

**CODING FORMS FOR SRC INDEXING**

<b>Microfiche No.</b>	CTS0001105		
<b>New Doc ID</b>	FYI-JTS-0794-1105	<b>Old Doc ID</b>	
<b>Date Produced</b>	01/11/84	<b>Date Received</b>	07/14/94
		<b>TSCA Section</b>	FYI
<b>Submitting Organization</b>	GREAT LAKES CHEM CORP		
<b>Contractor</b>			
<b>Document Title</b>	INITIAL SUBMISSION: LETTER FROM GREAT LAKES CHEM TO USEPA RE: TETRABROMOBISPHENOL A, PENTABROMOETHYLBENZENE, DECABROMODIPHENYL ETHER & DIBROMOPROPYL ACRYLATE W/ATTACHMENTS DATED 011184		
<b>Chemical Category</b>	TETRABROMOBISPHENOL A		





**Great Lakes**  
Chemical Corporation

→ *Will Ferry*  
**Contains No CBI #012487(4)**

**FYI-0794-00/105**

P. O. BOX 2200 · HIGHWAY 52 N. W. · WEST LAFAYETTE, INDIANA 47906 · PHONE: 317-463-2511 · TELEX: 27-9428 · CABLE: GLACHEM LAFAYETTE



FY-94-001105  
INIT 87/14/94

January 11, 1984

79-94-7 IR-405  
85-22-3 IR-409A  
1163-19-5 IR-443  
19660-16-3 IR-452

Mr. Martin Greif, Executive Secretary  
TSCA Interagency Testing Committee  
Environmental Protection Agency (TS-792)  
401 M Street  
Washington, DC 20460



84940000188

Dear Mr. Greif,

Enclosed is information on tetrabromobisphenol A (CAS No. 79-94-7), pentabromoethylbenzene (CAS No. 85-22-3), decabromodiphenyl ether (CAS No. 1163-19-5), and dibromopropyl acrylate (CAS No. 19660-16-3). Dibromopropyl acrylate is not currently a commercial product of Great Lakes; it has in the past been a developmental product and may again be. Pentabromomethylbenzene (CAS No. 87-83-2) is not manufactured by Great Lakes at this time and no information is presently available. The information consists of material safety data sheets, product information bulletins, and toxicity data sheets. The toxicity data sheets summarize proprietary studies performed for Great Lakes on the compounds.

The flame retardant products identified above are produced by Great Lakes in closed systems and packaged and shipped under conditions which result in negligible environmental dispersion. Only small numbers of employees are utilized in these operations. To the best of our knowledge similar restrictions exist as the products are formulated and used by our customers. After incorporation into polymer systems product exposures are further reduced and result, we believe, in insignificant opportunities for user contamination. In combination with the relatively low toxicities of these products we believe that hazards to humans and to the environment are vanishingly small.

Sincerely,

GREAT LAKES CHEMICAL CORPORATION

*Dennis L. McFadden*

Dennis L. McFadden  
Product Safety Coordinator

DLMcF/cs  
Enclosure

RECEIVED  
OPPT/CBIC  
JAN 11 1984  
3:27

# Product Information

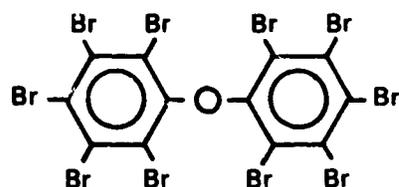


# Flame Retardant Chemicals

Effective: July 1, 1982  
Supersedes: May 20, 1977

## GREAT LAKES DE-83™

DE-83, DECABROMODIPHENYL OXIDE, is a technical grade fully brominated aromatic based general purpose flame retardant.



DECABROMODIPHENYL OXIDE

### APPLICATIONS

DE-83 is recommended as an additive flame retardant in thermoplastics, elastomeric and thermoset polymer systems where very high thermal stability is not a performance criteria. The economics of the DE-83 technical grade of decabromodiphenyl oxide make it an excellent flame retardant for those specific applications as well as coatings in adhesive systems. For specific formulation data refer to the product use bulletins.

### PHYSICAL PROPERTIES

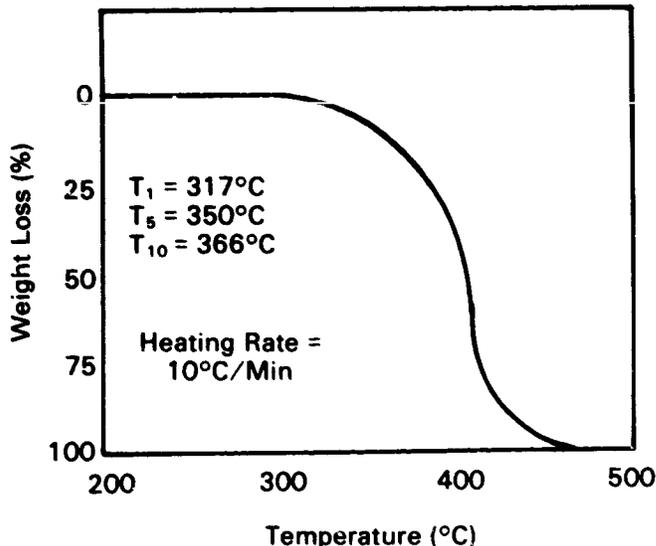
See price information bulletin for specifications.

Formula Weight:	959.2
Appearance:	off white/ cream colored powder
Melting Range:	295-310°C
Assay, Decabromodiphenyl Oxide VPC area:	97%
Organic Bromine Content (Theoretical)	83.3%
Specific Gravity:	3.2
Particle Size, average by Coulter Counter	3.2 microns
Inorganic Bromine	100-200 ppm

### Solubility at 25°C (g/100g solvent)

Water	0.1		
Methanol	0.1		
Methylene Chloride	0.1		
Toluene	0.2	Acetone	0.1
MethylEthyl Ketone	0.1	Styrene	0.1
Pentane	0.1	Benzene	0.1

Thermogravimetric Analysis (TGA)



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P.O. Box 2200, Highway 52 N.W., West Lafayette, Indiana 47906

Phone: 317/463-2511, Telex: 27-9428, Cable: GLAKCHEM Lafayette



## **TOXICOLOGICAL INFORMATION**

The potential of DE-83 for eye injury or intoxication by ingestion, eye, or skin contact is believed to be low. The oral LD<sub>50</sub> value for rats has been found to be greater than 5000 mg/kg of body weight. Dermal LD<sub>50</sub> is greater than 2000 mg/kg of body weight.

Repeated inhalation of dusts could be hazardous and should be avoided. The LC<sub>50</sub> of DE-83 is greater than 50 mg/liter.

DE-83 is not mutagenic in a series of bioassays employing salmonella and saccharomyces indicator organisms both directly and indirectly with liver activation.

A complete summary of toxicological data is available upon request.

## **HANDLING PRECAUTIONS**

The following are general precautionary measures which should be followed for decabromodiphenyl oxide. Excessive exposure to the product should be avoided or prevented by the use of appropriate personal protective equipment. The use of safety glasses with side shields, rubber gloves, and dust respirator is recommended. Suitable ventilation in the work place is recommended as a standard practice. Contaminated clothing should be washed before reuse.

DE-83 is not hazardous under the Federal Hazardous Substance Act and is not a hazardous waste under the Resource Conservation and Recovery Act.

## **FIRST AID RECOMMENDATIONS**

1. For eye exposure to DE-83, flush for several minutes with fresh water. If ill effects persist get medical attention.
2. For skin exposure, wash with soap and water repeating the process a number of times until traces of product are removed.
3. For excess exposure to dust if breathing difficulties occur, remove person to fresh air and obtain medical attention.
4. If large amounts of DE-83 are swallowed, induce vomiting and seek medical attention.

# TOXICITY DATA

10000 • MONROE DRIVE • WEST LAFAYETTE, INDIANA 47906 • PHONE: 317 463-2311 • TELEX: 27-9425 • CABLE: OILKCHEM LAFAYETTE

## DECABROMODIPHENYL OXIDE

### SUMMARY OF TOXICITY DATA

Acute Oral. Groups of five male Spartan rats were fasted overnight and then dosed with 50, 500, or 5,000 mg./kg. of decabromodiphenyl oxide. The compound was administered by intubation employing suspensions in corn oil at concentrations permitting a total dose of 10 ml./kg. at all dose levels. The rats were subsequently observed for 14 days and their body weight gains noted. None of the rats died and all exhibited normal weight gains during the observation period. These test results indicate that decabromodiphenyl oxide is not a toxic compound by the oral route of administration.

Acute Dermal. Decabromodiphenyl oxide was applied to the closely clipped intact skin of two male and two female New Zealand white rabbits each at dosage levels of 200 or 2,000 mg./kg. The application site was wrapped in gauze and occluded with a plastic covering for 24 hours after which wrappings were removed and the rabbits' backs were washed with tepid water. The rabbits were then observed for a 14 day period. Body weights were measured initially and at the end of the 14 day period. No rabbits died during the test period. All rabbits at the 2,000 mg./kg. dose level and one rabbit at the 200 mg./kg. exhibited body weight gains during the period. Three rabbits at the 200 mg./kg. dose level exhibited body weight losses ranging from ~2-10% during the period. These test results indicate that decabromodiphenyl oxide is not a toxic material by the dermal route of administration.

Primary Skin Irritation. Three male and three female New Zealand white rabbits were used in this study. Decabromodiphenyl oxide (500 mg.) was applied to the closely clipped intact skin of three rabbits and to the closely clipped abraded skin of three. The areas of application were wrapped in gauze and occluded with plastic for 24 hours after which wrappings were removed and the rabbits' backs were washed with tepid water and were examined for skin irritation. The examinations were repeated at 72 hours. No evidence of irritation, erythema or edema, was noted for any rabbit, at any dose level, at any observation time. These test results indicate that decabromodiphenyl oxide is not a primary skin irritant.

