

## **Tab 1:**

# **Specific Standard Operating Procedures**

# Standard Operating Procedure

## Acutely Toxic Materials

Print a copy and insert into your *Lab-Specific Chemical Hygiene Plan*.

### Section 1 – Lab-Specific Information

<b>Department:</b>	Chemistry
<b>Date SOP was written:</b>	9/15/2014
<b>Date SOP was approved by PI/lab supervisor:</b>	9/15/2014
<b>Principal Investigator:</b>	Christopher Uyeda
<b>Internal Lab Safety Coordinator/Lab Manager:</b>	Heather Schoonover
<b>Lab Phone:</b>	
<b>Office Phone:</b>	49-41602
<b>Emergency Contact:</b>	Heather Schoonover, 217-343-2996 (Name and Phone Number)
<b>Location(s) covered by this SOP:</b>	WTHR 419, 423A (Building/Room Number)

### Section 2 – Type of SOP:

Process       Hazardous Chemical       Hazardous Class

### Section 3 – Physical / Chemical Properties and Uses

#### Physical / Chemical Properties:

CAS#: N/A

GHS Classification: Highly toxic by inhalation, ingestion, and skin absorption (many acutely toxic chemicals are also carcinogenic, and may have other hazards such as target organ effect and/or corrosivity)

Molecular Formula: N/A

Form (physical state): N/A

Color: N/A

Boiling Point: N/A

Flash Point: N/A

Lower Explosive Limit: N/A

Upper Explosive Limit: N/A

Relative Vapor Density: N/A

**Important Definitions:**

- **Lethal Dose-50 (LD<sub>50</sub>):** The amount of a substance that, when administered to a group of experimental animals, will kill 50% of the group in a specified time.
- **Lethal Concentration-50 (LC<sub>50</sub>):** The concentration of a substance that, when administered to a group of experimental animals, will kill 50% of the group in a specified time.
- **Permissible Exposure Limit (PEL):** The maximum amount or concentration of a chemical that a worker may be exposed to under OSHA regulations. PELs are based on an 8-hour time weighted average (TWA) exposure.
- **Immediately Dangerous to Life and Health:** The airborne concentration of a contaminant that poses an immediate threat to life and health likely to cause death of immediate or delayed permanent adverse health effects or prevent escape from such an environment.
- **Toxic Chemical:** A chemical falling within any of the following categories:
  - a. A chemical that has a median lethal dose (LD<sub>50</sub>) of more than 50 milligrams per kilogram but not more than 500 milligrams per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.
  - b. A chemical that has a median lethal dose (LD<sub>50</sub>) of more than 200 milligrams per kilogram but not more than 1,000 milligrams per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between two and three kilograms each.
  - c. A chemical that has a median lethal concentration (LC<sub>50</sub>) in air of more than 200 parts per million but not more than 2,000 parts per million of gas or vapor, or more than two milligrams per liter but not more than 20 milligrams per liter of mist, fume, or dust, when administered by continuous inhalation for one hour (or less if death occurs within one hour) to albino rats weighing between 200 and 300 grams each.
- **Carcinogen:** A chemical is considered to be a carcinogen if:
  - a. It has been evaluated by the International Agency for Research on Cancer (IARC), and found to be a carcinogen or potential carcinogen; or
  - b. It is listed as a carcinogen or potential carcinogen in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (Latest edition); or
  - c. It is regulated by OSHA as a carcinogen.

**Section 4 – Potential Hazards**

Highly toxic by inhalation. Highly toxic by ingestion. Highly toxic by skin absorption. Many acutely toxic chemicals are also carcinogenic, and may have other hazards such as target organ effect, pose an environmental hazard, and/or corrosivity, etc. Make sure that all of the potential hazards are understood before handling any chemical.



## **Section 5 – Personal Protective Equipment (PPE)**

### **Respirator Protection:**

Acutely toxic chemicals should never be used outside of a chemical fume hood. If working with an acutely toxic compound, contact REM so a respiratory protection analysis can be performed. Respirators should be used under any of the following circumstances:

- As a last line of defense (i.e., after engineering and administrative controls have been exhausted).
- When Permissible Exposure Limit (PEL) has exceeded or when there is a possibility that PEL will be exceeded.
- Regulations require the use of a respirator.
- An employer requires the use of a respirator.
- There is potential for harmful exposure due to an atmospheric contaminant (in the absence of PEL)
- As PPE in the event of a chemical spill clean-up process

Lab personnel intending to use/wear a respirator mask must be trained and fit-tested by REM. This is a regulatory requirement. (<http://www.purdue.edu/rem/home/booklets/RPP98.pdf>)

### **Hand Protection:**

Chemical-resistant gloves must be worn. Use proper glove removal technique to avoid any skin contact. Wearing two pairs of chemical-resistant gloves is recommended. It is critical that the glove being worn is resistant to the particular acutely toxic chemical. Check the resources below for the most suitable glove. Also check the SDS for the specific acutely toxic compound being handled.

**NOTE:** Consult with your preferred glove manufacturer to ensure that the gloves you plan on using are compatible with the specific acutely toxic compound being used.

Refer to glove selection chart from the links below:

[http://www.ansellpro.com/download/Ansell\\_8thEditionChemicalResistanceGuide.pdf](http://www.ansellpro.com/download/Ansell_8thEditionChemicalResistanceGuide.pdf)

OR

<http://www.showabestglove.com/site/default.aspx>

OR

<http://www.mapaglove.com/>

### **Eye Protection:**

ANSI approved properly fitting safety glasses or chemical splash goggles are required.

### **Skin and Body Protection:**

Laboratory coats must be worn and be appropriately sized for the individual and buttoned to their full length. Laboratory coat sleeves must be of sufficient length to prevent skin exposure while wearing gloves. Personnel must also wear full length pants, or equivalent, and close-toed shoes. Full length pants and close-toed shoes must

be worn at all times by all individuals that are occupying the laboratory area. The area of skin between the shoe and ankle must not be exposed.

**Hygiene Measures:**

Wash thoroughly and immediately after handling. Remove any contaminated clothing and wash before reuse.

**Section 6 – Engineering Controls**

Use of acutely toxic compounds should be conducted in a properly functioning chemical fume hood whenever possible. The chemical fume hood must be approved and certified by REM and have a face velocity between 85 – 125 feet per minute.

**Section 7 – First Aid Procedures**

**If inhaled:**

Move into the fresh air immediately and seek immediate medical attention. If not breathing give artificial respiration and seek immediate medical attention.

**In case of skin contact:**

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash any contaminated clothing before reuse. Thoroughly clean shoes before reuse. Seek immediate medical attention.

**In case of eye contact:**

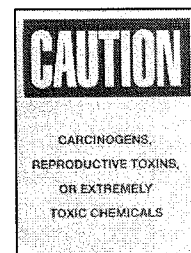
Check for and remove any contact lenses. Rinse thoroughly with plenty of water for at least 15 minutes. Seek immediate medical attention.

**If swallowed:**

Do NOT induce vomiting unless directed by medical personnel. Never give anything by mouth to an unconscious person. Seek immediate medical attention.

**Section 8 – Special Handling and Storage Requirements**

- A designated storage area must be established for acutely toxic chemicals and the area should be posted with a “Caution, Carcinogen, Reproductive Toxins, or Extremely Toxic Chemicals” label provided by REM (as shown to the right).
- Suitable storage locations include desiccators, glove boxes, flammable storage cabinets that do not contain incompatible chemicals (primarily strong acids), or non-domestic refrigerators or freezers.
- Acutely toxic materials should be stored in secondary containment at all times as a precautionary measure. If possible, store all acutely toxic materials in a cabinet dedicated only for reactive materials. Signs should be posted to indicate their presence and unique hazards.
- The amount of acutely toxic material stored in the lab should be kept at a minimum. Any expired or unnecessary materials should be properly disposed of as hazardous waste.
- All acutely toxic materials should be clearly labeled with the original manufacturer’s label, which should have the chemical name, hazard labels, and pictograms. The label should not be defaced in any way.
- Do not over purchase; only purchase what can be safely stored in the laboratory.
- Avoid contact with skin, eyes, and inhalation.



- Keep away from sources of ignition.
- Keep containers tightly closed. Store in a cool, dry, and well-ventilated area away from incompatible substances such as strong acids.

## **Section 9 – Spill and Accident Procedures**

### **Chemical Spill Dial 911**

Immediately evacuate area and ensure others are aware of the spill. If there is an imminent threat of a fire, pull the nearest fire alarm station to evacuate the building and **dial 911**. If the spill is minor and does not pose a threat to personnel, contact REM at 49-40121 during normal business hours (7 AM – 4 PM) for spill cleanup assistance (dial 911 if spill occurs after hours and assistance is needed).

### **Chemical Spill on Body or Clothes:**

Remove clothing and rinse body thoroughly in emergency shower for at least 15 minutes. Seek medical attention; **dial 911**.

### **Chemical Splash into Eyes:**

Immediately rinse eyes and inner surface of eyelid with water from the emergency eyewash station for 15 minutes by forcibly holding the eye open. Seek medical attention; **dial 911**.

## **Section 10 – Medical Emergency**

### **Life Threatening Emergency, After Hours, Weekends And Holidays:**

Dial 911

### **Non-Life Threatening Emergency:**

Immediately report injury to supervisor and complete the First Report of Injury.  
(<http://www.purdue.edu/rem/injury/froi.htm>)

## **Section 11 – Waste Disposal Procedures**

### **Label Waste:**

Make sure the waste container(s) is properly labeled; label should indicate all of the contents of the container. REM provides hazardous waste labels free of charge, call 49-40121 to obtain labels.

