

# Standard Operating Procedure

## Use of Bromine in Organic Chemistry I Laboratory and Organic Chemistry II Laboratory

NOTE: You must read this entire document and both you and the instructor must sign it before commencing any work.

Instructor: \_\_\_\_\_

This SOP will be used in Albertus Magnus 316.

### Summary of how material will be used

Bromine and solutions containing bromine will be used for qualitative tests to detect the presence of alkenes, for reaction with trans-cinnamic acid, and for reactions with acetanilide, anisole, and aniline. This SOP applies to all uses of bromine and bromine solutions in *Organic Chemistry I Laboratory* and *Organic Chemistry II Laboratory*. Specific procedures are attached.

### Potential Hazards

Bromine is a fuming red-brown liquid at room temperature that is corrosive and toxic. It is classified as acutely toxic by inhalation, as skin corrosive, as capable of causing eye damage, and as acutely toxic to aquatic life.

### Regulatory Issues

N/A

### Engineering Controls

Bromine, bromine solutions, and bromine containing waste must be handled in a fume hood. Keep hood sash at proper height to ensure sufficient airflow.

### Work Practice Controls

New workers must review this SOP with instructor prior to conducting work. At beginning of experiments, review properties of bromine and proper handling procedures. Use in fume hood. When done with experimental work, bromine-containing waste should be collected in an appropriate waste container for disposal. Do not rinse glassware that contains residual bromine with acetone. Bromine reacts with acetone to produce bromoacetone, a powerful lachrymator. Do not work alone.

### Specific Experimental Procedures

See attached.

**Personal Protective Equipment**

Wear protective eyewear, appropriate gloves, and lab coats at all times.

**Storage**

Keep containers tightly closed and in a dry well-ventilated place. Containers that are opened must be carefully resealed and kept upright. Do not store in polyethylene containers.

**Waste Disposal**

Surplus and waste from reaction procedures should be collected in an appropriate waste container for disposal. Do not rinse glassware that contains residual bromine with acetone. Bromine reacts with acetone to produce bromoacetone, a powerful lachrymator.

**Spills and Releases**

If a release occurs, immediately stop all work. Alert other nearby workers and supervisor to the situation. Make sure no one has received a hazardous exposure. If exposure symptoms are present, seek medical help immediately. Contact Providence College's Environmental Health and Safety Office and supervising faculty member for spill response assistance.

**Emergency Procedures**

If breathed in, move person into fresh air. Consult a physician. In case of skin contact, take off contaminated clothing and shoes immediately, Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician. In case of eye contact, rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Continue rinsing eyes during transport to hospital.

**I certify that a risk assessment has been conducted by a faculty member who is familiar with the laboratory use of the chemical being used.**

**Name:** \_\_\_\_\_ **Signature (lab supervisor):** \_\_\_\_\_ **Date:** \_\_\_\_\_

## Training Records

**“By my signature, I verify that I have read and understand this SOP, and have discussed any questions I have had with the indicated trainer. I agree to fully adhere to its requirements.”**

[illegible]

dichloromethane. Dry the combined dichloromethane extracts with sodium sulfate. Decant into a pre-weighed Erlenmeyer flask. Add a wooden stick and evaporate the dichloromethane on a steam bath. (To determine if all of the dichloromethane has been evaporated, remove the flask from the steam bath and measure its mass. Return it to the steam bath for an additional 5 minutes and then measure the mass again. Repeat the process until the mass remains constant.) Determine the mass of the compound isolated and calculate the percent obtained based on the mass of the clove oil used.

### *Cleaning up*

Place the residual sodium sulfate in the appropriate waste container. Dispose of the original dichloromethane layer in the appropriate waste container. The aqueous layers can be washed down the drain. Wash your glassware with detergent and rinse well with water.

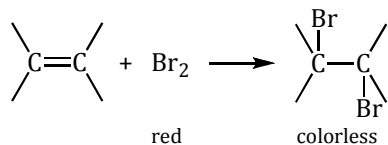
### *Part 3: Spectral Analysis*

Obtain a  $^{13}\text{C}$  NMR spectrum and an IR spectrum of your compound.

### *Part 4: Chemical Tests*

**Bromine test for simple multiple bonds:** Working in a hood, dissolve 2 drops of your compound in 1 mL of dichloromethane. Add a 2% solution of bromine in dichloromethane, dropwise, and shake it until the bromine color persists. The test is positive if more than five drops of the bromine solution are needed so that the color remains for 1 minute. *Cleaning up:* Discard solutions in appropriate waste container.