Acute Inhalation. Groups of 10 male and 10 female Spartan rats were exposed for 1 hour to concentrations of decabromodiphenyl oxide of 2 or 46.2 mg./l. in air and subsequently observed for 14 days. All rats survived the observation period. At the 2 mg./l. dose level salivation was noted in two rats during the exposure period. At 24 hours after

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dosage and for the remainder of the observation period all rats of this group appeared normal except for one which showed respiratory difficulty, marked to slight, on days three through eight, and one which showed ocular porphyrin discharge on days 9 through 12. At the 48.2 mg./l. dose level eye squint and increased motor activity were noted during the exposure period. Decreased motor activity was noted in the group through day four. Respiratory difficulties were noted in two rats at days three to six and in one rat each on days seven and eight. A few rats showed eye squint and ocular porphyrin discharge on days 7 through 12. All rats were normal on days 13 and 14. These test results indicate that decabromodiphenyl oxide is not a highly toxic substance by the inhalation route of administration.

Acute Eye Irritation. Single applications of 100 mg. of finely ground decabromodiphenyl oxide were made into the conjunctival sacs of the left eyes of three male and three female New Zealand white rabbits. Examinations were made for ocular irritation at 24, 48, and 72 hours and at seven days; sodium fluorescein and ultraviolet light were used at the 72 hour examination to assess possible corneal injury. Irritative findings were scored according to the method of Draize. None of the rabbits showed injury to the cornea or iris. Several of the rabbits showed very slight conjunctival irritation, redness and chemosis, in the early days of the test period, a very slight chemosis persisted in one rabbit through day seven. These test results indicate that decabromodiphenyl oxide is not an eye irritant.

Twenty-eight Day Feeding. Substantially equivalent samples of decabromodiphenyl oxide have been examined in three separate 28-day feeding studies. In all studies 10 male and 10 female Charles River CD rats were used in each treatment and each control group. Doses in all studies were at 100 and 1000 ppm in the rats' diets. The rats were observed daily for changes in behavior and appearance. Body weights and sex group feed consumptions were recorded weekly. At the conclusion of the 28-day feeding period all rats were sacrificed for gross pathological examination and histopathological examination of liver, kidney and thyroid tissues. Liver or liver and fat tissues were analyzed for bromide content after pooling by sex and dose rate.

In none of the tests did rats die, nor were there changes noted in behavior or appearance of any of the rats during the feeding period. Feed consumption and body weight gains were similar for all controls and for all treatment groups. No compound related gross lesions or microscopic lesions were observed in any of the groups. In two of the three studies no significant variations were observed between organ weights of control and treatment groups. In the third study statistically significant increases were noted in female rats at the 100 ppm dietary level for group mean relative liver and adrenal gland and absolute kidney weights. Such differences were not observed in rats at the 1000 ppm dose level in this study thus casting doubt on the biological significance of the findings at the lower dose rate. In one of the tests in which only liver tissues were analyzed for bromide content the levels found in the 100 ppm dose groups were comparable to the controls; in the 1000 ppm dose groups the bromide levels were slightly increased. In the remaining

## Decabromodiphenyl Oxide

Two studies in which liver and fat tissues were analyzed for bromide content. All treatment groups showed slightly increased bromide levels; female rats in one of these studies showed slightly increased bromide levels as compared to males.

**Mutagenicity:** Decabromodiphenyl oxide was examined for mutagenic activity at a number of concentrations in a series of *in vitro* microbial assays employing *Salmonella* and *Saccharomyces* indicator organisms both directly and in the presence of liver microsomal enzyme preparations from Arochlor-induced rats. The results of the tests whether in the presence or absence of the rat liver activation system were all negative. Decabromodiphenyl oxide was judged not mutagenic under these test conditions.

### LITERATURE DATA

Kociba, R. J., et al., *JFP/Combustion Toxicology*, 2, 267-285 (1975)  
"Results of a Two-Year Dietary Feeding Study with Decabromodiphenyl Oxide (DBDPO) in Rats"

"ABSTRACT: A 2-year toxicity study with decabromodiphenyl oxide (DBDPO) is described. Rats ingesting 1.0, 0.1 or 0.01 mg. DBDPO/kg./day for up to 2 years had no discernible alterations in appearance, demeanor, body weight, food consumption, hematology, urinalyses, clinical chemistry, organ weights, tumor formation or tissues subjected to pathologic examination. Neutron activation analysis was used to monitor the possible buildup of bromine content in tissues. Serum, muscle and kidney showed no increase in bromine content. In liver, low level steady state conditions were attained by 12 months. Adipose tissue showed a time- and dose-related increase in bromine content subsequent to ingestion of 1.0 or 0.1 mg DBDPO/kg./day. Bromine content of adipose tissue of rats ingesting 0.01 mg. DBDPO/kg./day for 2 years was 2.8±0.9 ppm as compared to a control value of 2.0±0.2 ppm. Despite the accumulation of bromine in adipose tissue of rats ingesting up to 1.0 mg. DBDPO/kg./day for 2 years, this study revealed no discernible toxicologic effects."

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Morris, T. M., et al., *JFP/Combustion Toxicology*, 1, 52-77 (1974)  
"Toxicological and Environmental Factors Involved in the Selection of Decabromodiphenyl Oxide as a Flame Retardant Chemical"

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This paper describes extensive work done on the chemical and physical properties, the toxicology, and the assessment of potential environmental effects of decabromodiphenyl oxide. The conclusion stated by the investigators as a result of these studies is as follows: "Based on the data available at this time, DBDPO (decabromodiphenyl oxide) appears to be both environmentally and toxicologically safe for use as a flame retardant additive in thermoplastics."

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For further details of the studies described above contact L. E. Holladay, Product Safety Coordinator, at the address above.

LEH/jal  
5/5/77



### SECTION V - HEALTH HAZARD DATA (cont.)

#### EFFECTS OF OVEREXPOSURE

Potential for eye injury or intoxication by ingestion, eye or skin contact believed low. Repeated inhalation of dusts may be hazardous and should be avoided.

#### EMERGENCY AND FIRST AID PROCEDURES

For eye or skin exposure, wash with large amounts of water - for eyes get medical attention. Remove contaminated clothing and wash before reuse. If large amounts swallowed, induce vomiting promptly and seek medical attention. If ill effects occur from inhalation, remove patient to fresh air and get medical attention.

### SECTION VI - REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID Combustion may result in the liberation of hydrogen bromide or other toxic gases.
	STABLE	X	
INCOMPATIBILITY Under combustion conditions may release hydrogen bromide and/or other toxic vapors.			
HAZARDOUS DECOMPOSITION PRODUCTS			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

### SECTION VII - SPILL OR LEAK PROCEDURES

#### STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Collect in containers for disposal. Use approved dust respirator, rubber gloves, safety glasses with side shields.

#### WASTE DISPOSAL METHOD

Dispose of in accord with local regulations for relatively non-toxic organics. Avoid conditions which may result in dispersion to streams or waterways.

### SECTION VIII - SPECIAL PROTECTION INFORMATION

#### RESPIRATORY PROTECTION

Not normally required; if dust generation occurs use approved dust respirator.

VENTILATION	LOCAL EXHAUST in case of dusting	SPECIAL
	MECHANICAL	OTHER

#### PROTECTIVE GLOVES

Desirable if skin contact likely

#### EYE PROTECTION

Use safety glasses

#### OTHER PROTECTIVE EQUIPMENT

Wear clean, body-covering clothing

### SECTION IX - SPECIAL PRECAUTIONS

#### PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE

Use reasonable care to avoid skin and eye contact. Avoid breathing dusts. Wash contaminated clothing before reuse.

Store in dry, well-ventilated area.

#### OTHER PRECAUTIONS

The information supplied above is intended to give faith and that data derived from sources believed to be reliable. However, no warranty, express or implied is extended regarding the accuracy of the results or the material herein. Study conditions of use and observe all safety instructions which are furnished by the user.

# Product Information

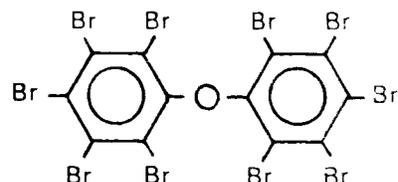


# Flame Retardant Chemicals

July 1, 1982  
Effective: May 20, 1977  
Supersedes:

## GREAT LAKES DE-83™

DE-83, DECABROMODIPHENYL OXIDE, is a technical grade fully brominated aromatic based general purpose flame retardant.



DECABROMODIPHENYL OXIDE

### APPLICATIONS

DE-83 is recommended as an additive flame retardant in thermoplastics, elastomeric and thermoset polymer systems where very high thermal stability is not a performance criteria. The economics of the DE-83 technical grade of decabromodiphenyl oxide make it an excellent flame retardant for those specific applications as well as coatings in adhesive systems. For specific formulation data refer to the product use bulletins.