### **Store Waste:**

Store hazardous waste in closed containers, and in a designated area.

### **Dispose of Waste:**

Complete a Chemical Waste Pickup Request Form to arrange for disposal by REM. Call REM at 49-40121 or visit the REM webpage for questions (<http://www.purdue.edu/rem/hmm/wststo.htm>). No acutely toxic compounds (including low concentration solutions) are permitted to be poured down the drain.

## **Section 12 – Safety Data Sheet (SDS)**

A current copy of the SDS for the specific acutely toxic compound being used must be made available to all personnel working in the laboratory at all times. To obtain a copy of the SDS, contact the chemical manufacturer or REM at 49-46371. Many manufacturers' SDSs can be found online on websites such as Sigma-Aldrich (<http://www.sigmaaldrich.com/united-states.html>) or Siri MSDS Index (<http://hazard.com/msds/>).

**Section 13 – Protocol/Procedure (Additional lab protocol may be added here)**



Click here to enter text.

NOTE: Any deviation from this SOP requires approval from PI.

**Section 14 – Documentation of Training (signature of all users is required)**

- Prior to conducting any work with acutely toxic materials, designated personnel must provide training to his/her laboratory personnel specific to the hazards involved in working with this substance, work area decontamination, and emergency procedures.
- The Principal Investigator must provide his/her laboratory personnel with a copy of this SOP and a copy of the SDS provided by the manufacturer.
- The Principal Investigator must ensure that his/her laboratory personnel have attended appropriate laboratory safety training or refresher training within the last one year.

**I have read and understand the content of this SOP:**

Name	Signature	Date
Heather Schoonover		Click here to enter a date. 9/15/14
Ian Powers		Click here to enter a date.
Colby Adolph		Click here to enter a date. 9.17.14
Talia Steiman		Click here to enter a date. 9/17/14
Douglas Hartline		Click here to enter a date. 9/17/14
Sudipta Pal		Click here to enter a date. 9/19/14
Youyun Zhou		Click here to enter a date. 09/17/2014
Ramajeyam Selvaraj		Click here to enter a date. 09-17-2014
Aaron Spesard		Click here to enter a date. 9-18-14
Jordan Rogers		Click here to enter a date. 9-22-14
Click here to enter text.		Click here to enter a date.
Click here to enter text.		Click here to enter a date.
Click here to enter text.		Click here to enter a date.



# Standard Operating Procedure

## Benzene

Print a copy and insert into your *Lab-Specific Chemical Hygiene Plan*.

### Section 1 – Lab-Specific Information

<b>Department:</b>	Chemistry
<b>Date SOP was written:</b>	9/15/2014
<b>Date SOP was approved by PI/lab supervisor:</b>	9/15/2014
<b>Principal Investigator:</b>	Christopher Uyeda
<b>Internal Lab Safety Coordinator/Lab Manager:</b>	Heather Schoonover
<b>Lab Phone:</b>	Click here to enter text.
<b>Office Phone:</b>	49-46102
<b>Emergency Contact:</b>	Heather Schoonover, 217-343-2996 <i>(Name and Phone Number)</i>
<b>Location(s) covered by this SOP:</b>	Wetherill 419, 423A <i>(Building/Room Number)</i>

### Section 2 – Type of SOP:

Process       Hazardous Chemical       Hazardous Class

### Section 3 – Physical / Chemical Properties

#### Physical / Chemical Properties:

CAS#: 71-43-2

GHS Classification: Flammable Liquid, Carcinogen, Target Organ Effect, Irritant, Mutagen

Molecular Formula: C<sub>6</sub>H<sub>6</sub>

Form (physical state): Liquid

Color: Colorless

Boiling Point: 80 °C

Flash Point: -11 °C

Lower Explosive Limit: 1.3% (V)

Upper Explosive Limit: 8% (V)

#### **Section 4 – Potential Hazards**

Benzene is an OSHA regulated carcinogen. It is a highly flammable liquid and may form explosive mixtures with air. Harmful if inhaled, causes respiratory tract irritation. Harmful if absorbed through skin. Causes eye and skin irritation. May cause cancer and genetic defects.

##### **Exposure Limits:**

OSHA PEL (8 HR. TWA):	0.5 ppm
OSHA Short Term Exposure Limit:	1 ppm
ACGIH TLV/TWA:	0.1 ppm



#### **Section 5 – Personal Protective Equipment (PPE)**

##### **Respirator Protection:**

Respirators should be used only under any of the following circumstances:

- As a last line of defense (i.e., after engineering and administrative controls have been exhausted).
- When Permissible Exposure Limit (PEL) has exceeded or when there is a possibility that PEL will be exceeded.
- Regulations require the use of a respirator.
- An employer requires the use of a respirator.
- There is potential for harmful exposure due to an atmospheric contaminant (in the absence of PEL)
- As PPE in the event of a chemical spill clean-up process

Lab personnel intending to use/wear a respirator mask must be trained and fit-tested by REM. This is a regulatory requirement. (<http://www.purdue.edu/rem/home/booklets/RPP98.pdf>)

##### **Hand Protection:**

Gloves must be worn. Use proper glove removal technique to avoid any skin contact. Nitrile and latex disposable gloves are NOT suitable. Viton gloves are recommended. Check the resources below for a more suitable glove.

NOTE: Consult with your preferred glove manufacturer to ensure that the gloves you plan on using are compatible with Benzene.

Refer to glove selection chart from the links below:

[http://www.ansellpro.com/download/Ansell\\_8thEditionChemicalResistanceGuide.pdf](http://www.ansellpro.com/download/Ansell_8thEditionChemicalResistanceGuide.pdf)

OR

<http://www.showabestglove.com/site/default.aspx>

OR

<http://www.mapaglove.com/>

**Eye Protection:**

ANSI approved properly fitting safety glasses or chemical splash goggles. Face shield is also recommended if there is a high probability of a splash hazard.

**Skin and Body Protection:**

Lab coats (100% cotton) must be worn and be appropriately sized for the individual and buttoned to their full length. Flame resistant lab coats should be worn if handling more than 1 liter of benzene. Laboratory coat sleeves must be of sufficient length to prevent skin exposure while wearing gloves. Personnel must also wear full length pants, or equivalent, and close-toed shoes. Full length pants and close-toed shoes must be worn at all times by all individuals that are occupying the laboratory area. The area of skin between the shoe and ankle must not be exposed.

**Hygiene Measures:**

Wash thoroughly and immediately after handling. Remove any contaminated clothing and wash before reuse.

**Section 6 – Engineering Controls**

Use of Benzene must be conducted in a properly functioning chemical fume hood. The chemical fume hood must be approved and certified by REM and have a face velocity between 85 – 125 feet per minute.

**Section 7 – First Aid Procedures**

**If inhaled:**

Move into the fresh air immediately and give oxygen. If not breathing give artificial respiration. Consult a physician.

**In case of skin contact:**

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash any contaminated clothing before reuse. Consult a physician.

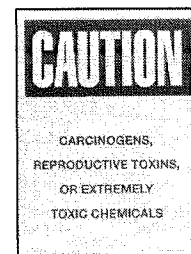
**In case of eye contact:**

Check for and remove any contact lenses. Rinse thoroughly with plenty of water for at least 15 minutes. Seek immediate medical attention and continue eye rinse during transport to hospital.

**If swallowed:**

Do NOT induce vomiting unless directed by medical personnel. Never give anything by mouth to an unconscious person. Consult a physician.

**Section 8 – Special Handling and Storage Requirements**



- A designated storage area must be established for Benzene and the area should be posted with a “Caution, Carcinogen, Reproductive Toxins, or Extremely Toxic Chemicals” label provided by REM (as shown to the right).
- Avoid contact with skin and eyes and inhalation.
- Keep away from sources of ignition.
- Keep containers tightly closed.
- Store in a cool, dry and well-ventilated area away from incompatible substances such as oxidizers.
- A suitable storage location is a flammable storage cabinet that does not contain incompatibles.

## **Section 9 – Spill and Accident Procedures**

### **Chemical Spill Dial 911**

Immediately evacuate area and ensure others are aware of the spill. If there is an imminent threat of a fire, pull the nearest fire alarm station to evacuate the building and **dial 911**. If the spill is minor and does not pose a threat to personnel, contact REM at 49-40121 during normal business hours (7 AM – 4 PM) for spill cleanup assistance (dial 911 if spill occurs after hours and assistance is needed).

### **Chemical Spill on Body or Clothes:**

Remove clothing and rinse body thoroughly in emergency shower for at least 15 minutes. Seek medical attention; **dial 911**.

### **Chemical Splash into Eyes:**

Immediately rinse eyes and inner surface of eyelid with water from the emergency eyewash station for 15 minutes by forcibly holding the eye open. Seek medical attention; **dial 911**.

## **Section 10 – Medical Emergency**

### **Life Threatening Emergency, After Hours, Weekends And Holidays:**

#### **Dial 911**

### **Non-Life Threatening Emergency:**

Immediately report injury to supervisor and complete the First Report of Injury.  
(<http://www.purdue.edu/rem/injury/froi.htm>)

## **Section 11 – Waste Disposal Procedures**

### **Label Waste:**

Make sure the waste container(s) is properly labeled; label should indicate all of the contents of the container. REM provides hazardous waste labels free of charge, call 49-40121 to obtain labels.

### **Store Waste:**

Store hazardous waste in closed containers, and in a designated area (flammable cabinet is recommended).