A successful test depends on the addition of bromine, a red liquid, to a double or a triple bond to give a colorless dibromide:



Not all double bonds react with  $\text{Br}_2\text{-CH}_2\text{Cl}_2$  solution. Only those that are electron-rich are sufficiently reactive nucleophiles to initiate the reaction. A double bond that is substituted with electron-withdrawing groups often fails to react or reacts slowly. Aromatic compounds either do not react or react very slowly.

**Ferric chloride test for phenols:** Dissolve one drop of your compound in 1 mL of dichloromethane. Add one drop of pyridine and three to five drops of a 1% solution of iron (III) chloride in dichloromethane. Most phenols produce an intense red, blue, purple, or green color. Some colors are transient, and it may be necessary to observe the solution carefully just as the solutions are mixed. The formation of a color is usually immediate, but the color may not last over any great period. *Cleaning up:* Discard solutions in appropriate waste container.

The colors observed in this test result from the formation of a complex of the phenols with  $\text{Fe(III)}$  ion. Some phenols do not give a positive result in this test, so a negative test must not be taken as significant without adequate evidence.

*Part 1: Reaction*

In a 50-mL round-bottom flask, combine 10.0 mmol of *trans*-cinnamic acid with 6.0 mL of glacial acetic acid. Add a few boiling chips and assemble an apparatus for addition under reflux using a separatory funnel, reflux condenser, and Claisen connecting tube. Be sure the stopcock of the separatory-addition funnel is closed, then add 10 mL of a 1.0 M solution of bromine in acetic acid and stopper it immediately. Place the reaction mixture in a 50°C water bath. Add the bromine/acetic acid solution in 5 to 10 portions - swirl the flask after each addition and wait until the color has faded to light orange before adding the next portion. After the last addition, heat the reaction mixture in the water bath for 15 minutes, swirling occasionally. If the mixture becomes colorless during this period, add more of the bromine/acetic acid solution dropwise until the color persists. If the mixture is distinctly orange after the end of the reaction period, add a drop or two of cyclohexene to turn the solution pale yellow.

*Part 2: Crystallization and Purification*

Transfer the reaction mixture to an Erlenmeyer flask, add 75 mL of water, and cool in an ice/water bath for 15 minutes. Collect the product by vacuum filtration and wash with several portions of cold water until the acetic acid odor is barely noticeable.

Purify the product by recrystallization from 50% aqueous ethanol. Dry the 2,3-dibromo-3-phenylpropanoic acid, weigh the sample, and measure its melting point. Decide whether you have prepared the *erythro* or the *threo* isomer, or a mixture of the two.

*Cleaning Up*

The filtrate can be washed down the drain. Wash your glassware with detergent and rinse well with water.

Dissolve 0.010 mole of your assigned aromatic compound in 5 mL of glacial acetic acid in a 50-mL Erlenmeyer flask and add slowly, with stirring, a solution of 1.6 mL of bromine dissolved in 2 mL of glacial acetic acid.

**CAUTION:** *WEAR GLOVES for all the operations that use bromine. The bromine/acetic acid solution should be prepared in a hood by dispensing the bromine from a buret into 2 mL of glacial acetic acid contained in a 25-mL Erlenmeyer flask; the acetic acid solution of the bromine should also be added to the aromatic compound solution in a hood.*

Stir the mixture of bromine and your aromatic compound for 2 or 3 minutes, and then add slowly, with stirring, 25 mL of water.

*Note: The brominated product of anisole tends to 'oil out' instead of crystallizing. To obtain a solid, use a glass rod and keep scraping the oil against the inside of the flask. This may require some time so be patient!*

If necessary, add just enough concentrated sodium bisulfite solution to discharge any yellow bromine color. In the case of the brominated anisole, be sure to stir the orange oil until the color disappears.

Collect the product in a Büchner funnel by vacuum filtration; wash the crystals with three 25-mL portions of water. Continue the application of the vacuum so as to dry the crystals as well as possible.

*Note: Before recrystallizing, save a small sample for analysis by TLC.*

Weigh the crude product and then recrystallize from methanol. Determine the mass and measure the melting point of the purified product. Have your laboratory instructor inspect your product and initial your notebook.

#### *TLC Analysis*

Line a 250 mL beaker with piece of filter paper. Pour 5 mL of either 9:1 or 3:7 ethyl acetate/hexane eluent into the beaker, cover with plastic wrap and set aside.

Obtain a 2.5 × 7.5 cm TLC silica gel plate. With a pencil, mark the origin by making a very faint pencil line across the plate 1 cm from the bottom. Faintly mark three cross-hatch lines on the origin line to indicate where the solutions will be spotted. Spot solutions of your aromatic compound, the crude product, and the purified product on a TLC plate.

Place the spotted TLC plate into the ethyl acetate/hexane developing chamber. Use the chamber wall to support the plate, as shown in the figure above. Cover the chamber with a piece of plastic wrap, secured with a rubber band.