### PHYSICAL PROPERTIES

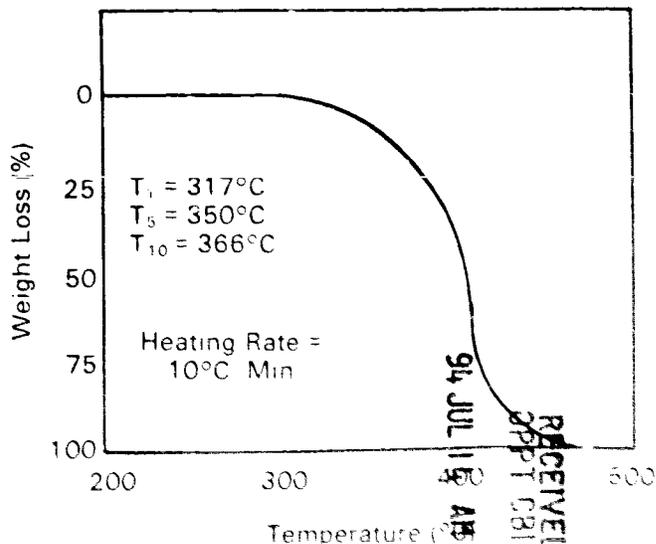
See price information bulletin for specifications.

Formula Weight:	959.2
Appearance:	off white/ cream colored powder
Melting Range:	295-310°C
Assay, Decabromodiphenyl Oxide VPC area:	97%
Organic Bromine Content (Theoretical)	83.3%
Specific Gravity:	3.2
Particle Size, average by Coulter Counter	3.2 microns
Inorganic Bromine	100-200 ppm

Solubility at 25°C (g/100g solvent)

Water	0.1	Acetone	0.1
Methanol	0.1	Styrene	0.1
Methylene Chloride	0.1	Benzene	0.1
Toluene	0.2		
MethylEthyl Ketone	0.1		
Pentane	0.1		

Thermogravimetric Analysis (TGA)



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P.O. Box 2200, Highway 52 N.W., West Lafayette, Indiana 47906

Phone: 317-463-2511, Telex: 27-9428, Cable: GLACHEM Lafayette



## TOXICOLOGICAL INFORMATION

The potential of DE-83 for eye injury or intoxication by ingestion, eye, or skin contact is believed to be low. The oral LD<sub>50</sub> value for rats has been found to be greater than 5000 mg/kg of body weight. Dermal LD<sub>50</sub> is greater than 2000 mg/kg of body weight.

Repeated inhalation of dusts could be hazardous and should be avoided. The LC<sub>50</sub> of DE-83 is greater than 50 mg/liter.

DE-83 is not mutagenic in a series of bioassays employing salmonella and saccharomyces indicator organisms both directly and indirectly with liver activation.

A complete summary of toxicological data is available upon request.

## HANDLING PRECAUTIONS

The following are general precautionary measures which should be followed for decabromodiphenyl oxide. Excessive exposure to the product should be avoided or prevented by the use of appropriate personal protective equipment. The use of safety glasses with side shields, rubber gloves, and dust respirator is recommended. Suitable ventilation in the work place is recommended as a standard practice. Contaminated clothing should be washed before reuse.

DE-83 is not hazardous under the Federal Hazardous Substance Act and is not a hazardous waste under the Resource Conservation and Recovery Act.

## FIRST AID RECOMMENDATIONS

1. For eye exposure to DE-83, flush for several minutes with fresh water. If ill effects persist, get medical attention.
2. For skin exposure, wash with soap and water repeating the process a number of times until traces of product are removed.
3. For excess exposure to dust if breathing difficulties occur, remove person to fresh air and obtain medical attention.
4. If large amounts of DE-83 are swallowed, induce vomiting and seek medical attention.



# MATERIAL SAFETY DATA SHEET

EMERGENCY TELEPHONE (501) 862-5141

IDENTITY - Great Lakes DE-83R and Great Lakes DE-83

=====

SECTION I - PRODUCT INFORMATION

MANUFACTURER'S NAME - GREAT LAKES CHEMICAL CORPORATION

TELEPHONE NUMBER FOR INFORMATION - (317) 463-2511

CAS REGISTRY NO. - 1163-19-5;  
68928-79-0;  
32536-52-0

DATE PREPARED - 6/86

FORMULA - C<sub>12</sub>Br<sub>10</sub>O

SUPERCEDES - 11/85

CHEMICAL FAMILY - Brominated diphenyl ether

PREPARED BY - Research Services Department  
Great Lakes Chemical Corporation  
West Lafayette, Indiana 47906

=====

SECTION II

HAZARDOUS COMPONENTS (Specify Chemical Identity Common Name(s))

<u>COMPONENT</u>	<u>OSHA PEL</u>	<u>ACGIH TLV</u>	<u>Other Limits Recommended</u>	<u>% (optional)</u>
Decabromodiphenyl oxide	15 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>	5 mg/m <sup>3</sup> (Lit.)	> 98
Nonabromodiphenyl oxide				< 2
Octabromodiphenyl oxide				< 0.1
(Nuisance dust levels)				

GLCC Product Code: 470, 480

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**SECTION III - PHYSICAL/CHEMICAL CHARACTERISTICS**

Boiling Point	Not available
Specific Gravity (water=1)	Approx. 3.2
Vapor Pressure (mm Hg.)	Not available
Melting Point	Not available
Vapor Density (AIR=1)	Not available
Evaporation Rate (Butyl Acetate = 1)	Not available
Solubility in Water	Negligible
Appearance and Odor	Off-white to cream - colored powder

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**SECTION IV - FIRE AND EXPLOSION HAZARD DATA**

Flash Point (Method Used)	Not applicable
Flammable Limits	N/A
LEL	N/A
UEL	N/A
Extinguishing Media	All conventional media are suitable
Special Fire Fighting Procedures	Wear self-contained breathing apparatus

**Unusual Fire and Explosion Hazards:**

Combustion in the presence of other fuels may result in the release of hydrogen bromide and/or bromine.

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**SECTION V - REACTIVITY DATA**

<u>Stability</u>	Unstable <u>    </u>	Conditions to Avoid: None
	Stable <u>  x  </u>	

0015

Eye Protection - Safety glasses

Other Protective Equipment - Wear clean, body covering clothing

Work/Hygienic Practices - Wash thoroughly after handling. Wash contaminated clothing before reuse.

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Information on this form is furnished solely for the purpose of compliance with OSHA's Hazard Communication Standard, 29CFR 1910.1200 and shall not be used for any other purpose.

DLMcF/db:13

Incompatibility (Materials to Avoid)

None known

Hazardous Decomposition or Byproducts

Hydrogen bromide and/or bromine

Hazardous Polymerization

May Occur  Will Not Occur

Conditions to Avoid: None

SECTION VI - HEALTH HAZARD DATA

Route(s) of Entry:

Inhalation? yes Skin? no Ingestion? yes

Health Hazards (Acute and Chronic):

Acute oral LD<sub>50</sub> for rats is greater than 5000 mg/kg. The acute dermal LD<sub>50</sub> for rabbits is greater than 2000 mg/kg and the inhalation LC<sub>50</sub> in rats is greater than 50 mg/L. In a 30-day study in rats at high feeding levels decabromodiphenyl oxide was found to cause hepatotoxicity and thyroid effects. In a 2-year feeding study at .01, .1 and 1 mg/kg levels, no hepatotoxicity or thyroid effects were reported. In a 2-year feeding study with rats at levels of 50,000 and 25,000 ppm in feed (approx. 2,000 and 1,000 mg per day) benign neoplastic nodules of the liver were observed in a dose-related manner. Chronic overexposure may result in liver effects.

Carcinogenicity:

NTP? no IARC Monographs? no OSHA Regulated? no

NTP final report issued, not listed in NTP Annual Report.

Signs and Symptoms of Exposure

No known signs or symptoms of exposure

Medical Conditions Generally Aggravated by Exposure

None reported

Emergency and First Aid Procedures

Eyes: Flush with water for 15 minutes. Get medical attention. Skin: Flush with water then wash with soap and water. Remove contaminated clothing and wash before reuse. Ingestion: If large amounts are swallowed, induce vomiting and get medical attention. Inhalation: Remove person to fresh air and get medical attention.

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SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE

Steps To Be Taken in Case Material is Released or Spilled

Collect in labelled containers for disposal. Use protective equipment.

Waste Disposal Method

Dispose of waste in an approved chemical incinerator or in a chemical landfill as approved by current laws and regulations.

Precautions to be Taken in Handling and Storing

Use reasonable care to avoid skin and eye contact. Avoid breathing dusts. Store in dry, well-ventilated area.

Other Precautions

None

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SECTION VIII - CONTROL MEASURES

Respiratory Protection

Wear NIOSH approved dust respirator where dusting occurs

Ventilation

Local Exhaust - Use to minimize dusting below TLV

Special - None

Mechanical - Use for general area control

Other - None

Protective Gloves - Desirable if skin contact likely



# TOXICITY DATA

P.O. BOX 2200 • HIGHWAY 52 N.W. • WEST LAFAYETTE, INDIANA 47906 • PHONE: 317-483-2611 • TELEX: 27-9422 • CABLE: GLAKCHEM LAFAYETTE

## DECABROMODIPHENYL OXIDE

### SUMMARIES OF TOXICITY DATA

Acute Oral. Groups of five male Spartan rats were fasted overnight and then dosed with 50, 500, or 5,000 mg./kg. of decabromodiphenyl oxide. The compound was administered by intubation employing suspensions in corn oil at concentrations permitting a total dose of 10 ml./kg. at all dose levels. The rats were subsequently observed for 14 days and their body weight gains noted. None of the rats died and all exhibited normal weight gains during the observation period. These test results indicate that decabromodiphenyl oxide is not a toxic compound by the oral route of administration.

Acute Dermal. Decabromodiphenyl oxide was applied to the closely clipped intact skin of two male and two female New Zealand white rabbits each at dosage levels of 200 or 2,000 mg./kg. The application site was wrapped in gauze and occluded with a plastic covering for 24 hours after which wrappings were removed and the rabbits' backs were washed with tepid water. The rabbits were then observed for a 14 day period. Body weights were measured initially and at the end of the 14 day period. No rabbits died during the test period. All rabbits at the 2,000 mg./kg. dose level and one rabbit at the 200 mg./kg. exhibited body weight gains during the period. Three rabbits at the 200 mg./kg. dose level exhibited body weight losses ranging from 2-10% during the period. These test results indicate that decabromodiphenyl oxide is not a toxic material by the dermal route of administration.