### **Dispose of Waste:**

Complete a Chemical Waste Pickup Request Form to arrange for disposal by REM. Call REM at 49-40121 or visit the REM webpage for questions. (<http://www.purdue.edu/rem/hmm/wststo.htm>)

**Section 12 – Safety Data Sheet (SDS)**

A current copy of the SDS for Benzene must be made available to all personnel working in the laboratory at all times. To obtain a copy of the SDS, contact the chemical manufacturer or REM at 49-46371. Many manufacturers' SDSs can be found online on websites such as Sigma-Aldrich (<http://www.sigmaaldrich.com/united-states.html>) or Siri MSDS Index (<http://hazard.com/msds/>).


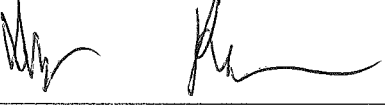

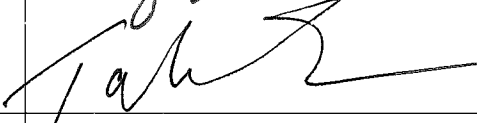
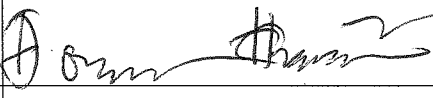
**Section 13 – Protocol/Procedure**

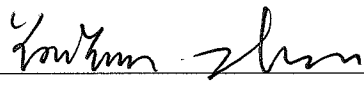
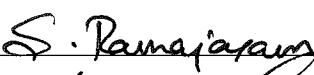
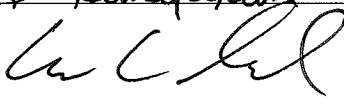

PPE required while handling (gloves, goggles, lab coat, pants that cover ankles, and closed toed shoes required).

**Section 14 – Documentation of Training**

- Prior to conducting any work with Benzene, designated personnel must provide training to his/her laboratory personnel specific to the hazards involved in working with this substance, work area decontamination, and emergency procedures.
- The Principal Investigator must provide his/her laboratory personnel with a copy of this SOP and a copy of the SDS provided by the manufacturer.
- The Principal Investigator must ensure that his/her laboratory personnel have attended appropriate laboratory safety training or refresher training within the last one year.

I have read and understand the content of this SOP:

Name	Signature	Date
Heather Schoonover		Click here to enter a date. 9/15/14
Ian Powers		Click here to enter a date.
Colby Adolph		Click here to enter a date. 9.17.14
Talia Steiman		Click here to enter a date. 9/17/14
Douglas Hartline		Click here to enter a date. 9/17/2014
Sudipta Pal	Sudipta Pal	Click here to enter a date. 9/19/14

Name	Signature	Date
Youyun Zhou		Click here to enter a date. 09/17/2014
Ramajeyan Selvaraj		Click here to enter a date. 09-17-2014
Aaron Spesard		Click here to enter a date. 9-18-14
Jordan Rogers		Click here to enter a date. 9-22-14
Click here to enter text.		Click here to enter a date.
Click here to enter text.		Click here to enter a date.
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# Standard Operating Procedure

## Bromine

Print a copy and insert into your *Lab-Specific Chemical Hygiene Plan*.

### Section 1 – Lab-Specific Information

Department:	Chemistry
Date SOP was written:	9/15/2014
Date SOP was approved by PI/lab supervisor:	9/15/2014
Principal Investigator:	Christopher Uyeda
Internal Lab Safety Coordinator/Lab Manager:	Heather Schoonover
Lab Phone:	
Office Phone:	49-46102
Emergency Contact:	Heather Schoonover, 217-343-2996 <i>(Name and Phone Number)</i>
Location(s) covered by this SOP:	Wetherill 419, 423A <i>(Building/Room Number)</i>

### Section 2 – Type of SOP:

Process       Hazardous Chemical       Hazardous Class

### Section 3 – Physical / Chemical Properties and Uses

#### Physical / Chemical Properties:

CAS#: 7726-95-6

GHS Classification: Toxic, Corrosive

Molecular Formula: Br<sub>2</sub>

Form (physical state): Fuming Liquid

Color: Red-Brown

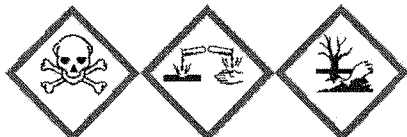
Boiling Point: 58.8 °C (137.8 °F)

#### Uses:

Bromine is mainly used in brominated flame retardants. Bromine compounds can also be used for water treatments, as a gasoline additive, in pesticides, in photographic chemicals, and in the manufacture of pharmaceuticals.

## Section 4 – Potential Hazards

Bromine is a strong oxidizer. It is corrosive and can cause severe burns to the skin and eyes. It is extremely destructive to the tissue of the mucous membranes and upper respiratory tract. It may be harmful if inhaled, ingested, or absorbed through the skin. Symptoms of exposure include burning sensation, coughing, 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, diarrhea, ulceration, dizziness, pulmonary edema, hoarseness, and permanent corneal opacification. Prolonged exposure may cause lung damage. Bromine has a permissible exposure limit (PEL) of 0.7 mg/m<sup>3</sup>.



## Section 5 – Personal Protective Equipment (PPE)

### Respirator Protection:

If Bromine is being used outside of a chemical fume hood, respiratory protection may be required. If this activity is absolutely necessary, contact REM so a respiratory protection analysis can be performed. Respirators should be used under any of the following circumstances:

- As a last line of defense (i.e., after engineering and administrative controls have been exhausted).
- When Permissible Exposure Limit (PEL) has exceeded or when there is a possibility that PEL will be exceeded.
- Regulations require the use of a respirator.
- An employer requires the use of a respirator.
- There is potential for harmful exposure due to an atmospheric contaminant (in the absence of PEL)
- As PPE in the event of a chemical spill clean-up process

Lab personnel intending to use/wear a respirator mask must be trained and fit-tested by REM. This is a regulatory requirement. (<http://www.purdue.edu/rem/home/booklets/RPP98.pdf>)

### Hand Protection:

Gloves must be worn. Use proper glove removal technique to avoid any skin contact. Neoprene, nitrile, and fluorinated rubber gloves are recommended. Check the resources below for the most suitable glove.

**NOTE:** Consult with your preferred glove manufacturer to ensure that the gloves you plan on using are compatible with the chemical being used.

Refer to glove selection chart from the links below:

[http://www.ansellpro.com/download/Ansell\\_8thEditionChemicalResistanceGuide.pdf](http://www.ansellpro.com/download/Ansell_8thEditionChemicalResistanceGuide.pdf)

OR



<http://www.showabestglove.com/site/default.aspx>

OR

<http://www.mapaglove.com/>

**Eye Protection:**

ANSI approved properly fitting safety glasses or chemical splash goggles are required. A face shield may also be appropriate depending on the specific application.

**Skin and Body Protection:**

Laboratory coats must be worn and be appropriately sized for the individual and buttoned to their full length. Laboratory coat sleeves must be of sufficient length to prevent skin exposure while wearing gloves. Personnel should also wear full length pants, or equivalent, and close-toed shoes. Full length pants and close-toed shoes must be worn at all times by all individuals that are occupying the laboratory area. The area of skin between the shoe and ankle should not be exposed.

**Hygiene Measures:**

Wash thoroughly and immediately after handling. Rinse immediately contaminated clothing and skin with plenty of water before removing clothes.

**Section 6 – Engineering Controls**

Use of Bromine should be conducted in a properly functioning chemical fume hood whenever possible. The chemical fume hood must be approved and certified by REM and have a face velocity between 85 – 125 feet per minute.

**Section 7 – First Aid Procedures**

**If inhaled:**

Move into the fresh air immediately. Consult a physician. If not breathing give artificial respiration and seek immediate medical attention.

**In case of skin contact:**

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash any contaminated clothing before reuse. Thoroughly clean shoes before reuse. Consult a physician.

**In case of eye contact:**

Check for and remove any contact lenses. Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Seek immediate medical attention.

**If swallowed:**

Do NOT induce vomiting unless directed by medical personnel. Never give anything by mouth to an unconscious person. Seek immediate medical attention.

**Section 8 – Special Handling and Storage Requirements**

- Do not over purchase; only purchase what can be safely stored in the laboratory.
- Avoid contact with skin, eyes, and clothing. Avoid inhalation of vapor or mist. Avoid formation of dust.

- Always use inside a chemical fume hood.
- Use spark-proof tools and explosion-proof equipment. Keep away from heat and sources of ignition- No smoking. Prevent the build-up of electrostatic charge.
- Handle bromine only with equipment made of Kynar, Teflon, Monel, Pyrex, glass, or lead-lined steel.
- Keep container upright & tightly closed in a dry and well-ventilated place.
- Containers which are opened must be carefully resealed and kept upright to prevent leakage.
- Keep away from incompatible materials such as reducing agents, alkali metals, powdered metals, aluminum, stainless steel, iron, copper, organic materials, aldehydes, ketones, arsenic powder, amines, amides, phenols, alcohol, ammonia, azides, and ozone. Bromine will attack some types of plastics, rubber, and coatings.
- Use in the smallest practical quantities for the experiment being performed.
- Containers should remain closed when not in use. Do not store in polyethylene containers.
- Containers should be labeled appropriately. Label should indicate the name of the chemical(s) in the container. Avoid using chemical abbreviations (acceptable if a legend is present in the lab) and formulae.