When the eluent front rises to within 1 cm of the top of the plate, remove the plate from the chamber and immediately mark the eluent front with a pencil. Allow the eluent to evaporate from the plate under a fume hood.

Examine the developed TLC plate under an ultraviolet light. Use a pencil to circle any visualized spots. Draw a picture of the TLC plate in your notebook. If the eluent you chose does not appear to provide adequate separation, repeat the analysis with the other ethyl acetate/hexane mixture.

Report your melting point and TLC data to your instructor before leaving lab.

#### *Cleaning Up*

Aqueous washes can be washed down the drain. Solids should be placed in the appropriate waste container.

## SAFETY DATA SHEET

Version 5.7

Revision Date 02/26/2015

Print Date 06/04/2015

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1. PRODUCT AND COMPANY IDENTIFICATION

## 1.1 Product identifiers

Product name : Bromine

Product Number : 207888  
Brand : Sigma-Aldrich  
Index-No. : 035-001-00-5

CAS-No. : 7726-95-6

## 1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

## 1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich  
3050 Spruce Street  
SAINT LOUIS MO 63103  
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

## 1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

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2. HAZARDS IDENTIFICATION

## 2.1 Classification of the substance or mixture

**GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Acute toxicity, Inhalation (Category 2), H330

Skin corrosion (Category 1A), H314

Serious eye damage (Category 1), H318

Acute aquatic toxicity (Category 1), H400

For the full text of the H-Statements mentioned in this Section, see Section 16.

## 2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H314

Causes severe skin burns and eye damage.

H318

Causes serious eye damage.

H330

Fatal if inhaled.

H400

Very toxic to aquatic life.

Precautionary statement(s)

P260

Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.

P264

Wash skin thoroughly after handling.

P271

Use only outdoors or in a well-ventilated area.

P273

Avoid release to the environment.

P280

Wear protective gloves/ protective clothing/ eye protection/ face

	protection.
P284	Wear respiratory protection.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P310	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/ physician.
P363	Wash contaminated clothing before reuse.
P391	Collect spillage.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

## 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

### 3.1 Substances

Formula	: Br <sub>2</sub>
Molecular weight	: 159.81 g/mol
CAS-No.	: 7726-95-6
EC-No.	: 231-778-1
Index-No.	: 035-001-00-5

#### Hazardous components

Component	Classification	Concentration
<b>Bromine</b>		
	Acute Tox. 2; Skin Corr. 1A; Eye Dam. 1; Aquatic Acute 1; H314, H330, H400	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

## 4. FIRST AID MEASURES

### 4.1 Description of first aid measures

#### General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

#### If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

#### In case of skin contact

Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

#### In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Continue rinsing eyes during transport to hospital.

#### If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

### 4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

### 4.3 Indication of any immediate medical attention and special treatment needed

No data available



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## 5. FIREFIGHTING MEASURES

### 5.1 Extinguishing media

#### Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

### 5.2 Special hazards arising from the substance or mixture

Hydrogen bromide gas

Container explosion may occur under fire conditions.

### 5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

### 5.4 Further information

May intensify fire; oxidiser.

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## 6. ACCIDENTAL RELEASE MEASURES

### 6.1 Personal precautions, protective equipment and emergency procedures

Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

For personal protection see section 8.

### 6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

### 6.3 Methods and materials for containment and cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

### 6.4 Reference to other sections

For disposal see section 13.

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## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

For precautions see section 2.2.

### 7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Do not store in polyethylene containers. Handle and open container with care.

Storage class (TRGS 510): Non-combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials

### 7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

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## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

#### Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Bromine	7726-95-6	TWA	0.100000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Upper Respiratory Tract irritation Lower Respiratory Tract irritation Lung damage		
		TWA	0.1 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation		

		Lower Respiratory Tract irritation Lung damage		
		STEL	0.200000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Lower Respiratory Tract irritation Lung damage		
		STEL	0.2 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Lower Respiratory Tract irritation Lung damage		
		TWA	0.100000 ppm 0.700000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		TWA	0.100000 ppm 0.700000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	0.300000 ppm 2.000000 mg/m3	USA. NIOSH Recommended Exposure Limits

## 8.2 Exposure controls

### Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

### Personal protective equipment

#### Eye/face protection

Tightly fitting safety goggles. Faceshield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

#### Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

#### Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

#### Splash contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

#### Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

#### Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering

controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

#### **Control of environmental exposure**

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

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## **9. PHYSICAL AND CHEMICAL PROPERTIES**

