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RESULTS OF RANGE FINDING TOXICOLOGICAL TESTS ON 1-BUTOXY-2,3-EPOXY-PROPANE (BUTYL GLYCIDYL ETHER)

Chemical Name (300 per name) — 25	CAS No. (10) — 24
GLYCIDOL & ITS DERIVATIVES	999 800-13-4
BUTYL GLYCIDYL ETHER	2426-08-6

Figure 3-7. Global Indexing Form

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Biochemical Research Department D-000369

The Dow Chemical Company

RESULTS OF RANGE FINDING TOXICOLOGICAL TESTS ON 1-BUTOXY-2,3-EPOXY-PROPANE (BUTYL GLYCIDYL ETHER)

File
K No.
Chg.
Rept. By K. J. Olson

Signed K. J. Olson Checked D. D. McCollister

Date July 10, 1957 Date July 10, 1957

PROBLEM

The subject material is commercially used as a reactive diluent for epoxy resins in casting and laminating applications. How does this material compare with the following for level of toxicity: Phenyl glycidyl ether, 3-2 styrene oxide, and allyl glycidyl ether? In addition, are there any particular problems or hazards associated with the industrial use and handling of butyl glycidyl ether?

CONCLUSIONS

A comparison of these reactive diluents for epoxy resins has been discussed in a letter

. In this letter it was indicated that 3-2 was the diluent of choice based on handling hazards. Butyl glycidyl ether and allyl glycidyl ether, being very similar in degree and type of toxicity, were considered the next materials of choice. Phenyl glycidyl ether and styrene oxide would be the last.

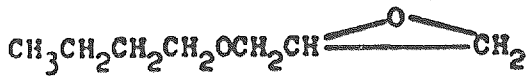
(Continued)

DATA SHEET OF PROPERTIES, HEALTH HAZARDS, AND PRECAUTIONS FOR SAFE HANDLING OF MATERIALS

MOLECULAR FORMULA	CHEMICAL NAME
$C_7H_{14}O_2$	1-butoxy-2,3-epoxy propane

MOLECULAR WEIGHT	INDUSTRIAL HYGIENE STANDARD	SYNONYMS
130.2	----	Butyl glycidyl ether

STRUCTURAL FORMULA OR COMPOSITION



PHYSICAL AND CHEMICAL PROPERTIES

BOILING POINT	EXPLOSIVE LIMITS (% BY VOL IN AIR)	FLASH POINT	IGNITION TEMP	MELTING POINT	ODOR (THRESHOLD CONCENTRATION IN AIR)
-- °C - mmHg.	--	-- °F.	-- °C.	-- °C.	----