## **Section 9 – Spill and Accident Procedures**

### **Chemical Spill Dial 911**

Immediately evacuate area and ensure others are aware of the spill. If there is an imminent threat of a fire, pull the nearest fire alarm station to evacuate the building and **dial 911**. If the spill is minor and does not pose a threat to personnel, contact REM at 49-40121 during normal business hours (7 AM – 4 PM) for spill cleanup assistance (dial 911 if spill occurs after hours and assistance is needed).

### **Chemical Spill on Body or Clothes:**

Remove clothing and rinse body thoroughly in emergency shower for at least 15 minutes. Seek medical attention; **dial 911**.

### **Chemical Splash into Eyes:**

Immediately rinse eyes and inner surface of eyelid with water from the emergency eyewash station for 15 minutes by forcibly holding the eye open. Seek medical attention; **dial 911**.

## **Section 10 – Medical Emergency**

### **Life Threatening Emergency, After Hours, Weekends And Holidays:**

Dial 911

### **Non-Life Threatening Emergency:**

Immediately report injury to supervisor and complete the First Report of Injury.  
(<http://www.purdue.edu/rem/injury/froi.htm>)

## **Section 11 – Waste Disposal Procedures**

### **Label Waste:**

Bromine waste cannot be disposed of down the drain. Make sure the waste container(s) is properly labeled; label should indicate all of the contents of the container. REM provides hazardous waste labels free of charge, call 49-40121 to obtain labels.

**Store Waste:**

Store hazardous waste in closed containers, and in a designated area.

**Dispose of Waste:**

Complete a Chemical Waste Pickup Request Form to arrange for disposal by REM. Call REM at 49-40121 or visit the REM webpage for questions. (<http://www.purdue.edu/rem/hmm/wststo.htm>) Any quantity of Bromine is not permitted to be poured down the drain.

**Section 12 – Safety Data Sheet (SDS)**

A current copy of the SDS for Bromine must be made available to all personnel working in the laboratory at all times. To obtain a copy of the SDS, contact the chemical manufacturer or REM at 49-46371. Many manufacturers' SDSs can be found online on websites such as Sigma-Aldrich (<http://www.sigmaaldrich.com/united-states.html>) or Siri MSDS Index (<http://hazard.com/msds/>).


**Section 13 – Protocol/Procedure (Additional lab protocol may be added here)**



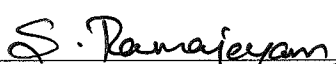


PPE required. Gloves, goggles, labcoat, pants must cover ankles, closed toed shoes required.

**Section 14 – Documentation of Training**

- Prior to conducting any work with Bromine, designated personnel must provide training to his/her laboratory personnel specific to the hazards involved in working with this substance, work area decontamination, and emergency procedures.
- The Principal Investigator must provide his/her laboratory personnel with a copy of this SOP and a copy of the SDS provided by the manufacturer.
- The Principal Investigator must ensure that his/her laboratory personnel have attended appropriate laboratory safety training or refresher training within the last one year.

I have read and understand the content of this SOP:

Name	Signature	Date
Heather Schoonover		Click here to enter a date. 9/15/14
Ian Powers		Click here to enter a date.
Colby Adolph		Click here to enter a date.
Talia Steiman		Click here to enter a date. 9/17/14
Douglas Hartline		Click here to enter a date. 9/17/14

Sudipta Pal		Click here to enter a date. 9/19/14
Youyun Zhou		Click here to enter a date. 09/17/2014
Ramajeyan Selvaraj		Click here to enter a date. 09-17-2014
Aaron Spesard		Click here to enter a date. 9-18-14
Jordan Rogers		Click here to enter a date. 9-22-14
Click here to enter text.		Click here to enter a date.
Click here to enter text.		Click here to enter a date.
Click here to enter text.		Click here to enter a date.
Click here to enter text.		Click here to enter a date.

# Standard Operating Procedure

## Chloroform

Print a copy and insert into your *Lab-Specific Chemical Hygiene Plan*.

### Section 1 – Lab-Specific Information

<b>Department:</b>	Chemistry
<b>Date SOP was written:</b>	9/15/2014
<b>Date SOP was approved by PI/lab supervisor:</b>	9/15/2014
<b>Principal Investigator:</b>	Christopher Uyeda
<b>Internal Lab Safety Coordinator/Lab Manager:</b>	Heather Schoonover
<b>Lab Phone:</b>	Click here to enter text.
<b>Office Phone:</b>	49-46102
<b>Emergency Contact:</b>	Heather Schoonover, 217-343-2996 <i>(Name and Phone Number)</i>
<b>Location(s) covered by this SOP:</b>	Wetherill 419, 423A <i>(Building/Room Number)</i>

### Section 2 – Type of SOP:

- Process       Hazardous Chemical       Hazardous Class

### Section 3 – Physical / Chemical Properties

#### Physical / Chemical Properties:

CAS#: 67-66-3

GHS Classification: Acute toxicity (oral and inhalation); Skin and eye irritation; Carcinogenicity; Reproductive toxicity; Specific target organ toxicity – single exposure: central nervous system; Specific target organ toxicity – repeated exposure: liver, kidney; Acute aquatic toxicity

Molecular Formula:  $\text{CHCl}_3$

Form (physical state): Liquid

Color: Colorless

Boiling Point: 61-62 °C



Flash Point: NA (not flammable)

Density: 1.492 g/L at 25 °C

#### **Section 4 – Potential Hazards**

Chloroform is an OSHA regulated carcinogen. Harmful if swallowed. Causes skin irritation. Causes serious eye irritation. May cause drowsiness or dizziness. Suspected of causing cancer. Suspected of damaging the unborn child. May cause damage to organs (liver, kidney) through prolonged or repeated exposure.

##### **Exposure Limits:**

OSHA PEL (8 HR. TWA):	2 ppm
OSHA Short Term Exposure Limit:	2 ppm
ACGIH TLV/TWA:	10 ppm



#### **Section 5 – Personal Protective Equipment (PPE)**

##### **Respirator Protection:**

Respirators should be used only under any of the following circumstances:

- As a last line of defense (i.e., after engineering and administrative controls have been exhausted).
- When Permissible Exposure Limit (PEL) has exceeded or when there is a possibility that PEL will be exceeded.
- Regulations require the use of a respirator.
- An employer requires the use of a respirator.
- There is potential for harmful exposure due to an atmospheric contaminant (in the absence of PEL)
- As PPE in the event of a chemical spill clean-up process

Lab personnel intending to use/wear a respirator mask must be trained and fit-tested by REM. This is a regulatory requirement. (<http://www.purdue.edu/rem/home/booklets/RPP98.pdf>)

##### **Hand Protection:**

Gloves must be worn. Use proper glove removal technique to avoid any skin contact. Nitrile and latex disposable gloves are NOT suitable. Polyvinyl Acetate, Viton, or fluorinated rubber gloves are recommended. Check the resources below for a more suitable glove.

NOTE: Consult with your preferred glove manufacturer to ensure that the gloves you plan on using are compatible with Methylene chloride.

Refer to glove selection chart from the links below:

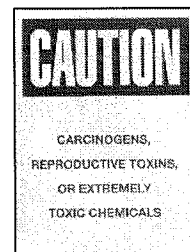
[http://www.ansellpro.com/download/Ansell\\_8thEditionChemicalResistanceGuide.pdf](http://www.ansellpro.com/download/Ansell_8thEditionChemicalResistanceGuide.pdf)

OR

<http://www.showabestglove.com/site/default.aspx>

OR

<http://www.mapaglove.com/>



**Eye Protection:**

ANSI approved properly fitting safety glasses or chemical splash goggles. Face shield is also recommended if there is a high probability of a splash hazard.

**Skin and Body Protection:**

Lab coats (100% cotton) must be worn and be appropriately sized for the individual and buttoned to their full length. Laboratory coat sleeves must be of sufficient length to prevent skin exposure while wearing gloves. Personnel must also wear full length pants, or equivalent, and close-toed shoes. Full length pants and close-toed shoes must be worn at all times by all individuals that are occupying the laboratory area. The area of skin between the shoe and ankle must not be exposed.

**Hygiene Measures:**

Wash thoroughly and immediately after handling. Remove any contaminated clothing and wash before reuse.

**Section 6 – Engineering Controls**

Use of Chloroform must be conducted in a properly functioning chemical fume hood. The chemical fume hood must be approved and certified by REM and have a face velocity between 85 – 125 feet per minute.

**Section 7 – First Aid Procedures**

**If inhaled:**

Move into the fresh air immediately and give oxygen. If not breathing give artificial respiration. Consult a physician.

**In case of skin contact:**

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash any contaminated clothing before reuse. Consult a physician.

**In case of eye contact:**

Check for and remove any contact lenses. Rinse thoroughly with plenty of water for at least 15 minutes. Seek immediate medical attention and continue eye rinse during transport to hospital.

**If swallowed:**

Do NOT induce vomiting unless directed by medical personnel. Never give anything by mouth to an unconscious person. Consult a physician.

**Section 8 – Special Handling and Storage Requirements**

- A designated storage area must be established for Methylene chloride and the area should be posted with a "Caution, Carcinogen, Reproductive Toxins, or Extremely Toxic Chemicals" label provided by REM (as shown to the right).

- Avoid contact with skin and eyes and inhalation.
- Keep containers tightly closed.
- Store in a cool, dry and well-ventilated area away from incompatible substances such as oxidizers.
- Containers which are opened must be carefully resealed and kept upright to prevent leakage.
- A suitable storage location is a flammable storage cabinet or lab cabinet that does not contain incompatibles.