### **9.1 Information on basic physical and chemical properties**

a) Appearance	Form: liquid Colour: brown
b) Odour	suffocating
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 7.2 °C (45.0 °F) - lit.
f) Initial boiling point and boiling range	58.8 °C (137.8 °F) - lit.
g) Flash point	No data available
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	233 hPa (175 mmHg) at 20 °C (68 °F) 895 hPa (671 mmHg) at 55 °C (131 °F) 301.307 hPa (225.999 mmHg) at 25 °C (77 °F)
l) Vapour density	5.52 - (Air = 1.0)
m) Relative density	3.119 g/mL at 25 °C (77 °F)
n) Water solubility	36.5 g/l at 20 °C (68 °F)
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	1 mm <sup>2</sup> /s at 20 °C (68 °F) -
s) Explosive properties	No data available
t) Oxidizing properties	No data available

### **9.2 Other safety information**

Relative vapour density	5.52 - (Air = 1.0)
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## **10. STABILITY AND REACTIVITY**

### **10.1 Reactivity**

No data available

### **10.2 Chemical stability**

Stable under recommended storage conditions.

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

No data available

### 10.5 Incompatible materials

Reducing agents, Alkali metals, Powdered metals, Aluminum, Stainless steel, Iron, Copper, Organic materials, Bromine will attack some types of plastics, rubber, and coatings, Aldehydes, Ketones, arsenic powder, Amines, Amides, phenols, Alcohol, reacts violently with: Ammonia, Azides, Ozone

### 10.6 Hazardous decomposition products

Other decomposition products - No data available

In the event of fire: see section 5

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## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

#### Acute toxicity

LD50 Oral - Rat - 2,600 mg/kg

Inhalation: No data available

Dermal: No data available

No data available

#### Skin corrosion/irritation

No data available

#### Serious eye damage/eye irritation

No data available

#### Respiratory or skin sensitisation

No data available

#### Germ cell mutagenicity

in vitro assay

S. typhimurium

Result: negative

Mouse - male and female

Result: negative

#### Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

#### Reproductive toxicity

No data available

No data available

#### Specific target organ toxicity - single exposure

No data available

#### Specific target organ toxicity - repeated exposure

No data available

**Aspiration hazard**

No data available

**Additional Information**

RTECS: EF9100000

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, Cyanosis, Cardiovascular effects., Respiratory disorders, Lachrymation, Nose bleeding, Vertigo, Irritability, loss of appetite, joint pain, Abdominal pain, Diarrhoea, hoarseness

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Liver - Irregularities - Based on Human Evidence

Liver - Irregularities - Based on Human Evidence

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**12. ECOLOGICAL INFORMATION****12.1 Toxicity**

Toxicity to daphnia and other aquatic invertebrates LC50 - Daphnia magna (Water flea) - 1 mg/l - 48 h

**12.2 Persistence and degradability**

No data available

**12.3 Bioaccumulative potential**

No data available

**12.4 Mobility in soil**

No data available

**12.5 Results of PBT and vPvB assessment**

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 Other adverse effects**

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life.

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**13. DISPOSAL CONSIDERATIONS****13.1 Waste treatment methods****Product**

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

**Contaminated packaging**

Dispose of as unused product.

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**14. TRANSPORT INFORMATION****DOT (US)**

UN number: 1744 Class: 8 (6.1) Packing group: I

Proper shipping name: Bromine

Reportable Quantity (RQ):

Poison Inhalation Hazard: Hazard zone A

**IMDG**

UN number: 1744 Class: 8 (6.1) Packing group: I EMS-No: F-A, S-B

Proper shipping name: BROMINE

Marine pollutant: yes

**IATA**

UN number: 1744 Class: 8 (6.1)

Proper shipping name: Bromine

IATA Passenger: Not permitted for transport  
IATA Cargo: Not permitted for transport

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## 15. REGULATORY INFORMATION

### SARA 302 Components

The following components are subject to reporting levels established by SARA Title III, Section 302:

	CAS-No.	Revision Date
Bromine	7726-95-6	2007-07-01

### SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Bromine	7726-95-6	2007-07-01

### Massachusetts Right To Know Components

	CAS-No.	Revision Date
Bromine	7726-95-6	2007-07-01

### Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Bromine	7726-95-6	2007-07-01

### New Jersey Right To Know Components

	CAS-No.	Revision Date
Bromine	7726-95-6	2007-07-01

### California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

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## 16. OTHER INFORMATION

### Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Eye Dam.	Serious eye damage
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H330	Fatal if inhaled.
H400	Very toxic to aquatic life.
Skin Corr.	Skin corrosion

### HMIS Rating

Health hazard:	4
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

### NFPA Rating

Health hazard:	4
Fire Hazard:	0
Reactivity Hazard:	0

### Further information

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**Preparation Information**

Sigma-Aldrich Corporation  
Product Safety – Americas Region  
1-800-521-8956

Version: 5.7

Revision Date: 02/26/2015

Print Date: 06/04/2015