Primary Skin Irritation. Three male and three female New Zealand white rabbits were used in this study. Decabromodiphenyl oxide (500 mg.) was applied to the closely clipped intact skin of three rabbits and to the closely clipped abraded skin of three. The areas of application were wrapped in gauze and occluded with plastic for 24 hours after which wrappings were removed and the rabbits' backs were washed with tepid water and were examined for skin irritation. The examinations were repeated at 72 hours. No evidence of irritation, erythema or edema, was noted for any rabbit, at any level, or at any observation time. These test results indicate that decabromodiphenyl oxide is not a primary skin irritant.

The information supplied above is given in good faith and has been derived from sources believed to be reliable. No warranty, express or implied, is extended regarding accuracy or the results to be obtained from its use. Since methods and procedures are subject to change, the user should refer to the latest edition of the product literature for the most current information.

**Acute Inhalation.** Groups of 10 male and 10 female Spartan rats were exposed for 1 hour to concentrations of decabromodiphenyl oxide of 2 or 48.1 mg/L. in air and subsequently observed for 14 days. All rats survived the observation period. At the 2 mg/L. dose level salivation was noted in two rats during the exposure period. At 24 hours after dosing and for the remainder of the observation period all rats of this group appeared normal except for one which showed respiratory difficulty, marked to slight, on days three through eight, and one which showed ocular porphyrin discharge on days 9 through 12. At the 48.1 mg/L. dose level eye squint and increased motor activity were noted during the exposure period. Decreased motor activity was noted in the group through day four. Respiratory difficulties were noted in two rats at days three to six and in one rat each on days seven and eight. A few rats showed eye squint and ocular porphyrin discharge on days 7 through 12. All rats were normal on days 13 and 14. These test results indicate that decabromodiphenyl oxide is not a highly toxic substance by the inhalation route of administration.

**Acute Eye Irritation.** Single applications of 100 mg. of finely ground decabromodiphenyl oxide were made into the conjunctival sacs of the left eyes of three male and three female New Zealand white rabbits. Examinations were made for ocular irritation at 24, 48, and 72 hours and at seven days; sodium fluorescein and ultraviolet light were used at the 72 hour examination to assess possible corneal injury. Irritative findings were scored according to the method of Draize. None of the rabbits showed injury to the cornea or iris. Several of the rabbits showed very slight conjunctival irritation, redness and chemosis, in the early days of the test period, a very slight chemosis persisted in one rabbit through day seven. These test results indicate that decabromodiphenyl oxide is not an eye irritant.

**Twenty-eight Day Feeding.** Substantially equivalent samples of decabromodiphenyl oxide have been examined in three separate 28-day feeding studies. In all studies 10 male and 10 female Charles River CD rats were used in each treatment and each control group. Doses in all studies were at 100 and 1000 ppm in the rats' diets. The rats were observed daily for changes in behavior and appearance. Body weights and sex group feed consumptions were recorded weekly. At the conclusion of the 28-day feeding period all rats were sacrificed for gross pathological examination and histopathological examination of liver, kidney and thyroid tissues. Liver or liver and fat tissues were analyzed for bromide content after pooling by sex and dose rate.

In none of the tests did rats die, nor were there changes noted in behavior or appearance of any of the rats during the feeding period. Feed consumption and body weight gains were similar for all controls and for all treatment groups. No compound related gross lesions or microscopic lesions were observed in any of the groups. In two of the three studies no significant variations were observed between organ weights of control and treatment groups. In the third study

statistically significant increases were noted in female rats at the 100 ppm dietary level for group mean relative liver and adrenal gland and absolute kidney weights. Such differences were not observed in rats at the 1000 ppm dose level in this study thus casting doubt on the biological significance of the findings at the lower dose rate. In one of the tests in which only liver tissues were analyzed for bromide content the levels found in the 100 ppm dose groups were comparable to the controls; in the 1000 ppm dose groups the bromide levels were slightly increased. In the remaining two studies in which liver and fat tissues were analyzed for bromide content all treatment groups showed slightly increased bromide levels; female rats in one of these studies showed slightly increased bromide levels as compared to males.

Mutagenicity. Decabromodiphenyl oxide was examined for mutagenic activity at a number of concentrations in a series of in vitro microbial assays employing Salmonella and Saccharomyces indicator organisms both directly and in the presence of liver microsomal enzyme preparations from Arochlor-induced rats. The results of the tests whether in the presence or absence of the rat liver activation system were all negative. Decabromodiphenyl oxide was judged not mutagenic under these test conditions.

LITERATURE DATA

Kociba, R. J., et al., JFF/Combustion Toxicology, 2, 267-285 (1975)  
 "Results of a Two-Year Dietary Feeding Study with Decabromodiphenyl Oxide (DBDPO) in Rats"

"ABSTRACT": A 2-year toxicity study with decabromodiphenyl oxide (DBDPO) is described. Rats ingesting 1.0, 0.1 or 0.01 mg. DBDPO/kg./day for up to 2 years had no discernible alterations in appearance, demeanor, body weight, food consumption, hematology, urinalyses, clinical chemistry, organ weights, tumor formation or tissues subjected to pathologic examination. Neutron activation analysis was used to monitor the possible buildup of bromine content in tissues. Serum, muscle and kidney showed no increase in bromine content. In liver, low level steady state conditions were attained by 12 months. Adipose tissue showed a time- and dose-related increase in bromine content subsequent to ingestion of 1.0 or 0.1 mg DBDPO/kg./day. Bromine content of adipose tissue of rats ingesting 0.01 mg. DBDPO/kg./day for 2 years was 2.8±0.9 ppm as compared to a control value of 2.0±0.2 ppm. Despite the accumulation of bromine in adipose tissue of rats ingesting up to 1.0 mg. DBDPO/kg./day for 2 years, this study revealed no discernible toxicologic effects."

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Deakin, F. W., et al., *JVT/Combustion Toxicology*, 1, 52-77 (1974)  
"Toxicological and Environmental Factors Involved in the Selection of Decabromodiphenyl Oxide as a Flame Retardant Chemical".

This paper describes extensive work done on the chemical and physical properties, the toxicology, and the assessment of potential environmental effects of decabromodiphenyl oxide. The conclusion stated by the investigators as a result of these studies is as follows: "Based on the data available at this time, DBDPO (decabromodiphenyl oxide) appears to be both environmentally and toxicologically safe for use as a flame retardant additive in thermoplastics."

NTP Technical Report on the Toxicology and Carcinogenesis Studies of Decabromodiphenyl Oxide in F344/N Rats and B6C3F<sub>1</sub> Mice, (May, 1986, NTP TR 309.

"Abstract: Toxicology and carcinogenesis studies of decabromodiphenyl oxide, a flame retardant for plastics and other materials, were conducted by exposing groups of 50 male and 50 female F344/N rats and B6C3F<sub>1</sub> mice at 0, 25,000, and 50,000 ppm in the diet for 103 weeks. These concentrations were selected because no toxicity was observed at any dose in the 14-day or 13-week studies and 50,000 ppm chemical in the diet is considered to be the highest dose to which rats and mice can be exposed for extended periods of time without reducing the nutritional value of the diet. No compound-related gross or microscopic pathologic effects were observed in the 14-day or 13-week studies.

Body weights of dosed male and female rats and mice in the 2-year studies were comparable to those of the controls. Decreased survival of low dose male rats was not believed to be compound related. No other effects on survival were observed in the 2-year studies. Loss of control male mice (presumably due to fighting) was significant during the first part of the study.

In the 2-year studies, nonneoplastic lesions were observed at increased incidences in rats and mice of each sex. Thrombosis and degeneration of the liver, fibrosis of the spleen, and lymphoid hyperplasia were observed in high dose male rats. Degeneration of the eye was observed in low dose female rats. Nonneoplastic lesions observed in dosed mice were granulomas in the liver of low dose males and hypertrophy in the liver of low dose and high dose males. Follicular cell hyperplasia was observed in thyroid glands of dosed male mice (control, 2/50; low dose, 10/50; high dose, 19/50).

The incidences of neoplastic nodules in the liver of low and high dose male rats (1/50; 7/50; 15/49) and high dose female rats (1/50; 3/49; 9/50) were significantly greater than those in the controls. Mononuclear cell leukemia occurred in dosed male rats with a positive trend (30/50; 33/50; 35/50); this marginal increase was not considered biologically significant. Acinar cell adenomas were observed in the pancreas of four high dose male rats, and a sarcoma was observed in the spleen of one low dose and one high dose male rat. Hepatocellular adenomas or carcinomas (combined) occurred at marginally increased incidences in dosed male mice (8/50; 22/50; 18/50). The incidences of thyroid gland follicular cell adenomas or carcinomas (combined) were increased in dosed male mice (0/50; 4/50; 3/50).

A study of decabromodiphenyl oxide absorption from the gastrointestinal tract indicated that absorption was minimal, possibly less than 1%, at the doses administered in the 2-year studies. Additional chemical analysis indicated that the decabromodiphenyl oxide used in these studies contained several less brominated diphenyl oxides. Therefore, since absorption and toxicity of minor impurities are unknown, effects observed in these studies must be attributed to the approximately 95% pure preparation used rather than to pure decabromodiphenyl oxide.