## **Section 9 – Spill and Accident Procedures**

### **Chemical Spill Dial 911**

Immediately evacuate area and ensure others are aware of the spill. If there is an imminent threat of a fire, pull the nearest fire alarm station to evacuate the building and **dial 911**. If the spill is minor and does not pose a threat to personnel, contact REM at 49-40121 during normal business hours (7 AM – 4 PM) for spill cleanup assistance (dial 911 if spill occurs after hours and assistance is needed).

### **Chemical Spill on Body or Clothes:**

Remove clothing and rinse body thoroughly in emergency shower for at least 15 minutes. Seek medical attention; **dial 911**.

### **Chemical Splash into Eyes:**

Immediately rinse eyes and inner surface of eyelid with water from the emergency eyewash station for 15 minutes by forcibly holding the eye open. Seek medical attention; **dial 911**.

## **Section 10 – Medical Emergency**

### **Life Threatening Emergency, After Hours, Weekends And Holidays:**

**Dial 911**

### **Non-Life Threatening Emergency:**

Immediately report injury to supervisor and complete the First Report of Injury.  
(<http://www.purdue.edu/rem/injury/froi.htm>)

## **Section 11 – Waste Disposal Procedures**

### **Label Waste:**

Make sure the waste container(s) is properly labeled; label should indicate all of the contents of the container. REM provides hazardous waste labels free of charge, call 49-40121 to obtain labels.

### **Store Waste:**

Store hazardous waste in closed containers, and in a designated area (flammable cabinet or lab cabinet is recommended).

### **Dispose of Waste:**

Complete a Chemical Waste Pickup Request Form to arrange for disposal by REM. Call REM at 49-40121 or visit the REM webpage for questions. (<http://www.purdue.edu/rem/hmm/wststo.htm>)



**Section 12 – Safety Data Sheet (SDS)**

A current copy of the SDS for Chloroform must be made available to all personnel working in the laboratory at all times. To obtain a copy of the SDS, contact the chemical manufacturer or REM at 49-46371. Many manufacturers' SDSs can be found online on websites such as Sigma-Aldrich (<http://www.sigmaaldrich.com/united-states.html>) or Siri MSDS Index (<http://hazard.com/msds/>).



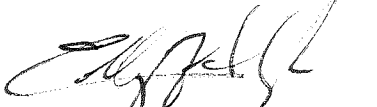




**Section 13 – Protocol/Procedure**

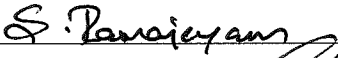

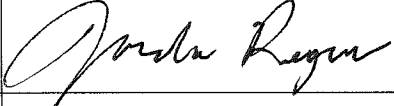
PPE required. Gloves, goggles, labcoat, pants must cover ankles, and closed toed shoes are required.

**Section 14 – Documentation of Training**

- Prior to conducting any work with Chloroform, designated personnel must provide training to his/her laboratory personnel specific to the hazards involved in working with this substance, work area decontamination, and emergency procedures.
- The Principal Investigator must provide his/her laboratory personnel with a copy of this SOP and a copy of the SDS provided by the manufacturer.
- The Principal Investigator must ensure that his/her laboratory personnel have attended appropriate laboratory safety training or refresher training within the last one year.

I have read and understand the content of this SOP:

Name	Signature	Date
Heather Schoonover		Click here to enter a date. 9/15/14
Ian Powers		Click here to enter a date.
Colby Adolph		Click here to enter a date. 9.17.14
Talia Steiman		Click here to enter a date. 9/17/14
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Youyun Zhou		Click here to enter a date. 9/17/14

Name	Signature	Date
Ramajeyam Salvaraj		Click here to enter a date. 09-17-2014
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Click here to enter text.		Click here to enter a date.
Click here to enter text.		Click here to enter a date.

# Standard Operating Procedure

## Compressed Gases

Print a copy and insert into your *Lab-Specific Chemical Hygiene Plan*.

### Section 1 – Lab-Specific Information

<b>Department:</b>	Chemistry
<b>Date SOP was written:</b>	9/15/2014
<b>Date SOP was approved by PI/lab supervisor:</b>	9/15/2014
<b>Principal Investigator:</b>	Christopher Uyeda
<b>Internal Lab Safety Coordinator/Lab Manager:</b>	Heather Schoonover
<b>Lab Phone:</b>	Click here to enter text.
<b>Office Phone:</b>	49-46102
<b>Emergency Contact:</b>	Heather Schoonover, 217-343-2996 <i>(Name and Phone Number)</i>
<b>Location(s) covered by this SOP:</b>	Wetherill 419, 423A <i>(Building/Room Number)</i>

### Section 2 – Type of SOP:

Process       Hazardous Chemical       Hazardous Class

### Section 3 – Physical / Chemical Properties and Uses

#### Physical / Chemical Properties:

CAS#: N/A

GHS Classification: Gases under pressure, compressed gas (depending on the type of compressed gas, other hazards such as toxicity and/or flammability often apply as well)

Molecular Formula: N/A

Form (physical state): Gas

Color: N/A

Boiling Point: N/A

Flash Point: N/A

Lower Explosive Limit: N/A

Upper Explosive Limit: N/A

Relative Vapor Density: N/A

#### **Section 4 – Potential Hazards**

Contains gas under pressure; may explode if heated. Protect from sunlight. Gases may displace oxygen and present an asphyxiation hazard. Many gases present other hazards; make sure that all of the potential hazards are understood before handling any chemical.



#### **Section 5 – Personal Protective Equipment (PPE)**

##### **Respirator Protection:**

If compressed gases are being used outside of a chemical fume hood, respiratory protection may be required. If this activity is absolutely necessary, contact REM so a respiratory protection analysis can be performed.

Respirators should be used under any of the following circumstances:

- As a last line of defense (i.e., after engineering and administrative controls have been exhausted).
- When Permissible Exposure Limit (PEL) has exceeded or when there is a possibility that PEL will be exceeded.
- Regulations require the use of a respirator.
- An employer requires the use of a respirator.
- There is potential for harmful exposure due to an atmospheric contaminant (in the absence of PEL)
- As PPE in the event of a chemical spill clean-up process

Lab personnel intending to use/wear a respirator mask must be trained and fit-tested by REM. This is a regulatory requirement. (<http://www.purdue.edu/rem/home/booklets/RPP98.pdf>)

##### **Hand Protection:**

Gloves must be worn. Use proper glove removal technique to avoid any skin contact. Nitrile gloves are recommended for low volume applications. Wearing two pairs of nitrile gloves is recommended.

**NOTE:** Consult with your preferred glove manufacturer to ensure that the gloves you plan on using are compatible with the specific flammable or combustible liquids being used.

Refer to glove selection chart from the links below:

[http://www.ansellpro.com/download/Ansell\\_8thEditionChemicalResistanceGuide.pdf](http://www.ansellpro.com/download/Ansell_8thEditionChemicalResistanceGuide.pdf)

OR

<http://www.showabestglove.com/site/default.aspx>

OR

<http://www.mapaglove.com/>

**Eye Protection:**

ANSI approved properly fitting safety glasses or chemical splash goggles are required.

**Skin and Body Protection:**

Laboratory coats must be worn and be appropriately sized for the individual and buttoned to their full length (flame resistant lab coats must be worn if handling flammable gases such as hydrogen). Laboratory coat sleeves must be of sufficient length to prevent skin exposure while wearing gloves. Personnel must also wear full length pants, or equivalent, and close-toed shoes. Full length pants and close-toed shoes must be worn at all times by all individuals that are occupying the laboratory area. The area of skin between the shoe and ankle must not be exposed.

**Hygiene Measures:**

Wash thoroughly and immediately after handling. Remove any contaminated clothing and wash before reuse.

**Section 6 – Engineering Controls**

Use of compressed gases should be conducted in a properly functioning chemical fume hood whenever possible. The chemical fume hood must be approved and certified by REM and have a face velocity between 85 – 125 feet per minute. Contact REM for information regarding specific handling requirements when work with toxic, highly toxic, corrosive, and reactive gases. Generally, these of gases need to be stored and used with local exhaust ventilation (e.g., fume hood or gas cylinder cabinet).

**Section 7 – First Aid Procedures**

**If inhaled:**

Move into the fresh air immediately. Consult a physician. If not breathing give artificial respiration and seek immediate medical attention.

**In case of skin contact:**

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash any contaminated clothing before reuse. Thoroughly clean shoes before reuse. Consult a physician.

**In case of eye contact:**

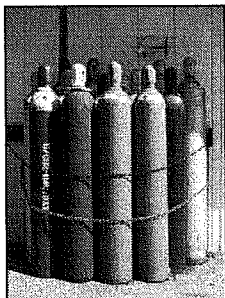
Check for and remove any contact lenses. Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Seek immediate medical attention.

**If swallowed:**

Do NOT induce vomiting unless directed by medical personnel. Never give anything by mouth to an unconscious person. Seek immediate medical attention.

**Section 8 – Special Handling and Storage Requirements**

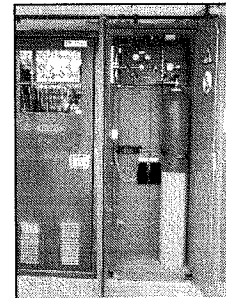
- Compressed gas cylinders should be stored in a secure, well ventilated location, and in an upright position at all times.
- All compressed gas cylinders should be handled as if full and should never be completely emptied.
- Cylinders that are not in use (meaning that the regulator is not attached) must be secured and the safety cap must be on the cylinder and are permitted to be chained together as shown below in Figure 1.
- Cylinders that are in use, meaning there is a regulator attached, must be individually secured by a chain or strap as shown below in Figure 2.
- Cylinder valves and regulators must be protected from impact or damage.
- A designated storage area must be established for compressed gases.
- Toxic, highly toxic, corrosive, and reactive gases should be stored in a gas cylinder cabinet as shown in Figure 3.
- Do not over purchase; only purchase what can be safely stored in the laboratory.
- Avoid contact with skin, eyes, and inhalation.
- Keep away from sources of ignition if the gas is flammable.



