

(2-Bromoethyl)trimethylammonium Bromide

sc-209119



The Power is Question

Material Safety Data Sheet

Hazard Alert Code Key:

EXTREME

HIGH

MODERATE

LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

(2-Bromoethyl)trimethylammonium Bromide

STATEMENT OF HAZARDOUS NATURE

CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

NFPA



SUPPLIER

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EMERGENCY

ChemWatch
Within the US & Canada: 877-715-9305
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(1-800-CHEMCALL) or call +613 9573 3112

SYNONYMS

C5-H13-Br2-N, BrCH₂CH₂N⁺(CH₃)₃.Br⁻, "ammonium, (2-bromoethyl)trimethyl-, bromide", "quaternary ammonium compound"

Section 2 - HAZARDS IDENTIFICATION

CHEMWATCH HAZARD RATINGS

| | | Min | Max |
|---------------|---|-----|-----|
| Flammability: | 1 | | |
| Toxicity: | 3 | | |
| Body Contact: | 3 | | |
| Reactivity: | 1 | | |
| Chronic: | 3 | | |

Min/Nil=0
Low=1
Moderate=2
High=3
Extreme=4



CANADIAN WHMIS SYMBOLS



EMERGENCY OVERVIEW

RISK

Causes burns.

Risk of serious damage to eyes.

Toxic by inhalation, in contact with skin and if swallowed.

Very toxic to aquatic organisms.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

■ Toxic effects may result from the accidental ingestion of the material; animal experiments indicate that ingestion of less than 40 gram may be fatal or may produce serious damage to the health of the individual.

■ The material can produce chemical burns within the oral cavity and gastrointestinal tract following ingestion.

■ Ingestion of acidic corrosives may produce burns around and in the mouth.
the throat and esophagus.

■ Concentrated solutions of many cationics may cause corrosive damage to mucous membranes and the esophagus.

Nausea and vomiting (sometimes bloody) may follow ingestion.

EYE

■ The material can produce chemical burns to the eye following direct contact.

Vapors or mists may be extremely irritating.

■ If applied to the eyes, this material causes severe eye damage.

■ Direct eye contact with acid corrosives may produce pain, tears, sensitivity to light and burns.

Mild burns of the epithelia generally recover rapidly and completely.

SKIN

■ Skin contact with the material may produce toxic effects; systemic effects may result following absorption.

■ The material can produce chemical burns following direct contact with the skin.

■ Open cuts, abraded or irritated skin should not be exposed to this material.

■ Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects.

Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

■ Skin contact with acidic corrosives may result in pain and burns; these may be deep with distinct edges and may heal slowly with the formation of scar tissue.

INHALED

■ If inhaled, this material can irritate the throat and lungs of some persons.

■ Inhalation of dusts, generated by the material, during the course of normal handling, may produce toxic effects.

■ Persons with impaired respiratory function, airway diseases and conditions such as emphysema or chronic bronchitis, may incur further disability if excessive concentrations of particulate are inhaled.

■ Corrosive acids can cause irritation of the respiratory tract, with coughing, choking and mucous membrane damage.

There may be dizziness, headache, nausea and weakness.

CHRONIC HEALTH EFFECTS

■ Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.

There is limited evidence that, skin contact with this product is more likely to cause a sensitization reaction in some persons compared to the general population.

There is some evidence that human exposure to the material may result in developmental toxicity. This evidence is based on animal studies where effects have been observed in the absence of marked maternal toxicity, or at around the same dose levels as other toxic effects but which are not secondary non-specific consequences of the other toxic effects.

Long term exposure to high dust concentrations may cause changes in lung function i.e. pneumoconiosis; caused by particles less than 0.5 micron penetrating and remaining in the lung.