Decabromodiphenyl oxide was not mutagenic in strains TA1535 TA1537, TA98, or TA100 of Salmonella typhimurium in the presence or absence of Aroclor 1254-induced Sprague-Dawley male rat or Syrian male hamster liver S9 when tested according to the preincubation protocol. Decabromodiphenyl oxide was not mutagenic in the mouse lymphoma L5178Y/TK<sup>+</sup> assay in the presence or absence of Aroclor 1254-induced F344 male rat liver S9. Decabromodiphenyl oxide did not induce sister-chromatid exchanges or chromosomal aberrations in Chinese hamster ovary cells in vitro in the presence or absence of S9 prepared from livers of Aroclor 1254-induced male Sprague-Dawley rats.

An audit of experimental data was conducted for these 2-year studies on decabromodiphenyl oxide. No data discrepancies were found that influenced the final interpretations.

Under the conditions of these 2-year feed studies of decabromodiphenyl oxide, there was some evidence of carcinogenicity for male and female F344/N rats as shown by increased incidences of neoplastic nodules of the liver in low dose (25,000 ppm) males and a high dose (50,000 ppm) groups of each sex. There was equivocal evidence of carcinogenicity for male B6C3F<sub>1</sub> mice as shown by increased incidences of hepatocellular adenomas or carcinomas (combined) in the low dose group and of thyroid gland follicular cell adenomas or carcinomas (combined) in both dosed groups. There was no evidence of carcinogenicity for female

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B6C3F<sub>1</sub> mice receiving 25,000 or 50,000 ppm in the diet. Several nonneoplastic lesions were observed at increased incidences, the most notable being thyroid gland follicular cell hyperplasia in male mice."

Five categories of interpretative conclusions were adopted for use in June 1983 in the Technical Reports series to specifically emphasize consistency and the concept of actual evidence of carcinogenicity. For each definitive study result (male rats, female rats, male mice, female mice), one of the following quintet will be selected to describe the findings. These categories refer to the strength of the experimental evidence and not to either potency or mechanism.

- o Clear Evidence of Carcinogenicity is demonstrated by studies that are interpreted as showing a chemically related increased incidence of malignant neoplasms, studies that exhibit a substantially increased incidence of benign neoplasms, or studies that exhibit an increased incidence of a combination of malignant and benign neoplasms where each increases with dose.
- o Some Evidence of Carcinogenicity is demonstrated by studies that are interpreted as showing a chemically related increased incidence of benign neoplasms, studies that exhibit marginal increases in neoplasms of several organs/tissues, or studies that exhibit a slight increase in uncommon malignant or benign neoplasms.
- o Equivocal Evidence of Carcinogenicity is demonstrated by studies that are interpreted as showing a chemically related marginal increase of neoplasms.
- o No Evidence of Carcinogenicity is demonstrated by studies that are interpreted as showing no chemically related increases in malignant or benign neoplasms.
- o Inadequate Study of Carcinogenicity demonstrates that because of major qualitative or quantitative limitations, the studies cannot be interpreted as valid for showing either the presence or absence of a carcinogenic effect.

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# MATERIAL SAFETY DATA SHEET

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## SECTION I

MANUFACTURER'S NAME <b>GREAT LAKES CHEMICAL CORPORATION</b>		EMERGENCY TELEPHONE NO. <b>(504) 862-5141</b>
TRADE NAME AND SYNONYMS <b>Tetrabromobisphenol A, Great Lakes' BA-59<sup>TM</sup> or BA-59P<sup>TM</sup>, TBBPA</b>		
CHEMICAL NAME AND SYNONYMS <b>4,4'-Isopropylidene bis(2,6-dibromophenol)</b>		
CHEMICAL FAMILY <b>Halogenated bisphenol</b>	FORMULA <b>C<sub>15</sub>H<sub>12</sub>Br<sub>4</sub>O<sub>2</sub></b>	CAS#79-94-7

## SECTION II - HAZARDOUS INGREDIENTS

COMPONENT	%	HAZARD DATA
Tetrabromobisphenol A	>96	Toxic hazard found to be very low.
Tribromobisphenol A	<3	
Related isomeric products	<2	

## SECTION III - PHYSICAL DATA

BOILING POINT (°F.) (d.)	-601	SPECIFIC GRAVITY (H <sub>2</sub> O=1) g./ml. at 59°F.	-1.76
VAPOR PRESSURE (mm Hg.)	-	Melting point, °F.	-358
VAPOR DENSITY (AIR=1)	-		
SOLUBILITY IN WATER g./100 g.	<0.01		
APPEARANCE AND ODOR <b>White, crystalline or powdered solid.</b>			

## SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	None.	FLAMMABLE LIMITS	None.
EXTINGUISHING MEDIA <b>All conventional extinguishing media suitable.</b>			
SPECIAL FIRE FIGHTING PROCEDURES <b>In fires fueled by other materials may release hydrogen bromide or bromine. Wear self-contained breathing apparatus.</b>			
UNUSUAL FIRE AND EXPLOSION HAZARDS <b>None except as cited above.</b>			

## SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE	None established.
TOXICITY	<b>Not found to be toxic in eye, skin, inhalation, or ingestion acute exposures. LD<sub>50</sub> is in excess of 50,000 mg./kg. in rats. Twenty-eight day feeding studies in rats at doses to 1000 ppm on diet showed no compound-related toxicities, little or no increase in bromine levels of fat or liver tissues.</b>

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## HAZARD STATEMENT

No known hazard on acute or chronic exposure; compound has very low toxicity by all exposure routes.

## EMERGENCY AND FIRST AID PROCEDURES

**Eyes:** Flush with water thoroughly; treat symptoms. **Skin:** Wash with soap and water. **Ingestion:** Induce vomiting; consult physician. **Inhalation:** Remove to fresh air; treat symptoms. **Clothing:** Wash contaminated clothing before reuse.

## SECTION VI - REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID Overheating (>500°F.) for extended period will result in hydrogen bromide release.
	STABLE	X	

## INCOMPATIBILITY

## HAZARDOUS DECOMPOSITION PRODUCTS

Hydrogen bromide on extended overheating (>500°F.)

HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

## SECTION VII - SPILL OR LEAK PROCEDURES

## STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Collect in containers for disposal following normally acceptable practices. Use approved dust respirators, rubber gloves, and safety glasses.

## WASTE DISPOSAL METHOD

Dispose of in accord with local regulations for relatively non-toxic organics. Landfill is acceptable where legally approved. Avoid conditions which may result in dispersion to streams or waterways.

## SECTION VIII - SPECIAL PROTECTION INFORMATION

## RESPIRATORY PROTECTION

Use dust respirator where dusting occurs during handling.

VENTILATION	LOCAL EXHAUST	Recommended where dusting occurs.	SPECIAL	None.
	MECHANICAL	General ventilation recommended.	OTHER	

## PROTECTIVE GLOVES

Use is recommended.

## EYE PROTECTION

Safety glass recommended.

## OTHER PROTECTIVE EQUIPMENT

None.

## SECTION IX - SPECIAL PRECAUTIONS

## PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

Store in cool, dry conditions; follow normal precautions observed in handling any synthetic chemical.

## OTHER PRECAUTIONS

None.

Rev. 12/79

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# TOXICITY DATA

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## TETRABROMOBISPHENOL A

### SUMMARIES OF TOXICITY DATA

**Acute Oral.** Male and female Wistar rats were fasted for 16 hours and then treated by intubation with tetrabromobisphenol A at a rate of 50,000 mg./kg. using a 50% suspension in 0.25% aqueous methyl cellulose. Following a 14 day observation period all surviving rats were sacrificed; neither they nor those rats which died during the observation period showed significant specific pathological lesions attributed to the test compound. These test results indicate the LD<sub>50</sub> for tetrabromobisphenol A is in excess of 50,000 mg./kg.

**Acute Dermal.** Tetrabromobisphenol A was applied to the closely clipped intact skin of albino rabbits at concentrations up to 3.16 g./kg. for 24 hours. No local or systematic symptoms of toxicity could subsequently be detected by clinical observation, urinalysis, hematology, weight gain, or gross autopsy.

**Acute Inhalation.** Rats, mice, and guinea pigs were exposed for eight hours to concentrations of 0.5 mg./l. of tetrabromobisphenol A in air and then observed for 48 hours before being sacrificed for gross autopsy. None of the animals showed symptoms of local or systematic toxicity during the eight hour exposure or during the 48 hour post-exposure observation period. Gross autopsies revealed no significant findings or pathological lesions which could be attributed to the tetrabromobisphenol A.

**Acute Eye Irritation.** Single applications of 3 mg. of finely ground tetrabromobisphenol A were made into the conjunctival sac of the left eye of albino rabbits. Eye examinations were made within five minutes after application, at one and four hours after application, and daily thereafter for seven days; irritative findings were scored according to the method of Draize. At the end of the seven day observation period the rabbits were sacrificed for gross autopsy. The composite Draize score was zero since no effects were noted on cornea, iris, or conjunctiva at any time after application of the chemical. The rabbits exhibited normal appearance and behavior during the test period, gained weight, and showed no evidence of systematic toxicity. No significant toxicological findings were revealed on gross autopsy.

(over)

Twenty-eight Day Feeding. Charles River CD rats were fed at dietary dosage levels of 1, 10, 100, and 1,000 p.p.m. of tetrabromobisphenol A for 28 days after which one group was sacrificed and the remaining rats were placed on withdrawal with normal diets for periods of 2, 6, and 12 weeks before they were sacrificed. Changes in general behavior or appearance, body weight and food consumption were not seen. One control female and one female at the 10 p.p.m. dosage level died during the course of the study. No compound-related gross or microscopic lesions or variations in organ weights were observed in any of the groups. Bromine levels were determined on fat and liver tissues of rats sacrificed at the end of the 28-day feeding period from the control group and from those fed at the 1,000 p.p.m. level; similar bromide levels were found in both tissues from both groups.