**Figure 1: Not In-Use Cylinders**

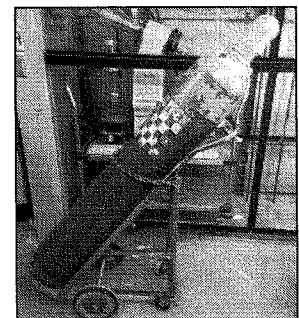


**Figure 2: In-Use Cylinders**



**Figure 3: Gas Cylinder Cabinet**

- Follow laboratory supervisor's instructions for PPE, which may differ depending on the type and/or quantity of compressed gas being used.
- Use in the smallest practical quantities for the experiment being performed.
- Work must be conducted in a chemical fume hood if air concentrations above 10% of the LEL could be created, if the chemical is irritating to the eyes or respiratory system, and/or is toxic by inhalation.
- Gas cylinder connections and fittings must be inspected frequently for deterioration and must never be used without a regulator.
- Never use a leaking, corroded, or damaged cylinder and never refill compressed gas cylinders.
- When stopping a leak between cylinder and regulator, always close the valve before tightening the union nut.
- The regulator should be replaced with a safety cap when the cylinder is not in use.
- The safety cap must be in place when a gas cylinder is moved.
- For large gas cylinders (>27 inches), an approved gas cylinder cart should be used. The cylinder must be strapped to the cart and the protective cap must be in place before moving the cylinder. A cylinder should never be moved or transported without the protective cap. The proper way to move a large gas cylinder is illustrated in Figure 4.
- A few compressed gas cylinders have a shelf-life and can become more hazardous as time goes on. It is extremely important that these chemicals are identified and managed properly. If any time-sensitive gases are



**Figure 4: Cylinder Cart**

found to be past the manufacturer's expiration date, they must be submitted to REM for hazardous waste disposal immediately. The following is a list of time-sensitive compressed gases:

- Hydrogen fluoride, anhydrous
- Hydrogen bromide, anhydrous
- Hydrogen sulfide, anhydrous
- Hydrogen cyanide, anhydrous
- Hydrogen chloride, anhydrous

## **Section 9 – Spill and Accident Procedures**

### **Chemical Spill Dial 911**

Immediately evacuate area and ensure others are aware of the spill. If there is an imminent threat of a fire, pull the nearest fire alarm station to evacuate the building and **dial 911**.

#### **Chemical Spill on Body or Clothes:**

Remove clothing and rinse body thoroughly in emergency shower for at least 15 minutes. Seek medical attention; **dial 911**.

#### **Chemical Splash into Eyes:**

Immediately rinse eyes and inner surface of eyelid with water from the emergency eyewash station for 15 minutes by forcibly holding the eye open. Seek medical attention; **dial 911**.

## **Section 10 – Medical Emergency**

### **Life Threatening Emergency, After Hours, Weekends And Holidays:**

Dial 911

#### **Non-Life Threatening Emergency:**

Immediately report injury to supervisor and complete the First Report of Injury.

(<http://www.purdue.edu/rem/injury/froi.htm>)

## **Section 11 – Waste Disposal Procedures**

### **Label Waste:**

Make sure the waste container(s) is properly labeled; label should indicate all of the contents of the container. REM provides hazardous waste labels free of charge, call 49-40121 to obtain labels.

### **Store Waste:**

Store hazardous waste in closed containers, and in a designated area (flammable cabinet is recommended).

### **Dispose of Waste:**

Before submitting compressed gas waste to REM, ensure that the cylinder cannot be returned to the manufacturer or distributor. Many gas vendors charge demurrage for gas storage. Most lecture bottles cannot be returned to the manufacturer and must be treated as waste. Complete a Chemical Waste Pickup Request Form to arrange for disposal by REM. Call REM at 49-40121 or visit the REM webpage for questions.

(<http://www.purdue.edu/rem/hmm/wststo.htm>)

**Section 12 – Safety Data Sheet (SDS)**

A current copy of the SDS for the specific compressed gas being used must be made available to all personnel working in the laboratory at all times. To obtain a copy of the SDS, contact the chemical manufacturer or REM at 49-46371. Many manufacturers' SDSs can be found online on websites such as Sigma-Aldrich (<http://www.sigmaaldrich.com/united-states.html>) or Siri MSDS Index (<http://hazard.com/msds/>).

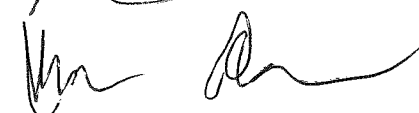

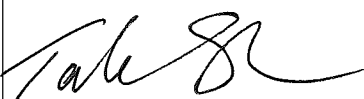

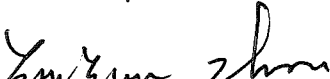
**Section 13 – Protocol/Procedure**

PPE required. Gloves, goggles, labcoat, pants must cover ankles, and closed toed shoes are required.

**Section 14 – Documentation of Training**

- Prior to conducting any work with compressed gases, designated personnel must provide training to his/her laboratory personnel specific to the hazards involved in working with this substance, work area decontamination, and emergency procedures.
- The Principal Investigator must provide his/her laboratory personnel with a copy of this SOP and a copy of the SDS provided by the manufacturer.
- The Principal Investigator must ensure that his/her laboratory personnel have attended appropriate laboratory safety training or refresher training within the last one year.

I have read and understand the content of this SOP:

Name	Signature	Date
Heather Schoonover		Click here to enter a date. 9/15/14
Ian Powers		Click here to enter a date.
Colby Adolph		Click here to enter a date. 9.17.14
Talia Steiman		Click here to enter a date. 9/17/14
Douglas Hartline		Click here to enter a date. 9/17/2014
Sudipta Pal		Click here to enter a date. 9/19/2014
Youyun Zhou		9/17/14



Ramajeyam Salvaraj	<i>S. Ramajeyam</i>	09-17-2014
Aaron Spesard	<i>Aaron Spesard</i>	9/18/14
Jordan Rogers	<i>Jordan Rogers</i>	9-22-14

# Standard Operating Procedure

## Corrosives

Print a copy and insert into your *Lab-Specific Chemical Hygiene Plan*.

### Section 1 – Lab-Specific Information

<b>Department:</b>	Chemistry
<b>Date SOP was written:</b>	9/15/2014
<b>Date SOP was approved by PI/lab supervisor:</b>	9/15/2014
<b>Principal Investigator:</b>	Christopher Uyeda
<b>Internal Lab Safety Coordinator/Lab Manager:</b>	Heather Schoonover
<b>Lab Phone:</b>	Click here to enter text.
<b>Office Phone:</b>	49-46102
<b>Emergency Contact:</b>	Heather Schoonover, 217-343-2996 <i>(Name and Phone Number)</i>
<b>Location(s) covered by this SOP:</b>	Wetherill 419, 423A <i>(Building/Room Number)</i>

### Section 2 – Type of SOP:

Process       Hazardous Chemical       Hazardous Class

### Section 3 – Physical / Chemical Properties and Uses

#### Physical / Chemical Properties:

CAS#: N/A

GHS Classification: Corrosive

Molecular Formula: N/A

Form (physical state): Liquid or Solid

Color: N/A

Boiling Point: N/A

Flash Point: N/A

Lower Explosive Limit: N/A

Upper Explosive Limit: N/A

Relative Vapor Density: N/A

**Uses:**

Acid and bases are common laboratory chemicals that are also used in plastic production, cleaning and descaling agents, detergents, fertilizers, oil-refining, and paper manufacturing, among others. Sulfuric acid is the electrolyte in lead-acid batteries. Aqueous potassium hydroxide is employed as the electrolyte in alkaline batteries based on nickel-cadmium and manganese dioxide-zinc. Most corrosive materials are hygroscopic, meaning they readily absorb moisture in air.

**Important Definitions:**

- **Acid-** Any chemical compound which, when dissolved in water, gives a solution with a pH of less than 7.0.
- **Mineral Acid-** A compound having atoms of hydrogen, identifying nonmetal (typically chlorine, sulfur, or phosphorus), and maybe oxygen. Sulfuric acid ( $H_2SO_4$ ) and Hydrochloric acid (HCl) are examples of mineral acids.
- **Organic Acid-** An organic compound with acidic properties. Generally, Organic acids are also flammable. Acetic acid ( $CH_3COOH$ ) and Formic acid ( $HCOOH$ ) are examples of organic acids.
- **Base-** Any chemical compound which, when dissolved in water, gives a solution with a pH of greater than 7.0.

**Section 4 – Potential Hazards**

Corrosive. May be harmful if inhaled, ingested, or absorbed through the skin. Inhalation may cause irritation to the respiratory tract with burning pain in the nose and throat, coughing, wheezing, shortness of breath and pulmonary edema. Contact with skin causes burns and irritation. Eye contact causes burns, irritation, a may cause blindness. Ingestion may cause permanent damage to the digestive tract. It is destructive to the tissue of the mucous membranes and upper respiratory tract. Acids and bases may have other hazards associated with them, such as flammability, oxidizer, or toxicity. Note: Refer to SOP of Hydrofluoric acid (HF) for specific hazards and safety information.