Chronic intoxication with ionic bromides, historically, has resulted from medical use of bromides but not from environmental or occupational exposure; depression, hallucinosis, and schizophreniform psychosis can be seen in the absence of other signs of intoxication. Bromides may also induce sedation, irritability, agitation, delirium, memory loss, confusion, disorientation, forgetfulness (aphasias), dysarthria, weakness, fatigue, vertigo, stupor, coma, decreased appetite, nausea and vomiting, diarrhoea, hallucinations, an acne like rash on the face, legs and trunk, known as bronchoderma (seen in 25-30% of case involving bromide ion), and a profuse discharge from the nostrils (coryza). Ataxia and generalised hyperreflexia have also been observed. Correlation of neurologic symptoms with blood levels of bromide is inexact. The use of substances such as brompheniramine, as antihistamines, largely reflect current day usage of bromides; ionic bromides have been largely withdrawn from therapeutic use due to their toxicity. Several cases of foetal abnormalities have been described in mothers who took large doses of bromides during pregnancy.

Prolonged or repeated skin contact may cause degreasing with drying, cracking and dermatitis following.

Repeated or prolonged exposure to acids may result in the erosion of teeth, swelling and or ulceration of mouth lining. Irritation of airways to lung, with cough, and inflammation of lung tissue often occurs.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

| NAME | CAS RN | % |
|---|-----------|-----|
| (2-bromoethyl)trimethylammonium bromide | 2758-06-7 | >98 |

Section 4 - FIRST AID MEASURES

SWALLOWED

· For advice, contact a Poisons Information Center or a doctor at once. · Urgent hospital treatment is likely to be needed.

EYE

■ If this product comes in contact with the eyes: · Immediately hold eyelids apart and flush the eye continuously with running water. · Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.

SKIN

■ If skin or hair contact occurs: · Immediately flush body and clothes with large amounts of water, using safety shower if available. · Quickly remove all contaminated clothing, including footwear.

INHALED

· If fumes or combustion products are inhaled remove from contaminated area. · Lay patient down. Keep warm and rested. Inhalation of vapors or aerosols (mists, fumes) may cause lung edema. Corrosive substances may cause lung damage (e.g.

NOTES TO PHYSICIAN

■ For exposures to quaternary ammonium compounds;
· For ingestion of concentrated solutions (10% or higher): Swallow promptly a large quantity of milk, egg whites / gelatin solution. If not readily available, a slurry of activated charcoal may be useful. Avoid alcohol. Because of probable mucosal damage omit gastric lavage and emetic drugs.
· For dilute solutions (2% or less): If little or no emesis appears spontaneously, administer syrup of Ipecac or perform gastric lavage.
For acute or short term repeated exposures to strong acids:
· Airway problems may arise from laryngeal edema and inhalation exposure. Treat with 100% oxygen initially.
· Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling.

Section 5 - FIRE FIGHTING MEASURES

| | |
|-----------------------------|---------------|
| Vapour Pressure (mmHG): | Not available |
| Upper Explosive Limit (%): | Not available |
| Specific Gravity (water=1): | Not available |
| Lower Explosive Limit (%): | Not available |

EXTINGUISHING MEDIA

· Water spray or fog.
· Foam.

FIRE FIGHTING

· Alert Emergency Responders and tell them location and nature of hazard.
· Wear full body protective clothing with breathing apparatus.
When any large container (including road and rail tankers) is involved in a fire, consider evacuation by 800 metres in all directions.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

· Combustible.
· Slight fire hazard when exposed to heat or flame.
Combustion products include: carbon monoxide (CO), carbon dioxide (CO₂), hydrogen bromide, nitrogen oxides (NO_x), other pyrolysis products typical of burning organic material.

FIRE INCOMPATIBILITY

■ Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

PERSONAL PROTECTION

Glasses:
Safety Glasses.
Full face- shield.
Gloves:
Respirator:
Particulate dust filter.
Acid vapour Type B cartridge/ canister.

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

· Drains for storage or use areas should have retention basins for pH adjustments and dilution of spills before discharge or disposal of material.
· Check regularly for spills and leaks.
· Clean up all spills immediately.
· Avoid contact with skin and eyes.