Fourteen-day Inhalation. Charles River CD rats were exposed to atmospheric concentrations of two, six and eighteen mg./l. of micronized tetrabromobisphenol A for four hours daily, five days each week, for two weeks. Observations were made daily for physical appearance, behavior and pharmacotoxic signs. Body weights and food consumption were recorded. Hematological, biochemical, and urinalysis measurements were made at 14 days before the rats were sacrificed. Excess salivation, nasal porphyrin discharge, clear nasal discharge, and excessive lacrimation were noted during the course of the study for a few to all of the rats at the two higher dosage levels. No changes attributed to the compound were seen in body weights, food consumption, or in hematological, biochemical, or urinalysis studies. No rats died during the study period. On sacrifice and autopsy no compound related gross or microscopic lesions were seen in any rats from the experimental groups. A decrease in the mean relative liver weights of the female rats from the three exposure levels may have been compound related.

Mutagenicity. Tetrabromobisphenol A was examined for mutagenic activity at a number of concentrations in a series of in vitro microbial assays employing Salmonella and Saccharomyces indicator organisms both directly and in the presence of liver microsomal enzyme preparations from Arochlor-induced rats. The results of the tests whether in the presence or absence of the rat liver activation system were all negative. Tetrabromobisphenol A was judged not mutagenic under these test conditions.

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For further details of the studies described above contact L. E. Holladay, Product Safety Coordinator, at the address above.

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## Product Information

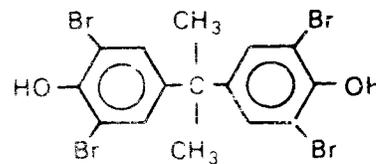


# Flame Retardant Chemicals

effective February 16, 1981  
Supersedes February 22, 1979

### GREAT LAKES BA-59™ AND GREAT LAKES BA-59P™

BA-59™ and BA-59P™ (TETRABROMOBISPHENOL A) are aromatic based flame retardants for both thermoplastic and thermoset resin systems.



TETRABROMOBISPHENOL A

#### APPLICATIONS

BA-59 is highly effective as a reactive flame retardant in epoxy resin systems due to its structural compatibility, high bromine content and thermal stability. The high purity polymer grade BA-59P is used as a reactive flame retardant for polycarbonates and as an additive for styrenic thermoplastics such as ABS and high impact polystyrene. For specific application data, refer to the product use bulletins.

#### PHYSICAL PROPERTIES

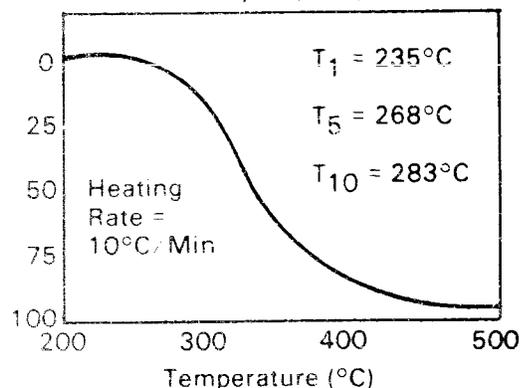
See price information bulletin for specifications

Formula Weight	543.7
Appearance	white free-flowing powder
Freezing point	180°C
Organic Bromine Content (Theoretical)	58.8%

Solubility at 25°C (g/100g solvent)

Water	0.1	Acetone	225
Methanol	80	Methyl Ethyl Ketone	1.8
Methylene Chloride	27	Pentane	0.2
Toluene	6	Benzene	10

Thermogravimetric Analysis (TGA)



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## **TOXICOLOGICAL INFORMATION**

BA-59 and BA-59P have very low toxicity by all exposure routes. The oral LD<sub>50</sub> for rats is in excess of 50,000 mg/kg. The products are not toxic in eye, skin, inhalation, or ingestion acute exposures.

BA-59 and BA-59P have been determined to not be mutagenic in a series of bioassays employing salmonella and saccharomyces indicator organism both directly and with liver activation.

A complete summary of toxicity data is available upon request.

## **HANDLING PRECAUTIONS**

The following are general precautionary measures which should be followed for Tetra-bromobisphenol A. Excess exposure to the product should be avoided or prevented by the use of appropriate personal protective equipment. The use of safety glasses with side shields, rubber gloves and dust respirator is recommended. Suitable ventilation in the work place is recommended as a standard practice. Contaminated clothing should be washed before reuse.

BA-59 is not hazardous under the Federal Hazardous Substance Act and is not a hazardous waste under the Resource Conservation and Recovery Act.

## **FIRST AID RECOMMENDATIONS**

1. For eye exposure to BA-59 or BA-59P flush for several minutes with fresh water. If ill effects persist, get medical attention.
2. For skin exposure, wash with soap and water repeating the process a number of times until traces of product are removed.
3. For excess exposure to dust if breathing difficulties occur, remove person to fresh air and obtain medical attention.
4. If large amounts of BA-59 or BA-59P are swallowed, induce vomiting, and seek medical attention.



**Great Lakes**  
Chemical Corporation

# MATERIAL SAFETY DATA SHEET

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## SECTION I

MANUFACTURER'S NAME <b>GREAT LAKES CHEMICAL CORPORATION</b>		EMERGENCY TELEPHONE NO. (317) 463-2511 (501) 862-5141
TRADE NAME AND SYNONYMS <b>Pentabromoethylbenzene, EB-80</b>		
CHEMICAL NAME AND SYNONYMS <b>Pentabromoethylbenzene</b>		
CHEMICAL FAMILY <b>Haloaromatic compound</b>	FORMULA <b>C<sub>8</sub>H<sub>5</sub>Br<sub>5</sub></b>	

## SECTION II - HAZARDOUS INGREDIENTS

COMPONENT	%	HAZARD DATA
Pentabromoethylbenzene	~99	Repeated inhalation of dusts should be avoided. Tests indicate low order of toxicity.
Other bromination products of ethyl benzene	<1	Unknown

## SECTION III - PHYSICAL DATA

BOILING POINT (°F.)	-	SPECIFIC GRAVITY (H <sub>2</sub> O=1) 25°C g./cc.	~2.7
VAPOR PRESSURE (mm Hg.)	-	MELTING POINT, °F.	275-280
VAPOR DENSITY (AIR=1)	-		
SOLUBILITY IN WATER, 25°C. g./100 g.	<0.1		
APPEARANCE AND ODOR <b>Tan colored powder.</b>			

## SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) <b>None.</b>	FLAMMABLE LIMITS <b>None.</b>
EXTINGUISHING MEDIA <b>All conventional extinguishing media are suitable.</b>	
SPECIAL FIRE FIGHTING PROCEDURES <b>None.</b>	
UNUSUAL FIRE AND EXPLOSION HAZARDS Combustion in the presence of other fuels may result in the release of hydrogen bromide and/or bromine vapors necessitating the use of approved chemical respirators or air-breathing equipment.	

## SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE <b>None established.</b>
TOXICITY <b>Possible eye irritant. Acute toxicity studies and 28 day feeding studies indicate a very low order of toxicity. Repeated inhalation of dusts, however, may be hazardous and should be avoided.</b>

- CONTINUED -

Material for eye injury or irritation by ingestion believed low. Re-  
lease liberation of dusts may be hazardous and should be avoided.

- HAZARDOUS AND PRECAUTION PROCEDURES**
- 1) Eye or skin exposure, wash with large quantities of water - notify physician.
  - 2) Remove contaminated clothing and wash before reuse.
  - 3) If swallowed, induce vomiting promptly and notify physician.
  - 4) If ill effects occur from inhalation remove victim to fresh air-notify physician.

SECTION VI - REACTIVITY DATA			
STABILITY	UNSTABLE		CONDITIONS TO AVOID Combustion may result in the liberation of hydrogen bromide or other toxic gases.
	STABLE	X	
INCOMPATIBILITY			
HAZARDOUS DECOMPOSITION PRODUCTS Under combustion conditions may release hydrogen bromide and/or bromine vapors.			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII - SPILL OR LEAK PROCEDURES	
STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED	
Collect in containers for disposal. Use approved dust respirators, rubber gloves, and safety glasses with side shields.	
WASTE DISPOSAL METHOD	
Dispose of in accordance with local regulations for relatively non- toxic organics. Avoid conditions which may result in dispersion to streams or waterways.	

SECTION VIII - SPECIAL PROTECTION INFORMATION		
RESPIRATORY PROTECTION Not normally required; if dust generation occurs use approved dust respirator.		
VENTILATION	LOCAL EXHAUST	SPECIAL
	MECHANICAL	OTHER
PROTECTIVE GLOVES Desirable if skin contact likely.		EYE PROTECTION Use safety glasses with side shields.
OTHER PROTECTIVE EQUIPMENT Wear clean, body-covering clothing.		

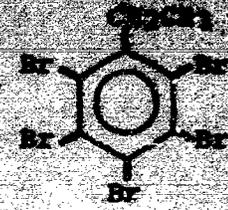
SECTION IX - SPECIAL PRECAUTIONS	
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING	
Use care to avoid skin and eye contact. Avoid breathing dusts. Wash contaminated clothing before reuse. Store in dry, well-ventilated area. Avoid overheating.	
OTHER PRECAUTIONS	

The information on this sheet is presented in good faith and has been derived from sources believed to be reliable. However, the user should  
exercise care in applying it and should consult the manufacturer of the product to be identified from the use. Under conditions of use, the user should  
control all risks by observing the label.