**Section 5 – Personal Protective Equipment (PPE)**

**Respirator Protection:**

If corrosives are being used outside of a chemical fume hood, respiratory protection may be required. If this activity is absolutely necessary, contact REM so a respiratory protection analysis can be performed. Respirators should be used under any of the following circumstances:

- As a last line of defense (i.e., after engineering and administrative controls have been exhausted).
- When Permissible Exposure Limit (PEL) has exceeded or when there is a possibility that PEL will be exceeded.
- Regulations require the use of a respirator.
- An employer requires the use of a respirator.

- There is potential for harmful exposure due to an atmospheric contaminant (in the absence of PEL)
- As PPE in the event of a chemical spill clean-up process

Lab personnel intending to use/wear a respirator mask must be trained and fit-tested by REM. This is a regulatory requirement. (<http://www.purdue.edu/rem/home/booklets/RPP98.pdf>)

**Hand Protection:**

Gloves must be worn. Use proper glove removal technique to avoid any skin contact. Nitrile gloves are recommended. Check the resources below for the most suitable glove.

**NOTE:** Consult with your preferred glove manufacturer to ensure that the gloves you plan on using are compatible with the specific oxidizing liquids or solids being used.

Refer to glove selection chart from the links below:

[http://www.ansellpro.com/download/Ansell\\_8thEditionChemicalResistanceGuide.pdf](http://www.ansellpro.com/download/Ansell_8thEditionChemicalResistanceGuide.pdf)

OR

<http://www.showabestglove.com/site/default.aspx>

OR

<http://www.mapaglove.com/>

**Eye Protection:**

ANSI approved properly fitting safety glasses or chemical splash goggles are required. A face shield may also be appropriate depending on the specific application.

**Skin and Body Protection:**

Laboratory coats must be worn and be appropriately sized for the individual and buttoned to their full length. Laboratory coat sleeves must be of sufficient length to prevent skin exposure while wearing gloves. Personnel should also wear full length pants, or equivalent, and close-toed shoes. Full length pants and close-toed shoes must be worn at all times by all individuals that are occupying the laboratory area. The area of skin between the shoe and ankle should not be exposed.

**Hygiene Measures:**

Wash thoroughly and immediately after handling. Rinse immediately contaminated clothing and skin with plenty of water before removing clothes.

**Section 6 – Engineering Controls**

Use of corrosives should be conducted in a properly functioning chemical fume hood whenever possible. The chemical fume hood must be approved and certified by REM and have a face velocity between 85 – 125 feet per minute.

**Section 7 – First Aid Procedures**

**If inhaled:**

Move into the fresh air immediately. Consult a physician. If not breathing give artificial respiration and seek immediate medical attention.

**In case of skin contact:**

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash any contaminated clothing before reuse. Thoroughly clean shoes before reuse. Consult a physician.

**In case of eye contact:**

Check for and remove any contact lenses. Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Seek immediate medical attention.

**If swallowed:**

Do NOT induce vomiting unless directed by medical personnel. Never give anything by mouth to an unconscious person. Seek immediate medical attention.

**Section 8 – Special Handling and Storage Requirements**

- Do not over purchase; only purchase what can be safely stored in the laboratory.
- Avoid contact with skin and eyes. Avoid inhalation of vapor or mist. Avoid formation of dust.
- Always use inside a chemical fume hood.
- Note: In case you need to dilute the concentration of acids, always add acid to water.
- Keep container upright & tightly closed in a dry and well-ventilated place.
- Containers which are opened must be carefully resealed and kept upright to prevent leakage.
- Keep away from sources of ignition. Avoid heat and shock or friction when handling.
- Store in original container. Acids should not be stored in metal containers.
- Keep away from incompatible materials. Acids and bases should not be stored together. Organic acids and Oxidizing acids must be stored separately or with proper secondary containment (see below).

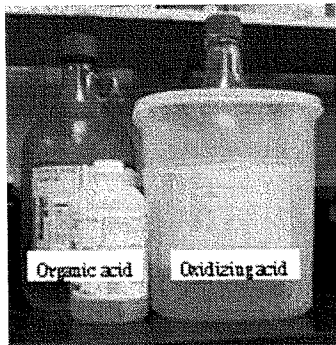


Fig.1- Demonstration of proper use of secondary containment with Organic and Oxidizing acids

- Use in the smallest practical quantities for the experiment being performed.
- Work must be conducted in a chemical fume hood if the chemical is irritating to the eyes or respiratory system, and/or is toxic by inhalation.
- Containers should remain closed when not in use.
- Containers should be labeled appropriately. Label should indicate the name of the chemical(s) in the container. Avoid using chemical abbreviations (acceptable if a legend is present in the lab) and formulae.
- Containers should be in good condition and compatible with the material.
- Transport all corrosives in secondary containment, such as polyethylene or other non-reactive acid/solvent bottle carrier.
- Corrosives must be segregated from incompatible materials. Incompatibilities will be noted in Section 10 of the SDS, "Stability and Reactivity".

## **Section 9 – Spill and Accident Procedures**

### **Chemical Spill Dial 911**

Immediately evacuate area and ensure others are aware of the spill. If there is an imminent threat of a fire, pull the nearest fire alarm station to evacuate the building and **dial 911**. If the spill is minor and does not pose a threat to personnel, contact REM at 49-40121 during normal business hours (7 AM – 4 PM) for spill cleanup assistance (dial 911 if spill occurs after hours and assistance is needed).

### **Chemical Spill on Body or Clothes:**

Remove clothing and rinse body thoroughly in emergency shower for at least 15 minutes. Seek medical attention; **dial 911**.

### **Chemical Splash into Eyes:**

Immediately rinse eyes and inner surface of eyelid with water from the emergency eyewash station for 15 minutes by forcibly holding the eye open. Seek medical attention; **dial 911**.

## **Section 10 – Medical Emergency**

### **Life Threatening Emergency, After Hours, Weekends And Holidays:**

**Dial 911**

### **Non-Life Threatening Emergency:**

Immediately report injury to supervisor and complete the First Report of Injury.  
(<http://www.purdue.edu/rem/injury/froi.htm>)

## **Section 11 – Waste Disposal Procedures**

### **Label Waste:**

Corrosive waste cannot be disposed of down the drain. When possible, do not mix acidic and basic waste streams. Make sure the waste container(s) is properly labeled; label should indicate all of the contents of the container. REM provides hazardous waste labels free of charge, call 49-40121 to obtain labels.

### **Store Waste:**

Store hazardous waste in closed containers, and in a designated area.

### **Dispose of Waste:**

Complete a Chemical Waste Pickup Request Form to arrange for disposal by REM. Call REM at 49-40121 or visit the REM webpage for questions. (<http://www.purdue.edu/rem/hmm/wststo.htm>) No oxidizing liquids or solids are permitted to be poured down the drain.

## **Section 12 – Safety Data Sheet (SDS)**

A current copy of the SDS for the specific corrosive chemical being used must be made available to all personnel working in the laboratory at all times. To obtain a copy of the SDS, contact the chemical manufacturer or REM at 49-46371. Many manufacturers' SDSs can be found online on websites such as Sigma-Aldrich (<http://www.sigmaaldrich.com/united-states.html>) or Siri MSDS Index (<http://hazard.com/msds/>).

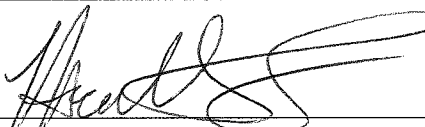

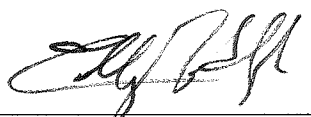



**Section 13 – Protocol/Procedure**



PPE required. Gloves, goggles, labcoat, pants must cover ankles, and closed toed shoes are required.

**Section 14 – Documentation of Training**

- Prior to conducting any work with corrosives, designated personnel must provide training to his/her laboratory personnel specific to the hazards involved in working with this substance, work area decontamination, and emergency procedures.
- The Principal Investigator must provide his/her laboratory personnel with a copy of this SOP and a copy of the SDS provided by the manufacturer.
- The Principal Investigator must ensure that his/her laboratory personnel have attended appropriate laboratory safety training or refresher training within the last one year.

I have read and understand the content of this SOP:

Name	Signature	Date
Heather Schoonover		Click here to enter a date. 9/15/14
Ian Powers		Click here to enter a date.
Colby Adolph		Click here to enter a date. 9.17.14
Talia Steiman		Click here to enter a date. 9/17/14
Douglas Hartline		Click here to enter a date. 9/17/2014
Sudipta Pal	Sudipta Pal	Click here to enter a date. 9/19/14
Youyun Zhou		Click here to enter a date. 9/17/14
Ramajeyam Salvaraj	S. Ramajeyam	Click here to enter a date. 09-17-2014

<p><b>Aaron Spesard</b></p>		<p>Click here to enter a date. <i>9/18/14</i></p>
<p><b>Jordan Rogers</b></p>		<p>Click here to enter a date. <i>9-22-14</i></p>
<p>Click here to enter text.</p>		<p>Click here to enter a date.</p>
<p>Click here to enter text.</p>		<p>Click here to enter a date.</p>
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# Standard Operating Procedure

## Diethyl Ether

Print a copy and insert into your *Lab-Specific Chemical Hygiene Plan*.