MAJOR SPILLS

· Clear area of personnel and move upwind.
· Alert Emergency Responders and tell them location and nature of hazard.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- Avoid all personal contact, including inhalation.
 - Wear protective clothing when risk of exposure occurs.
- Empty containers may contain residual dust which has the potential to accumulate following settling. Such dusts may explode in the presence of an appropriate ignition source.
- Do NOT cut, drill, grind or weld such containers.
 - In addition ensure such activity is not performed near full, partially empty or empty containers without appropriate workplace safety authorisation or permit.

RECOMMENDED STORAGE METHODS

- DO NOT use aluminum or galvanized containers.

Check regularly for spills and leaks.

Glass container.

- Lined metal can, Lined metal pail/drum
- Plastic pail.

For low viscosity materials

- Drums and jerricans must be of the non-removable head type.
- Where a can is to be used as an inner package, the can must have a screwed enclosure.

STORAGE REQUIREMENTS

- Store in original containers.
- Keep containers securely sealed.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

| Source | Material | TWA ppm | TWA mg/m ³ | STEL ppm | STEL mg/m ³ | Peak ppm | Peak mg/m ³ | TWA F/CC | Notes |
|---|---|------------|--------------------------|-------------|---------------------------|-------------|---------------------------|-------------|--|
| Canada - Ontario Occupational Exposure Limits | (2-bromoethyl)trimethylammonium bromide (Particles (Insoluble or Poorly Soluble) Not Otherwise) | | 10 (I) | | | | | | |
| Canada - British Columbia Occupational Exposure Limits | (2-bromoethyl)trimethylammonium bromide (Particles (Insoluble or Poorly Soluble) Not Otherwise Classified (PNOC)) | | 10 (N) | | | | | | |
| Canada - Ontario Occupational Exposure Limits | (2-bromoethyl)trimethylammonium bromide (Specified (PNOS) / Particules (insolubles ou peu solubles) non précisées par ailleurs) | | 3 (R) | | | | | | |
| US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants | (2-bromoethyl)trimethylammonium bromide (Particulates not otherwise regulated Respirable fraction) | | 5 | | | | | | |
| US - California Permissible Exposure Limits for Chemical Contaminants | (2-bromoethyl)trimethylammonium bromide (Particulates not otherwise regulated Respirable fraction) | | 5 | | | | | | (n) |
| US - Oregon Permissible Exposure Limits (Z-1) | (2-bromoethyl)trimethylammonium bromide (Particulates not otherwise regulated (PNOR) (f) Total Dust) | | 10 | | | | | | Bold print identifies substances for which the Oregon Permissible Exposure Limits (PELs) are different than the federal |

Limits.
PNOR
means
“particles
not
otherwise
regulated.”

| | | | |
|---|---|---|--|
| US - Michigan Exposure Limits for Air Contaminants | (2-bromoethyl)trimethylammonium bromide (Particulates not otherwise regulated, Respirable dust) | 5 | |
|---|---|---|--|

Bold print
identifies
substances
for which
the Oregon
Permissible
Exposure
Limits
(PELs) are
different
than the
federal
Limits.
PNOR
means
“particles
not
otherwise
regulated.”

| | | | |
|--|--|---|--|
| US - Oregon Permissible Exposure Limits (Z-1) | (2-bromoethyl)trimethylammonium bromide (Particulates not otherwise regulated (PNOR) (f) Respirable Fraction) | 5 | |
|--|--|---|--|

| | | | |
|--|--|---|--|
| US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants | (2-bromoethyl)trimethylammonium bromide (Particulates not otherwise regulated (PNOR)(f)- Respirable fraction) | 5 | |
|--|--|---|--|

| | | | |
|---|--|----|--|
| Canada - Prince Edward Island Occupational Exposure Limits | (2-bromoethyl)trimethylammonium bromide (Particles (Insoluble or Poorly Soluble) [NOS] Inhalable particles) | 10 | |
|---|--|----|--|

See
Appendix B
current
TLV/BEI
Book

ENDOELTABLE

PERSONAL PROTECTION



RESPIRATOR

- Particulate dust filter.
 - Acid vapour Type B cartridge/ canister.
- Consult your EHS staff for recommendations

EYE

- Chemical goggles.
- Full face shield.