11032

**PENTABROMOETHYLBENZENE**

**FORMULA:** C<sub>6</sub>H<sub>5</sub>Br<sub>5</sub>  
**FORMULA WEIGHT:** 500.7  
**BROMINE CONTENT:** 79.8%



**TYPICAL PROPERTIES:**

**Appearance:** white/off-white powder  
**Melting Point:** 134-139°C  
**Solubility:** (approximate) g/100gm solvent @ 25°C

Acetone:	5
Benzene:	90
Carbon tetrachloride:	35
Ethylene dibromide:	35
Methanol:	0.5
Water:	<0.1

**Thermogravimetric Analytical Data:**

<b>Weight Loss</b>	<b>1%</b>	<b>5%</b>	<b>10%</b>	<b>25%</b>	<b>50%</b>	<b>75%</b>	<b>95%</b>
<b>Temperature °C</b>	<b>180</b>	<b>217</b>	<b>232</b>	<b>259</b>	<b>280</b>	<b>293</b>	<b>300</b>

Determined on Perkin-Elmer TGS-1 Thermobalance (20°C/min., under nitrogen)

**Flame Retardant Characteristics:**

Polymer Base	Limiting Oxygen Index (ASTM D2863-70)		
	No F.R. Additive	F.R. only 12phr	12phr F.R. + 3phr Sb2O3
Polypropylene	18.0	22.9	23.6
Polystyrene (High Impact, GP)	18.5	20.0	23.2
ABS (Molding Grade)	18.8	21.6	24.7
Poly-(methylmethacrylate)	17.7	18.9	19.0

**HANDLING PRECAUTIONS:**

Based upon acute toxicity studies with rats and rabbits, pentabromoethylbenzene appears to have a very low order of toxicity by ingestion, inhalation or skin absorption. However, its use requires only the normal precautions be followed as in the handling of any synthetic material.

# TOXICITY DATA

NEW YORK • LAFAYETTE, MISSISSIPPI • PHONE: 601-484-2111 • TELETYPE: 27-6422 • CABLE: GLAKCHEM LAFAYETTE  
PENTABROMOETHYLBENZENE

## SUMMARY OF TOXICITY DATA

**Acute Oral.** Groups of five male Carworth CFE rats were fasted overnight and then dosed with 50, 500, or 5000 mg./kg. of pentabromoethylbenzene. The compound was administered by intubation employing suspensions in corn oil at concentrations permitting a total dose of 10 ml./kg. at all dose levels. The rats were subsequently observed for 14 days and their body weight gains noted. None of the rats died and all exhibited normal weight gains during the observation period. These test results indicate that pentabromoethylbenzene is not a toxic substance by the oral route of administration.

**Acute Dermal.** Pentabromoethylbenzene was applied to the closely clipped intact skin of two male and two female New Zealand white rabbits each at dosage levels of 200 or 2000 mg./kg. The application site was wrapped in gauze and occluded for 24 hours after which wrappings were removed and the rabbit's backs were washed with tepid water. The rabbits were then observed for a 14 day period. Body weights were measured initially and at the end of the 14 day period. No rabbits died during the test period. Three of the four rabbits at each dosage level exhibited body weight gains during the period. One rabbit at each of the two dosage levels exhibited body weight losses which were attributed to injuries sustained while in the stocks and were not considered compound related. These test results indicate that pentabromoethylbenzene is not a toxic material by the dermal route of administration.

**Primary Skin Irritation.** Three male and three female New Zealand white rabbits were used in this study. Pentabromoethylbenzene (500 mg.) was applied to the closely clipped intact skin of three rabbits and to the closely clipped abraded skin of three. The areas of application were wrapped in gauze and occluded for 24 hours after which wrappings were removed and the rabbit's backs were washed with tepid water and were examined for skin irritation. The examinations were repeated at 72 hours. One of three rabbits in each of the intact and abraded groups exhibited very slight erythema at the 24 hour observation only. No erythema was noted at 72 hours and no edema was observed at either time. These test results indicate that pentabromoethylbenzene is not a primary skin irritant.

**Acute Inhalation.** Groups of ten male Carworth CFE rats were exposed for one hour to concentrations of pentabromoethylbenzene of 2 or 200 mg./l. in air and subsequently observed for 14 days. All rats survived the observation period. At the 2 mg./l. dose level eye squint, increased

(over)

followed by decreased respiratory rates, prostration, salivation, lacrimation, erythema, and decreased motor activity were noted in the rats during the exposure period. At 24 hours after dosing and for the remainder of the observation period all rats of this group appeared normal and exhibited normal body weight gains. At the 200 mg./l. dose level the same effects were noted as in the lower dose but including dyspnea during the exposure period. From 24 hours to the ninth day following compound exposure several rats exhibited corneal opacity, chemosis, and drying of the corneal surface. Also during this period the rats of this dose showed a slight decrease in motor activity. On the 10th, 11th and 14th day following exposure one rat exhibited corneal opacity with the remainder of the rats appearing normal. These test results indicate that pentabromoethylbenzene is not a toxic substance by the inhalation route of administration.

Acute Eye Irritation. Single applications of 100 mg. pentabromoethylbenzene were made into the cupped conjunctival sacs of the right eye of three male and three female New Zealand white rabbits. Examinations were made for ocular irritation at 24, 48, and 72 hours and at seven days; sodium fluorescein and ultraviolet light were used at the 72 hour examination to assess possible corneal injury. Irritative findings were scored according to the method of Draize. None of the rabbits showed injury to the cornea or iris. Several of the rabbits showed slight to moderate conjunctivae redness; one rabbit showed very slight chemosis. These test results indicate that pentabromoethylbenzene is a possible slight eye irritant.

Mutagenicity. Pentabromoethylbenzene was examined for mutagenic activity at a number of concentrations in a series of in vitro microbial assays employing Salmonella and Saccharomyces indicator organisms both directly and in the presence of liver microsomal enzyme preparations from Arochlor-induced rats. The results of the test whether in the presence or absence of the rat liver activation system were all negative. Pentabromoethylbenzene was judged not mutagenic under these test conditions.

Twenty-eight Day Feeding. Groups of 10 male and 10 female Charles River CD rats were fed at dietary dosage levels of 100 or 1000 ppm of pentabromoethylbenzene in basal diet. A control of 10 male and 10 female Charles River CD rats were fed only the basal diet. The rats were observed daily during the feeding period for changes in behavior and appearance. Body weights and sex group feed consumptions were recorded weekly. At the conclusion of the 28-day feeding period all rats were sacrificed for gross pathological examination and for histopathological examination of liver, kidney, and thyroid tissues. Liver and fat tissues pooled by sex and dose group were analyzed for bromine content.

In none of the tests did rats die, nor were there changes noted in behavior or appearance of any of the rats during the feeding period. Male rats at the 100 and 1000 ppm dosage levels consumed slightly less diet than and did not gain as much body weight as the control rats. Dose related increases in bromine liver and fat samples were seen in

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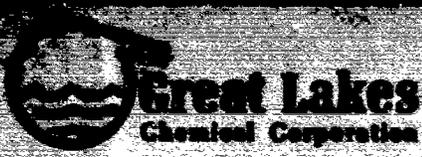
**Thyroidal Thylobenone**

Both dosage groups. No compound related gross pathologic lesions, microscopic pathologic lesions in the tissues examined (liver, kidneys, thyroid) or variations in organ weights were observed in any of the rats.

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For further details of the studies described above contact L. E. Holladay, Product Safety Coordinator, at the address above.

LEH/jal  
6/15/77



# MATERIAL SAFETY DATA SHEET

12-462

P.O. BOX 2200 • HIGHWAY 12 N.W. • WEST LAFAYETTE, INDIANA 47906 • PHONE: 317-463-2511 • TELEX: 27-0426 • CABLE: CLAKENB LAFAYETTE

Information on this form is furnished solely for the purpose of compliance with the Occupational Safety and Health Act of 1970 and shall not be used for any other purpose. Use or dissemination of all or any part of this information for any other purpose may result in a violation of law or constitute grounds for legal action.

SECTION I	
MANUFACTURER'S NAME <b>GREAT LAKES CHEMICAL CORPORATION</b>	EMERGENCY TELEPHONE NO. <b>(317) 463-2511 (501) 862-5141</b>
TRADE NAME AND SYNONYMS <b>Great Lakes AE-59</b>	<b>Contains No CBI</b>
CHEMICAL NAME AND SYNONYMS <b>2,3-Dibromopropyl Acrylate</b>	
CHEMICAL FAMILY <b>Haloalkyl ester</b>	FORMULA <b>C<sub>6</sub>H<sub>8</sub>Br<sub>2</sub>O<sub>2</sub></b>

SECTION II - HAZARDOUS INGREDIENTS		
COMPONENT	%	HAZARD DATA
2,3-Dibromopropyl acrylate and acrylic oligomers	≥98.5	Acute oral LD <sub>50</sub> is >50 mg./kg. and <500 mg./kg.
2,3-Dibromopropanol	≤1	
1,2,3-Tribromopropane	≤0.5	
Monomethyl ether of hydroquinone	200ppm	

SECTION III - PHYSICAL DATA			
BOILING POINT (°F.) at 0.3 min.	205	SPECIFIC GRAVITY (H <sub>2</sub> O=1), 20°C.	1.76
VAPOR PRESSURE (mm Hg.)	N/A		
VAPOR DENSITY (AIR=1)	N/A		
SOLUBILITY IN WATER	Very low		
APPEARANCE AND ODOR			

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SECTION IV - FIRE AND EXPLOSION HAZARD DATA	
FLASH POINT (Method used) 307°F. (Cleveland open cup)	FLAMMABLE LIMITS Not applicable
EXTINGUISHING MEDIA No fire hazard; all conventional extinguishing media are suitable.	
SPECIAL FIRE FIGHTING PROCEDURES None	
UNUSUAL FIRE AND EXPLOSION HAZARDS Combustion in the presence of other fuels may result in the release of hydrogen bromide and/or bromine vapors necessitating the use of approved chemical respirators or air-breathing equipment.	

