

Standard Operating Procedures

Bromine

Department:	Chemistry
Date SOP was written:	April 16, 2014
Principal Investigator:	Dr. Greg Boyce
Location:	Whitaker Hall Room 243

Section 1: Process, Hazardous Chemical, or Hazardous Class

Chemical(s)	Use(s)
Bromine	<ol style="list-style-type: none"> 1. Bromine is used in the lab as a reagent in chemical reactions. 2. Preparation of dilution solutions of bromine.

Section 2: Definition of Chemical group and Properties

CAS#: 7726-95-6

Molecular Formula: Br₂

Form (physical state): Liquid

Color: Brown

Melting point/freezing point: 7.2°C (45.0°F)

Boiling point: 58.8°C (137.8 °F)

Vapor Pressue: 233 hPa (175 mmHg) at 20°C (68 °F)

Density: 3.119 g/mL at 25°C (77°F)

Flash point: N/A

Lower explosion limit: N/A

Upper explosion limit: N/A

Odor: N/A

Section 3: Potential Hazards



Pictograms:

GHS Classification

Acute toxicity, Oral (Category 5)
Acute toxicity, inhalation (Category 1)
Skin corrosion (Category 1A)
Serious eye damage (Category 1)
Acute aquatic toxicity (Category 1)

Hazard Statement (s)

H303 May be harmful if swallowed.
H314 Causes severe skin burns and eye damage.
H330 Fatal if inhaled.
H400 Very toxic to aquatic life.

Precautionary statement (s)

P260 Do not breathe dust/fume/gas/mist/vapors/spray.
P273 Avoid release to the environment.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P284 Wear respiratory protection.
P305
+ P351
+ P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310 Immediately call a POISON CENTER or doctor/physician.

Section 4: Personal Protective Equipment

Use what is listed below unless other lab-specific information is included in the Protocol/Procedure section.

Eye and Face Protection

ANSI-approved safety glasses with side shields or chemical splash goggles must be worn at all times when handling chemicals in the lab.

Skin and Body Protection

1. Gloves are required when handling hazardous chemicals.
 - a. Specific glove type recommendations are provided in the Protocol/Procedure section.
 - b. Inspect gloves prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Wash and dry hands after handling chemicals, before breaks, and at the end of the workday.
2. Lab coats are required when handling hazardous chemicals in the lab.
 - a. Nomex 3A flame-resistant lab coats are required when working with pyrophorics (H250) and explosives (H200, H201, H202, H203)
 - b. Flame resistant lab coats (Nomex or other material) should be worn when working with hazardous chemicals as a Category 1 or 2 flammable liquids (H224 and H225).
3. Cotton-based, non-synthetic clothing (including long pants; no skin exposed below the waist) should be worn.
4. Closed-toe and closed-heel shoes are required in the lab.

Section 5: Engineering Controls

The following is the set of engineering controls required:

- A laboratory type fume hood with the sash position closed as much as possible
- A glove box for pyrophorics and water reactive chemicals. Glove boxes may also be required for other chemicals, such as regulated carcinogens and particularly hazardous substances;
- Supplemental protective equipment like a blast shield, where appropriate, to protect from explosions when using peroxide formers, pyrophorics, water reactives, and potentially explosive chemicals.

Section 6: Special Handling and Storage Requirements

Working alone- Certain extremely hazardous operations should not be performed if the PI is not present (Dr. Boyce). Never work alone with extremely hazardous materials/operations.

Precautions for safe handling

- Avoid contact with skin and eyes. Avoid formation of vapors, dusts, mists, and aerosols.
- Use appropriate exhaust ventilation.
- Use appropriate personal protective equipment.
- Remove incompatible chemicals from immediate work area.
- Keep flammable, pyrophoric, potentially explosive and water reactive chemicals away from sources of ignition.
- Use care when preparing chemical solutions

Conditions for safe storage

- Keep quantities to a minimum.
- Keep containers tightly closed and in a cool, dry and well-ventilated location.
- Keep in proper storage cabinets and shelving. Use lowest shelf possible.
- Assure chemicals are properly labeled.
- Segregate incompatible chemicals.
- Store carcinogens in a designated area.