HANDS/FEET

- Wear chemical protective gloves, eg. PVC.

NOTE: The material may produce skin sensitization in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.

Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:

- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739).

- When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374) is recommended.
- When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374) is recommended.
- Contaminated gloves should be replaced.

Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.

OTHER

- Overalls.
- PVC Apron.

ENGINEERING CONTROLS

- Local exhaust ventilation is required where solids are handled as powders or crystals; even when particulates are relatively large, a certain proportion will be powdered by mutual friction.
- Exhaust ventilation should be designed to prevent accumulation and recirculation of particulates in the workplace.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Mixes with water.

Corrosive.

Acid.

Toxic or noxious vapours/gas.

| | | | |
|---------------------------|-----------------|--------------------------------|----------------|
| State | DIVIDED SOLID | Molecular Weight | 246.98 |
| Melting Range (°F) | 471(decomposes) | Viscosity | Not Applicable |
| Boiling Range (°F) | Not applicable | Solubility in water (g/L) | Miscible |
| Flash Point (°F) | Not available | pH (1% solution) | Not available |
| Decomposition Temp (°F) | Not Available | pH (as supplied) | Not applicable |
| Autoignition Temp (°F) | Not available | Vapour Pressure (mmHG) | Not available |
| Upper Explosive Limit (%) | Not available | Specific Gravity (water=1) | Not available |
| Lower Explosive Limit (%) | Not available | Relative Vapor Density (air=1) | >1 |
| Volatile Component (%vol) | Not available. | Evaporation Rate | Not available |

APPEARANCE

White chunky powder; mixes with water.

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

- Contact with alkaline material liberates heat.

STORAGE INCOMPATIBILITY

■ Segregate from alkalis, oxidizing agents and chemicals readily decomposed by acids, i.e. cyanides, sulfides, carbonates.

Reacts with mild steel, galvanized steel / zinc producing hydrogen gas which may form an explosive mixture with air.

- Avoid strong bases.

For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

(2-bromoethyl)trimethylammonium bromide

TOXICITY AND IRRITATION

(2-BROMOETHYL)TRIMETHYLAMMONIUM BROMIDE:

■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

| TOXICITY | IRRITATION |
|--|--------------|
| Oral (rat) LD50: 190 mg/kg | Nil Reported |
| Subcutaneous (rat) LD50: 60 mg/kg | |
| Oral (mouse) LD50: 450 mg/kg | |
| Intraperitoneal (mouse) LD50: 55 mg/kg | |
| Subcutaneous (mouse) LD50: 65 mg/kg | |
| Intramuscular (mouse) LD50: 60 mg/kg | |

■ The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. Industrial bronchitis, on the other hand, is a disorder that occurs as result of exposure due to high concentrations of irritating substance (often particulate in nature) and is completely reversible after exposure ceases. The disorder is characterised by dyspnea, cough and mucus production.

The material may produce respiratory tract irritation, and result in damage to the lung including reduced lung function.

The material may cause skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin.

For alkyltrimethylammonium chloride (ATMAC)

Most undiluted cationic surfactants satisfy the criteria for classification as Harmful (Xn) with R22 and as Irritant (Xi) for skin and eyes with R38 and R41. In addition, certain surfactants will satisfy the criteria for classification as Corrosive with R34 in addition to the acute toxicity.