CORROSIVENESS	PHYSICAL STATE	COLOR
----	Liquid	Colorless

CHEMICAL REACTIVITY: ----

STABILITY: ----

TOXIC PROPERTIES

TYPE OF CONTACT	CLASSIFICATION OF TOXIC PROPERTIES	
EYE	[X] May cause no response or no more than very slight or slight transitory pain and/or irritation of the eyelids.	[ ] May cause some permanent loss of vision (this includes damage to cornea or internal injury which is incompletely healed in one week.)
	[ ] May cause sufficient injury to the eye to result in loss of time from work. (This includes damage to the cornea which heals or nearly heals in a week and/or considerable conjunctival irritation such edema.)	[ ] Vapor exposure may cause severe pain, lacrymation or serious injury to the eyes.
SKIN *	[ ] Single prolonged exposure (hours) causes no effect. Several repeated prolonged exposures may or may not cause the development of some slight irritation.	[X] Single short exposure (minutes) may cause considerable irritation and/or single prolonged or frequently repeated short exposures cause a burn and/or may cause systemic injury, even death.
	[ ] Single prolonged exposure may cause some reddening of the skin. Repeated prolonged contacts may cause appreciable irritation, possibly a mild burn and/or may cause appreciable systemic injury due to absorption	[ ] An exposure rapidly causes severe burns and/or serious systemic injury, even death.
INHALATION: DUST OR MIST	[ ] No systemic injury expected. No irritation to nose and throat in dusty or misty atmosphere.	[ ] Dusty or misty atmosphere painful to most and threats (intolerable to most people) and/or exposure may cause serious systemic injury.
	[ ] Throat and nose irritation in a dusty or misty atmosphere is painful but not intolerable and/or prolonged or repeated exposures may cause systemic injury.	[ ] Short exposure (minutes) may cause death or serious systemic injury.
INHALATION: VAPOR	[ ] Exposures do not cause any effects other than some very slight irritation or pain to the eyes or respiratory passages at the most.	[X] Exposures may cause extreme drowsiness, and/or serious systemic injury, and/or may cause intolerable irritation to the respiratory passages.
	[ ] Single exposure exceeding 1-2 hours, or frequently repeated exposures of shorter duration, may cause slight anesthesia and/or slight systemic injury, and or cause appreciable, but not intolerable irritation of respiratory passages.	[ ] Short exposures may cause unconsciousness, and/or serious systemic injury, including death.
	* Even very short exposure will cause serious systemic injury or death.	
INGESTION	X Amounts which may be swallowed incidental to industrial handling will not cause injury.	[ ] Amounts which may be swallowed incidental to industrial handling and use may cause serious injury.

COMMENTS

* This material is absorbed readily through the intact skin in lethal amounts.

On the basis of its chemical structure, this material can be expected to be a sensitizer.

DEGREES OF EXPOSURE RELATED TO TYPES OF OPERATION		PRECAUTIONS (SEE CODE BELOW)				
		EYES	SKIN	INHALATION* DUSTS OR MIST	INHALATION* VAPOR	INGESTION
I NO CONTACT	Characterized by remote operations with equipment isolated from the work area. The persons operating isolated areas will require the personal precautions outlined for IV below.	A	A		A	A
II MINOR CONTACT	Characterized by closed systems with equipment located outside the work area; enclosed manual, mechanical handling of materials in bulk. Examples are: continuous reactors, mills and blowers, enclosed conveyors; ventilated packaging.	A	A		A	A
III OCCASIONAL DAILY CONTACTS	Characterized by manual handling of materials in packages such as bags, drums and fiberpaks. Ventilation may be provided for specific jobs. Many batch operations fall into this category.	B	D		C	A
IV GROSS CONTACT LIKELY	Characterized by hand operations. Examples are: Emergency repairs, cleaning equipment, cleaning filters, taking care of spills, packaging volatile or dusty materials without ventilation, shoveling and way driving.	B	E		D	A

EYE CONTACT	A No eye protection needed. B Use safety glasses without side shields. C Use safety glasses with side shields.	D Use chemical workers goggles. E Use gas tight goggles or a full face gas mask.
SKIN** CONTACT	A A bath and clean clothes once per week along with the usual washing at minimum should be adequate precautions. B Greasy contaminated clothing and shoes must be removed not later than the end of the work period and must be thoroughly cleaned before re-use. C Require shower at the end of the work period and clean clothing from the skin out at the start of each work day.	D Clothing should be changed and skin washed promptly upon any detectable contact. Each use will require special consideration to determine suitable protective devices and standards of personal cleanliness. E Impervious clothing such as rubber boots, rubber aprons, and rubber gloves will be required. Specific items will be determined as required by circumstances.
INHALATION — DUST OR MIST	A No respiratory protection. B No protection required for exposure of thirty min. duration or less to obviously dusty atmospheres. Exposures of longer duration will require the use of a dust respirator bearing the approval of the U. S. Bureau of Mines for the use with toxic dusts.	D Any exposure to obviously dusty atmospheres will require a dust respirator bearing the approval of the U. S. Bureau of Mines for use with toxic dusts. E Any exposure to dusty atmospheres will require the use of an airline respirator, blower mask, or Chemes mask.
INHALATION — VAPOR	A No precautions necessary. B No precautions necessary for single exposures of less than 1/2 hour. Longer single exposure, or frequently repeated exposures will require a gas mask or respirator equipped with appropriate canister.	C No precautions necessary for single exposures of no more than ten minutes. Longer exposures either single or repeated, will require gas mask or respirator equipped with appropriate canister. D Gas mask with appropriate canister required at all times. E Evacuate area at once and enter only with airline respirator, blower mask or Chemes mask.
INGESTION	A No unusual procedures required.	E Food and tobacco should not be present in the work area. Hands and face should be washed before smoking and eating.

