toxicity: TTEGDA/day x 5 day/ week x 2 weeks resulted in skin corrosion but no organ effects were noted.

2. *Miscellaneous*

In vitro Mutagenicity Assays[4] Bacteria: Ames Test - negative (both activated and non-activated).

Mouse: Lymphoma Forward Mutation Assay - positive (both activated and non-activated).

3. Human Data")

Irritation: Severe irritation in single application patch test at concentrations above 1%. At 0.1% there was no irritation.

B. Human Use and Experience

All MFAs are irritating upon contact and are known or suspected skin sensitizers. Dermatitis from exposure to aerosols generated by manufacturing processes has been reported and it has been speculated that the heat of milling may generate vapor concentrations sufficient to cause dermatitis.(2> It is important to note that, in use. exposure to aerosols may include exposure to various resin systems, pho-toinitiators, solvents, hydrogen transfer agents, stabilizers. surfactants, fillers, polymerization inhibitors, etc:5>

Widespread commercial use of MFAs appears to have developed only in the last 5-10 years. No reports of respiratory or other systemic effects in humans were found.

Reportedly, there are significant technical problems associated with sampling and analyzing for the MFAs.

V. RECOMMENDED OEL GUIDE

A. Rationale

Contact dermatitis has been reported for humans and serious eye injury has been reported for laboratory animals. Exposure to some M FA-resin aerosols has also been reported to cause dermatitis. Since no assessment of the possible effects of long term exposure to aerosols was found, a conservative exposure level is recommended.

B. Recommended OEL

Avoid skin or eye contact with liquids or aerosols

1 mg/ m^3 (8-hour time weighted average for a 40 hour week).

VI. REFERENCES

Literature searches performed: Registry of Toxic Effects, Toxline. and Toxicology Data Base.

1. **Celanese Chemical Company, Inc.:** Material Safety Data Sheet: *Tetraethylene Glycol Diacrylate (TTEGDA). (11/79).*
2. **Nethercott, J.R.:** Skin Problems Associated with Multifunctional Acrylic Monomers of Ultraviolet Curing Inks. *Brit. J. Dermatol.* 98:541-552 (1978).
3. **Celanese Chemical Company, Inc.:** Safety and Handling Manual: *Multifunctional Acrylates.*
4. **Celanese Chemical Company, Inc.:** Toxicity Summary: *Tetraethylene Glycol Diacrylate (TTEGDA). (1979).*
5. **Emmet, E.A. and J.R. Kominsky:** Allergic Contact Dermatitis from Ultraviolet Cured Inks. *J. Occup. Med.* /9:2, 113-115 (February, 1977).