According to Centre Europeen des Agents de Surface et de leurs Intermediaires Organiques (CESIO), C8-18 alkyltrimethylammonium chloride (ATMAC) (i.e., lauryl, coco, soya, and tallow) are classified as Corrosive (C) with the risk phrases R22 (Harmful if swallowed) and R34 (Causes burns). C16 ATMAC is classified as Harmful (Xn) with the risk phrases R22 (Harmful if swallowed), R38 (Irritating to skin), and R41 (Risk of serious damage to eyes). C20-22 ATMAC are classified as Irritant (Xi) with R36/38 (Irritating to eyes and skin).

Toxicokinetics and Acute Toxicity: The few available absorption studies conducted with cationic surfactants indicate that absorption occurs in small amounts through the skin. Percutaneous absorption of radiolabelled C12 alkyltrimethylammonium bromide (ATMAB) in 3% aqueous solution (applied to an 8 cm² area with occlusion) in the rat was low and corresponded to 0.6% of the applied 14C activity in 72 hours. Most of the absorbed surfactant was excreted in the urine, i.e. 0.35% of the applied 14C activity within the first 24 hours, whereas 13.2% remained on the skin after rinsing. Cutaneous application of the surfactant without rinsing resulted in a greater degree of percutaneous absorption (3.15%) in 48 hours. In the rat elimination after parenteral administration was rapid and was effected primarily via the urine, - more than 80% of the radioactivity was eliminated within 24 hours of application. About 80% of the 14C activity was found in the gastrointestinal tract 8 hours after oral administration of 14C-labelled C16 ATMAB. Only small amounts of the applied radioactivity were found in the urine and in the blood plasma. This indicates poor intestinal absorption. Similar small amounts of 14C were found in the liver, kidneys, spleen, heart, lungs and skeletal muscles. Within 3 days of ingestion, 92% of the administered radioactivity had been excreted in the faeces and 1% in the urine. No appreciable enterohepatic circulation of the radioactivity was found.

The acute oral toxicity of alkyltrimethylammonium salts is somewhat higher than the toxicity of anionic and nonionic surfactants. This may be due to the strongly irritating effect which cationic surfactants exhibit on the mucous membrane of the gastrointestinal tract (SFT 1991). Cationic surfactants are generally about 10 times more toxic when administered by the intravenous route compared to oral administration.

Skin and Eye Irritation: Skin irritation depends on surfactant concentration. Regardless of the structure, cationic surfactants lead to serious destruction of the skin at high concentrations. Solutions of approximately 0.1% are rarely irritating, whereas irritation is usually pronounced at concentrations between 1.0 and 10.0% surfactant. C16 ATMAC was severely irritating to rabbit skin in a concentration of 2.5%. The surfactant was applied to intact and abraded sites and scored after 34 hours. Then the skin was rinsed and then scored again after 48 hours. The erythema and Eschar Index was 3.75 (maximum 4) and the edema Index was 2.0 (maximum 4).

With regard to eye irritation, cationic surfactants are the most irritating of the surfactants. The longer chained alkyltrimethylammonium salts are less irritating to the rabbit eye than the shorter alkyl chain homologues. C10 ATMAB, C12 ATMAB, and C16 ATMAC were tested in concentrations between 0.1 and 1.0% in water and were found to be significantly irritating or injurious to the rabbit eye. A 5% solution of C18 ATMAC was instilled into the eyes of guinea pigs, and this concentration was very irritating with a total PII (The Primary Irritation Index) score of 96 (maximum 110).

A homologous series of ATMAB produced very little swelling of the stratum corneum and some homologues produced a shrinkage of the stratum corneum after prolonged exposure.

Many proteins in the skin are considerably more resistant to the denaturing effects of cationic surfactants compared to those of anionic surfactants. As cationic surfactants frequently have a lower critical micelle concentration than the anionic surfactants, a saturation of the surfactant/protein complex is prevented by the formation of micelles.