SECTION V - HEALTH HAZARD DATA	
THRESHOLD LIMIT VALUE NOT established. Acute oral LD <sub>50</sub> is >50 mg./kg. but <500 mg./kg.	
TOXICITY Although not a highly toxic compound, 2,3-dibromopropanol acrylate can exhibit toxic effects by all exposure routes. It can irritate or damage eyes or skin as results of local exposure and can result in death at high dose rates by inhalation or ingestion. Long term chronic exposure at lower rates may result in liver or kidney damage.	



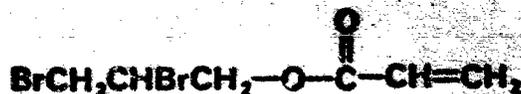


**Great Lakes**  
Chemical Corporation

## PRODUCT INFORMATION

**GREAT LAKES AE-59™**  
**2,3-DIBROMOPROPYL ACRYLATE**

**FORMULA:**  $C_6H_9Br_2O_2$   
**FORMULA WEIGHT:** 271.9  
**BROMINE CONTENT:** 58.8%



### TYPICAL PROPERTIES:

**Appearance:** clear, light yellow liquid  
**Specific gravity, g/ml @ 20°C:** 1.76  
**Approximate pounds per gallon:** 14.6  
**Boiling point @ 0.3 mm Hg:** 96°C  
**Viscosity @ 25°C, cps. Brookfield:** 14  
**Inhibitor, ppm MEHQ:** 200  
**Polymer content:** none  
**Solubility:**

Great Lakes AE-59 is completely miscible in acetone, benzene, carbon tetrachloride and methanol. It has very low solubility in water.

**Thermal Stability, °C:** 220-240

(Temperature at which significant discoloration occurs within 15 minutes exposure.)

**SPI gel test data (50 g. sample catalyzed with 1.0% benzoyl peroxide)**

**Gel time, minutes (150-180°F)** 1.6

**Time to peak temperature, minutes (150°F to peak)** 3.0

**Peak temperature, °F** 430

**Flash point, Cleveland open cup, °F:** 302

### HANDLING AND STORAGE:

Keep container closed. Protect from moisture and contamination. Store in a cool, dry place out of direct sunlight. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

### SUGGESTED USES:

Great Lakes AE-59 is a reactive monomer which will copolymerize with unsaturated polyester resins; acrylated epoxies for irradiation curable binders and coatings; acrylate and styrene copolymers for the preparation of oil and water repellent textile finishes. Other commercial possibilities include: sulfide post-treated acrylate copolymers useful for coatings, paper binders and anti-static and dyeability-improvement additives to olefinic polymers; emulsion copolymers for saturated elastomers and flame resistant rubber resin composites; terpolymers for flame resistant thermoplastic composites; flame retardant acrylonitrile copolymer fibers; and copolymerization with styrene in the preparation of foam.

TM Trademark of Great Lakes Chemical Corporation

August 18, 1959

# TOXICITY DATA

11-452

WILSON • WINDY HILL • WEST LAFAYETTE, INDIANA 47906 • PHONE: 317-485-2811 • TELEX: 27-0428 • CABLE: BLAKCHEM LAFAYETTE

## 2,3-DIBROMOPROPYL ACRYLATE

### SUMMARY OF TOXICITY DATA

**Acute Oral.** Groups of five Charles River CD male albino rats were fasted overnight and then dosed with 50, 500, or 5000 mg./kg. of 2,3-dibromopropyl acrylate. The compound was administered in corn oil at concentrations permitting a total dose of 10 ml./kg. at all dose levels. The rats were then observed for mortality and body weight gains for 14 days. Those treated at the 50 mg./kg. rate survived the observation period and showed normal body weight gains. Two of the five rats dosed at 500 mg./kg. died within 24 hours following compound administration and another was dead at 48 hours. The remaining two rats of the group survived the observation period and exhibited normal body weight gains. All rats receiving the 5000 mg./kg. dose died within 24 hours following administration. These test results indicate that 2,3-dibromopropyl acrylate is a toxic but not highly toxic substance by the oral route of administration.

**Acute Dermal.** 2,3-Dibromopropyl acrylate was applied to the closely clipped abraded and unabraded skin of male and female New Zealand albino rabbits at concentrations of 200 or 2000 mg./kg. for 24 hours. During a subsequent 14 day observation period none of the rabbits died, and all exhibited normal weight gains. These test results indicate that 2,3-dibromopropyl acrylate is not a toxic substance by the dermal route of administration.

**Primary Skin Irritation.** 2,3-Dibromopropyl acrylate was applied to the closely clipped intact or abraded skin of New Zealand white rabbits at a dose of 0.5 milliliter. The area was occluded and wrapped. After 24 hours the wrappings were removed, and the rabbits' backs were washed with tepid water and examined for irritation. The examination was repeated at 72 hours following application. At 24 hours very slight to well-defined erythema and very slight to moderate edema was noted in the intact and abraded animals. In addition one animal in the abraded group exhibited intradermal hemorrhaging at 24 hours only. At 72 hours all rabbits in the intact and two of three in the abraded groups exhibited very slight erythema. One animal in the abraded group exhibited no erythema at 72 hours. No edema was noted in the intact or abraded groups at 72 hours. These test results indicate that 2,3-dibromopropyl acrylate is not a primary skin irritant, but is a moderate skin irritant.

**Acute Inhalation.** Charles River CD rats were exposed in a sealed container for one hour to an aerosol mist of 2,3-dibromopropyl acrylate at concentrations of 2 or 200 mg./l. All rats at the 2 mg./l. dosage level survived the one hour exposure and the 14 day observation period.

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These rats exhibited decreased motor activity, erythema, eye squint, salivation, lacrimation, nasal porphyrin discharge, and clear nasal discharge during exposure and for 24 hours after administration. At 24 hours and through 14 days all rats appeared normal and exhibited normal body weight gains. At the 200 mg./l. dosage level one female rat died at 24 hours and another female was dead at 48 hours; all other rats at this dose survived the 14 day observation period and exhibited normal body weight gains. During the exposure period the same signs were noted as in the lower dose level and included slight and marked dyspnea and soft stool in three rats. At 24 hours the rats exhibited both nasal and respiratory congestion continuing through the fifth day of the 14 day observation period. These test results indicate that 2,3-dibromopropyl acrylate is not a toxic substance by the inhalation route of administration.

Acute Eye Irritation. Single applications of 0.1 ml. of 2,3-dibromopropyl acrylate were instilled into the cupped conjunctival sac of the right eye of three male and three female New Zealand white rabbits. Eye examinations were made for ocular irritation at 24, 48, 72 hours and seven days. Irritative findings were scored according to the method of Draize. Irritation of cornea, iris, and conjunctivae was normal to moderate throughout the observation period. At the seven day observation most of the animals appeared normal. Examination at 72 hours with sodium fluorescein and ultra-violet light revealed evidence of corneal damage in three of the six animals. These test results indicate that 2,3-dibromopropyl acrylate is an eye irritant.

Twenty-eight Day Feeding. Charles River CD rats were fed at dietary dosage levels of 100 or 1000 ppm for 28 days. There were 10 male and 10 female rats in each dose group and in a control group fed only the basal diet. The rats were observed daily during the feeding period for changes in behavior and appearance. Body weights and feed consumptions were recorded weekly. At the conclusion of the 28-day feeding period all rats were sacrificed for gross pathological and for histopathological examination of liver, kidney, and thyroid tissues. Liver tissues pooled by sex and dose group were analyzed for bromine content.

In none of the tests did rats die nor were there changes noted in behavior or appearance of any of the rats during the feeding period. Feed consumption and body weight gains were similar for control and treatment groups. Absolute and relative liver weights were statistically significantly increased for both male and female rats at the 1000 ppm dietary level only. All other organ weight variations were statistically insignificant except the male rats brain weights at the 1000 ppm level and females relative ovary weight at 100 ppm level which were decreased but of doubtful biological significance. Dose-related increases in bromide levels of liver tissues were noted in pooled tissues from both male and female rats and ranged from about 5 to about 41 times the levels found in the controls. No compound related gross pathologic lesions were observed at necropsy in any rats from the experimental groups. Gross lesions observed were those which commonly occur spontaneously and were not considered significant. Compound related histopathologic liver lesions were observed in rats from the 1000 ppm dose level. These lesions consisted of enlargement of the centrolobular and midzonal liver

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Page 2

### 2,3-Dibromopropyl Acrylate

parenchymal cells. The cytoplasm of the enlarged cells had large areas with a finely granular "ground glass" appearance. Frequently eosinophilic "round bodies" also were present in the cytoplasm of enlarged hepatocytes. These bodies usually exhibited a dense eosinophilic hyaline wall which surrounded a pale, granular eosinophilic central portion. The liver lesion in rats fed 2,3-dibromopropyl acrylate occurred more frequently and with greater severity in males and with a dosage related order of incidence and severity.

Mutagenicity. 2,3-Dibromopropyl acrylate was examined for mutagenic activity at a number of concentrations in a series of in vitro microbial assays employing Salmonella and Saccharomyces indicator organisms both directly and in the presence of liver microsomal enzyme preparations from Arochlor-induced rats. 2,3-Dibromopropyl acrylate exhibited mutagenic activity with Salmonella strains TA-98 and TA-1535 under activation conditions only. All other tests were negative. 2,3-Dibromopropyl acrylate was judged mutagenic under these test conditions.

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For further details of the studies described above contact L. E. Holladay, Product Safety Coordinator, at the address above.

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