COMMENTS

**GOOD PRACTICE REQUIRES THAT GROSS AMOUNTS OF ANY CHEMICAL BE REMOVED FROM THE SKIN AS SOON AS IS PRACTICAL

*SUITABLE GAS MASK CANISTER

Organic vapor

NOMED K. J. Olson CHECKED D. D. McCollister

DATE 4-2-57 DATE 6-24-57

FIRST AID MEASURES

EYE CONTACT	[X]	If the eyes are contaminated, they should be flushed immediately with copious amounts of flowing water for at least 15 minutes.
	[X]	Medical attention should be obtained if irritation persists or develops after washing of the eyes.
	[ ]	Medical attention should be obtained.
	[ ]	MEDICAL ATTENTION SHOULD THEN BE OBTAINED WITHOUT DELAY.
SKIN CONTACT	[ ]	Any injuries or irritations which may develop should receive medical attention.
	[ ]	Contaminated clothing and shoes should be removed and not re-used until thoroughly cleaned.
	[ ]	Wash contaminated skin with soap and plenty of water.
	[ ]	Contaminated clothing, including shoes, should be removed and the affected skin area should be washed thoroughly with soap and plenty of water.
	[ ]	Medical attention should then be obtained.
	[ ]	Contaminated clothing and shoes should not be re-used until thoroughly cleaned.
	[X]	All contaminated clothing, including shoes, must be removed immediately and the affected skin area flushed thoroughly with water from a safety shower, or other suitable device and cleansed with soap and plenty of water.
	[X]	MEDICAL ATTENTION MUST THEN BE OBTAINED AS RAPIDLY AS POSSIBLE.
	[ ]	Contaminated clothing including shoes, must not be re-used until thoroughly cleaned or must be discarded.
INHALATION	[X]	If a person should experience any noticeable ill effects from breathing the vapor or fumes of this material, medical attention should be obtained promptly.
	[X]	If a person should be overcome from breathing this material, he should be removed to fresh air at once, be made to rest, kept warm, and MEDICAL ATTENTION SHOULD BE OBTAINED IMMEDIATELY. If breathing stops, artificial respiration should be administered.
INGESTION	[X]	If ~~appreciable~~ very large amounts of material are swallowed, vomiting should be induced by tickling the back of the tongue with the finger or by giving an emetic such as 2 tablespoonfuls of table salt in a glass of warm water. Medical attention should then be obtained.
	[ ]	If the material is swallowed, vomiting must be induced by tickling the back of the tongue with the finger or by giving an emetic such as 2 tablespoonfuls of table salt in a glass of warm water. MEDICAL ATTENTION SHOULD THEN BE OBTAINED WITHOUT DELAY

COMMENTS:

CONCLUSIONS(CONTINUED)

The subject material has a low acute oral toxicity. There should be no problem from ingestion incidental to the handling and industrial use of this substance. If large quantities are swallowed accidentally or willfully, some injury may result. The likelihood of serious injury is remote.

The undiluted material and the 10% solution of butyl glycidyl ether in propylene glycol have a very slight effect on the eye. Transient corneal injury may occur but is expected to heal completely within a few days. Precautions should be taken to prevent contact with the eyes. Safety glasses should provide satisfactory protection.

The undiluted butyl glycidyl ether is rapidly absorbed through the skin. A single exposure to relatively low concentrations may result in absorption of lethal amounts. The 10% solution of the subject material in Dowanol 50B has a very slight effect on intact skin and a moderate effect on abraded skin. Judging from chemical structure this material may very well be a sensitizer to human subjects. Precautions should be taken to prevent skin contact with either the undiluted or strong concentrations. Protective clothing, impermeable to the material, should be worn as required by circumstance.