Compared to a representative anionic surfactant, the cooperative binding with subsequent protein denaturation requires about a tenfold higher concentration of a cationic surfactant. Contrary to the irreversible denaturing effect of sodium dodecyl sulfate, the adverse effects of some cationic surfactants on proteins may be reversible. Cationic surfactants can interact with proteins or peptides by polar and hydrophobic binding. Polar interactions result in electrostatic bonds between the negatively charged groups of the protein molecule and the positively charged surfactant molecule.

Sensitisation: A repeated insult patch test of C16 ATMAC was conducted with 114 volunteers. Seventeen days after the last induction of 0.25% surfactant, a challenge patch of 0.25% was applied. No sensitization was observed.

Sub-chronic toxicity: C16 ATMAB was administered at concentrations of 10, 20, and 45 mg/kg/day via the drinking water to rats for one year. The only effect observed was a decrease in body weight gain in the 45 mg/day dose group.

Reproductive Toxicity: No embryo toxic effects were seen, when C18 ATMAC was applied dermally to pregnant rats during the period of major organogenesis (day 6-15 of gestation). The concentrations of C18 ATMAC were 0.9, 1.5 and 2.5%. There was no increase in the incidence of fetal malformations. C16 ATMAB was not teratogenic in rats after oral doses. Mild embryonic effects were observed with 50 mg/kg/day, but these effects were attributed to maternal toxicity rather than to a primary embryonic effect. Lower doses of C16 ATMAB showed no embryo toxic or teratogenic effects.

Mutagenicity: C16 ATMAC was studied in in vitro short-term tests to detect potential mutagenic effects. Cultures of Syrian golden hamster embryo cells were used for an in vitro bioassay. No in vitro transformation of hamster embryo cells was induced, and C16 ATMAC was not mutagenic in Salmonella typhimurium (Inoue and Sunakawa 1980). No mutagenic effects or genetic damages were indicated in a survey of nine short-term genotoxicity tests with C16 and C18 ATMAC (Yam et al. 1984).

Environmental and Health Assessment of Substances in Household Detergents and Cosmetic Detergent Products, Environment Project, 615, 2001. Torben Madsen et al: Miljøministeriet (Danish Environmental Protection Agency)

For quaternary ammonium compounds (QACs):

Quaternary ammonium compounds (QACs) are cationic surfactants. They are synthetic organically tetra-substituted ammonium compounds, where the R substituents are alkyl or heterocyclic radicals. A common characteristic of these synthetic compounds is that one of the R's is a

long-chain hydrophobic aliphatic residue.

The cationic surface active compounds are in general more toxic than the anionic and non-ionic surfactants. The positively-charged cationic portion is the functional part of the molecule and the local irritation effects of QACs appear to result from the quaternary ammonium cation. Due to their relative ability to solubilise phospholipids and cholesterol in lipid membranes, QACs affect cell permeability which may lead to cell death. Further QACs denature proteins as cationic materials precipitate protein and are accompanied by generalised tissue irritation. It has been suggested that the experimentally determined decrease in acute toxicity of QACs with chain lengths above C16 is due to decreased water solubility.

In general it appears that QACs with a single long-chain alkyl groups are more toxic and irritating than those with two such substitutions. The straight chain aliphatic QACs have been shown to release histamine from minced guinea pig lung tissue. However, studies with benzalkonium chloride have shown that the effect on histamine release depends on the concentration of the solution. When cell suspensions (11% mast cells) from rats were exposed to low concentrations, a decrease in histamine release was seen. When exposed to high concentrations the opposite result was obtained.

In addition, QACs may show curare-like properties (specifically benzalkonium and cetylpyridinium derivatives, a muscular paralysis with no involvement of the central nervous system. This is most often associated with lethal doses. Parenteral injections in rats, rabbits and dogs have resulted in prompt but transient limb paralysis and sometimes fatal paresis of the respiratory muscles. This effect seems to be transient. From human testing of different QACs the generalised conclusion is obtained that all the compounds investigated to date exhibit similar toxicological properties.