Section 7: Spill and Accident Procedures

Spill- Assess the extent of danger; if necessary request help by calling **911**. If you cannot assess the conditions of the environment well enough to be sure of your own safety, do not enter the area. If possible help contaminated or injured persons. Evacuate the spill area. Avoid breathing vapors from spill. If possible, confine the spill to a small area using a spill kit or absorbent material. Keep others from entering contaminated area (e.g., use caution tape, barriers, etc.).

Minor Spill- In the event of a minor spill, if there is no potential hazardous chemical exposure, report the spill and proceed to clean it, if you are trained. Use appropriate personal protective equipment and clean-up material for chemical spilled. Double bag spill waste in clear plastic bags, label and take to the next chemical waste pick-up location.

Major Spill- Any hazardous chemical spill that involves chemical exposure, any chemical spill that due to size and/or hazard requires capabilities beyond your training, or any chemical spill that gives the perception (because of odor, for example) that there has been a hazardous release call **911** and report the spill for assistance.

- DO NOT use water to attempt to extinguish a reactive material fire as it can enhance the combustion of some reactive materials, e.g. metal compounds.
- Do not use combustible materials (paper towels) to clean up a spill, as these may increase the risk of igniting the reactive compound. Soda ash (powdered lime) or dry sand should be used to completely smother and cover any small spill that occurs. Also for a very small spill (i.e. tip of the needle) you can let the material burn itself out in the fume hood.
- A container of Metal X, soda ash (powdered lime) or dry sand should be kept within arm's length when working with a reactive material.
- If anyone is exposed, or on fire, drench in the safety shower with copious amounts of water.
- In the case of a metal fire, smothering the fire is a better course of action than use of water.
- The recommended fire extinguisher is a standard dry powder (ABC) type. Class D extinguishers are recommended for combustible solid metal fires (e.g. sodium, LAH), but not for organolithium reagents. Contact the EH&S Fire Prevention team and/or review the MSDS for the appropriate fire extinguisher.
- Call **9-1-1** for emergency assistance and for assistance with all fires, even if extinguished.
- Associated fires, should be extinguished by remotely stopping the gas flow.

Section 8: Decontamination Procedures:

- Wearing proper PPE, laboratory work surfaces should be cleaned at the end of each work day.
- All materials - disposable gloves, wipers, bench paper, etc. - that are contaminated with chemicals should be disposed of as hazardous waste. Proper and complete hazardous waste labeling of containers is important.
- The contaminated waste should be placed in a metal container away from other combustibles to prevent fires. Verify the material is no longer pyrophoric before placing waste in with other combustible waste.

Section 9: Waste Disposal Procedures:

Wearing proper PPE, decontaminate equipment and bench tops using soap and water. Dispose of the used chemical and contaminated disposables as hazardous waste following the guidelines below.

General hazardous waste disposal guidelines:

Label Waste

- Hazardous waste labels must be placed on the hazardous waste container upon the start of accumulation.

Store Waste

- Hazardous waste containers must be kept closed, except when adding waste.
- Hazardous waste containers must be stored in secondary containment to adequately contain all of the contents of the container.
- Hazardous waste containers must be inspected weekly for signs of leaks, corrosion, or deterioration.

Dispose of Waste

- Hazardous waste must be transferred to EH&S for disposal within 6 months of being generated.
- Empty Containers: At no time should full or partially full containers be placed in the trash.
- Do not dispose of chemicals by pouring them down the drain or placing them in the trash.
- Do not use fume hoods to evaporate chemicals.

Section 10: Material Safety Data Sheet Locations:

SDS can be accessed online at <http://ucmsds.com>