The subject material may present a definite problem from a single exposure to the vapor or fumes at room temperatures and when the material is heated. The vapors in concentrations

(Continued)

CONCLUSIONS (CONTINUED)

sufficient to cause systemic injury probably are appreciably irritating to the eyes and nose. Vapor concentrations which might well be dangerous to life in a short time, are readily attainable when the material is heated. Precautions must be taken to avoid exposure to the vapors. The material should be handled under a hood or in a well-ventilated area. For cleaning up accidental spills, it is recommended that a full face gas mask equipped with a suitable cannister be used in well-ventilated areas or a self-contained breathing apparatus be used in poorly ventilated areas.

These conclusions are based upon range finding toxicological tests and are limited to precautions for industrial handling of the material. Development of specific uses will require consideration of the health problems presented and of the need for further toxicological studies.

SAMPLE INFORMATION

C. R. I. Name: Propane: 1 butoxy-2,3 epoxy-,

Common Name: Butyl glycidyl ether

Source: Coatings Technical Service

K Number:

Date Request Received: 9-5-56

Date Sample Received: 9-5-56

Physical State: Colorless liquid

Molecular Formula: $C_7H_{14}O_2$

Structural Formula:

SUMMARY OF RANGE FINDING TOXICOLOGICAL DATA

Acute Oral Toxicity

Animal	Prep. Fed	Dose (g./kg.)	No.Died No.Fed	Response-Remarks
Rat	20% solution in corn oil	2.0	2/2	One animal died within 2 hours, the second died within 12 hours after administration.
Rat	20% solution in corn oil	1.0	0/2	Slight lung and liver damage, marked degeneration of kidney at autopsy.

Eye Contact - Rabbit

Material	Treatment	Response-Remarks
Undiluted	Washed and unwashed	Slight immediate pain and conjunctival irritation, slight corneal injury. Completely healed in 48 hours.
10% solution in propylene glycol	Washed and unwashed	Slight to moderate conjunctival irritation, and corneal damage. Essentially normal in 48 hours.

Skin Contact - Rabbit

Material	Condition of Skin	No. of Appl.	Site	Response-Remarks
Undiluted	Intact and abraded	1	Ear and Belly	Animal died over night.
10% solution in Dowanol 50B	Intact	10	Ear	No irritation observed.
10% solution in Dowanol 50B	Intact	10	Belly	Slight hyperemia, slight to moderate edema, moderate exfoliation, essentially normal after last application.
10% solution in Dowanol 50B	Abraded	3	Belly	Moderate hyperemia, edema and necrosis, resulting in a wet, raw, green ulcerated sore. Healing incomplete leaving a moderate scab. A moderate scar expected.

Skin Absorption - Rabbit

Prep. Applied	Dose (g./kg.)	No.Died / No.Treated	Response-Remarks
50% solution in Dowanol 50B	1	2/2	Animals died overnight.
50% solution in Dowanol 50B	0.5	0/2	Moderate hyperemia, edema and necrosis over area where material contacted the skin.

Inhalation (Saturated Atmosphere)

Animal	Bath Temp.	Hours Exposed	No.Died / No.Treated	Response-Remarks
Rat	100°C Est. conc. 5200 ppm.	2	0/3	Eye irritation after 15 minutes of exposure. All animals drowsy at end of exposure. Manifested dyspnea.
Rat	100°C	4	1/3	Slight eye and nasal irritation shortly after beginning of exposure. Animals drowsy and had difficulty in breathing at end of exposure. Moderate lung and liver damage, slight kidney necrosis at autopsy.
Rat	Room	4	0/3	Slight eye and nasal irritation.
Rat	Room Est. conc. 2300 ppm.	7	1/3	Slight eye and nasal irritation at end of exposure. Animals drowsy and do not respond well to stimuli. The one animal died 7 days after exposure, indicating the delayed effects of the vapor.

INDEX HEADINGS

C. R. I. Name: Propane: 1-butoxy-2,3-epoxy-.

Common Name: Butyl glycidyl ether