CARCINOGEN

| | | | |
|--|--|--------------|--------|
| BROMINE COMPOUNDS (ORGANIC OR INORGANIC) | US Environmental Defense Scorecard Suspected Carcinogens | Reference(s) | P65-MC |
|--|--|--------------|--------|

Section 12 - ECOLOGICAL INFORMATION

Very toxic to aquatic organisms.

This material and its container must be disposed of as hazardous waste.

Avoid release to the environment.

Refer to special instructions/ safety data sheets.

Ecotoxicity

| Ingredient | Persistence: Water/Soil | Persistence: Air | Bioaccumulation | Mobility |
|---|----------------------------|-------------------|-----------------|----------|
| (2-bromoethyl)trimethylammonium bromide | HIGH | No Data Available | LOW | HIGH |

Section 13 - DISPOSAL CONSIDERATIONS

US EPA Waste Number & Descriptions

A. General Product Information

Corrosivity characteristic: use EPA hazardous waste number D002 (waste code C)

Disposal Instructions

All waste must be handled in accordance with local, state and federal regulations.

! Puncture containers to prevent re-use and bury at an authorized landfill.

Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.

A Hierarchy of Controls seems to be common - the user should investigate:

- Reduction
- Reuse
- Recycling
- Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.

DO NOT allow wash water from cleaning equipment to enter drains. Collect all wash water for treatment before disposal.

- Recycle wherever possible.
- Consult manufacturer for recycling options or consult Waste Management Authority for disposal if no suitable treatment or disposal facility can be identified.

Section 14 - TRANSPORTATION INFORMATION



DOT:

Symbols: None Hazard class or Division: 8

Identification Numbers: UN2923 PG: III

Label Codes: 8, 6.1 Special provisions: IB8, IP3, T1, TP33

Packaging: Exceptions: 154 Packaging: Non- bulk: 213
Packaging: Exceptions: 154 Quantity limitations: 25 kg
Passenger aircraft/rail:
Quantity Limitations: Cargo 100 kg Vessel stowage: Location: B
aircraft only:
Vessel stowage: Other: 40, 95
Hazardous materials descriptions and proper shipping names:
Corrosive solids, toxic, n.o.s.

Air Transport IATA:

ICAO/IATA Class: 8 (6.1) ICAO/IATA Subrisk: None
UN/ID Number: 2923 Packing Group: III
Special provisions: A3
Cargo Only
Packing Instructions: 100 kg Maximum Qty/Pack: 864
Passenger and Cargo Passenger and Cargo
Packing Instructions: 25 kg Maximum Qty/Pack: 860
Passenger and Cargo Limited Quantity Passenger and Cargo Limited Quantity
Packing Instructions: 5 kg Maximum Qty/Pack: Y845
Shipping Name: CORROSIVE SOLID, TOXIC, N.O.S. * (CONTAINS
(2-BROMOETHYL)TRIMETHYLAMMONIUM BROMIDE)

Maritime Transport IMDG:

IMDG Class: 8 IMDG Subrisk: 6.1
UN Number: 2923 Packing Group: III
EMS Number: F-A , S-B Special provisions: 223 274
Limited Quantities: 5 kg Marine Pollutant: Yes
Shipping Name: CORROSIVE SOLID, TOXIC, N.O.S.(contains (2-bromoethyl)trimethylammonium bromide)

Section 15 - REGULATORY INFORMATION

(2-bromoethyl)trimethylammonium bromide (CAS: 2758-06-7) is found on the following regulatory lists;

"Canada Non-Domestic Substances List (NDSL)", "US Toxic Substances Control Act (TSCA) - Inventory"

Section 16 - OTHER INFORMATION

Reasonable care has been taken in the preparation of this information, but the author makes no warranty of merchantability or any other warranty, expressed or implied, with respect to this information. The author makes no representations and assumes no liability for any direct, incidental or consequential damages resulting from its use. For additional technical information please call our toxicology department on +800 CHEMCALL.

■ Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references.

■ The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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