### Section 1 – Lab-Specific Information

<b>Department:</b>	Chemistry
<b>Date SOP was written:</b>	9/15/2014
<b>Date SOP was approved by PI/lab supervisor:</b>	9/15/2014
<b>Principal Investigator:</b>	Christopher Uyeda
<b>Internal Lab Safety Coordinator/Lab Manager:</b>	Heather Schoonover
<b>Lab Phone:</b>	Click here to enter text.
<b>Office Phone:</b>	49-46102
<b>Emergency Contact:</b>	Heather Schoonover, 217-343-2996 <i>(Name and Phone Number)</i>
<b>Location(s) covered by this SOP:</b>	Wetherill 419, 423A <i>(Building/Room Number)</i>

### Section 2 – Type of SOP:

Process       Hazardous Chemical       Hazardous Class

### Section 3 – Physical / Chemical Properties

#### Physical / Chemical Properties:

CAS#: 60-29-7

GHS Classification: Flammable Liquid, Acute Toxicity, Skin Irritation, Eye Irritation, Specific Target Organ Toxicity

Molecular Formula: C<sub>4</sub>H<sub>10</sub>O

Form (physical state): Liquid

Color: Colorless

Boiling Point: 34.6 °C

Flash Point: -40 °C

Auto-Ignition Point: 160 °C

Lower Explosive Limit: 1.8% (V)

Upper Explosive Limit: 48% (V)

#### **Section 4 – Potential Hazards**

Diethyl ether is an extremely flammable liquid and vapor, forming explosive mixtures with air. The auto-ignition temperature of diethyl ether is 160 °C; therefore it can be ignited by a hot surface without flame or spark. If not stored and handled properly, diethyl ether can pose a serious threat to the health and safety of personnel. Diethyl ether is peroxide forming and has the potential to form explosive peroxides; therefore it is a time-sensitive chemical. Refer to REM's Time-Sensitive Chemicals webpage for more specific information (<http://www.purdue.edu/rem/hmm/timesensitive.htm>).



#### **Section 5 – Personal Protective Equipment (PPE)**

##### **Respirator Protection:**

Respirators should be used only under any of the following circumstances:

- As a last line of defense (i.e., after engineering and administrative controls have been exhausted).
- When Permissible Exposure Limit (PEL) has exceeded or when there is a possibility that PEL will be exceeded.
- Regulations require the use of a respirator.
- An employer requires the use of a respirator.
- There is potential for harmful exposure due to an atmospheric contaminant (in the absence of PEL)
- As PPE in the event of a chemical spill clean-up process

Lab personnel intending to use/wear a respirator mask must be trained and fit-tested by REM. This is a regulatory requirement. (<http://www.purdue.edu/rem/home/booklets/RPP98.pdf>)

##### **Hand Protection:**

Gloves must be worn. Use proper glove removal technique to avoid any skin contact. Nitrile gloves are recommended. Wearing two pairs of nitrile gloves is recommended.

**NOTE:** Consult with your preferred glove manufacturer to ensure that the gloves you plan on using are compatible with diethyl ether.

Refer to glove selection chart from the links below:

[http://www.ansellpro.com/download/Ansell\\_8thEditionChemicalResistanceGuide.pdf](http://www.ansellpro.com/download/Ansell_8thEditionChemicalResistanceGuide.pdf)

OR

<http://www.showabestglove.com/site/default.aspx>

OR

<http://www.mapaglove.com/>

**Eye Protection:**

ANSI approved properly fitting safety glasses or chemical splash goggles. Face shield is also recommended if there is a high probability of a splash hazard.

**Skin and Body Protection:**

Lab coats must be worn and be appropriately sized for the individual and buttoned to their full length. Flame resistant lab coats must be worn if handling more than 1 liter of diethyl ether. Laboratory coat sleeves must be of sufficient length to prevent skin exposure while wearing gloves. Personnel must also wear full length pants, or equivalent, and close-toed shoes. Full length pants and close-toed shoes must be worn at all times by all individuals that are occupying the laboratory area. The area of skin between the shoe and ankle must not be exposed.

**Hygiene Measures:**

Wash thoroughly and immediately after handling. Remove any contaminated clothing and wash before reuse.

**Section 6 – Engineering Controls**

Use of diethyl ether must be conducted in properly functioning chemical fume hood. The chemical fume hood must be approved and certified by REM and have a face velocity between 85 – 125 feet per minute.

**Section 7 – First Aid Procedures**

**If inhaled:**

Move into the fresh air immediately and give oxygen. If not breathing give artificial respiration. Consult a physician.

**In case of skin contact:**

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash any contaminated clothing before reuse. Consult a physician.

**In case of eye contact:**

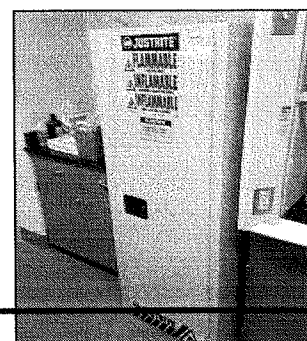
Check for and remove any contact lenses. Rinse thoroughly with plenty of water for at least 15 minutes. Seek immediate medical attention and continue eye rinse during transport to hospital.

**If swallowed:**

Do NOT induce vomiting unless directed by medical personnel. Never give anything by mouth to an unconscious person. Consult a physician.

**Section 8 – Special Handling and Storage Requirements**

- Conduct the procedure only after a supervisor has observed the user performing the proper technique unassisted.
- Label all diethyl ether containers with the purchase date and the date opened. Storage time should never exceed the manufacturer's recommendations. The general storage time limit for diethyl ether is 12 months.
- Keep away from sources of ignition. Avoid heat and shock or friction when handling.



- Keep containers tightly closed. Store in a cool, dry and well-ventilated area away from incompatible substances. Store away from light.
- Avoid contact with skin, eyes, and inhalation.
- Diethyl ether must be segregated from incompatible materials such as oxidizers, strong acids, halogens, and sulfur compounds.
- The amount of diethyl ether stored should be kept at an absolute minimum.
- Prevent electric static build-up with a grounding cable when transferring diethyl ether.
- Suitable storage locations include flammable storage cabinets or intrinsically safe refrigerators or freezers.
- Store diethyl ether away from light. Limit exposure to air and other contaminants, specifically heavy metals.
- If possible, only use diethyl ether with inhibitors.

## **Section 9 – Spill and Accident Procedures**

### **Chemical Spill Dial 911**

Immediately evacuate area and ensure others are aware of the spill. If there is an imminent threat of a fire, pull the nearest fire alarm station to evacuate the building and **dial 911**. If the spill is minor and does not pose a threat to personnel, contact REM at 49-40121 during normal business hours (7 AM – 4 PM) for spill cleanup assistance (dial 911 if spill occurs after hours and assistance is needed).

### **Chemical Spill on Body or Clothes:**

Remove clothing and rinse body thoroughly in emergency shower for at least 15 minutes. Seek medical attention; **dial 911**.

### **Chemical Splash into Eyes:**

Immediately rinse eyes and inner surface of eyelid with water from the emergency eyewash station for 15 minutes by forcibly holding the eye open. Seek medical attention; **dial 911**.

## **Section 10 – Medical Emergency**

### **Life Threatening Emergency, After Hours, Weekends And Holidays:**

**Dial 911**

### **Non-Life Threatening Emergency:**

Immediately report injury to supervisor and complete the First Report of Injury.  
(<http://www.purdue.edu/rem/injury/froi.htm>)

## **Section 11 – Waste Disposal Procedures**

### **Label Waste:**

Make sure the waste container(s) is properly labeled; label should indicate all of the contents of the container. REM provides hazardous waste labels free of charge, call 49-40121 to obtain labels.

### **Store Waste:**

Store hazardous waste in closed containers, and in a designated area (flammable cabinet is recommended). Diethyl ether waste should be segregated from all incompatible chemicals such as oxidizers.

### **Dispose of Waste:**

Complete a Chemical Waste Pickup Request Form to arrange for disposal by REM. Call REM at 49-40121 or visit the REM webpage for questions. (<http://www.purdue.edu/rem/hmm/wststo.htm>)

**Section 12 – Safety Data Sheet (SDS)**

A current copy of the diethyl ether SDS must be made available to all personnel working in the laboratory at all times. To obtain a copy of the SDS, contact the chemical manufacturer or REM at 49-46371. Many manufacturers' SDSs can be found online on websites such as Sigma-Aldrich (<http://www.sigmaaldrich.com/united-states.html>) or Siri MSDS Index (<http://hazard.com/msds/>).






**Section 13 – Protocol/Procedure**

PPE required. Gloves, goggles, labcoat, pants must cover ankles, and closed toed shoes are required.

**Section 14 – Documentation of Training** (signature of all users is required)

- Prior to conducting any work with diethyl ether, designated personnel must provide training to his/her laboratory personnel specific to the hazards involved in working with this substance, work area decontamination, and emergency procedures.
- The Principal Investigator must provide his/her laboratory personnel with a copy of this SOP and a copy of the SDS provided by the manufacturer.
- The Principal Investigator must ensure that his/her laboratory personnel have attended appropriate laboratory safety training or refresher training within the last one year.

I have read and understand the content of this SOP:

Name	Signature	Date
Heather Schoonover		Click here to enter a date. 9/15/14
Ian Powers		Click here to enter a date.
Colby Adolph		Click here to enter a date. 9.17.14
Talia Steiman		Click here to enter a date. 9/17/14
Douglas Hartline		Click here to enter a date. 9/17/2014

Name	Signature	Date
<b>Sudipta Pal</b>	<i>Sudipta Pal</i>	Click here to enter a date.
<b>Youyun Zhou</b>	<i>Youyun Zhou</i>	Click here to enter a date. 8/17/14
<b>Ramajeyam Salvaraj</b>	<i>S. Ramajeyam</i>	Click here to enter a date. 09-17-2014
<b>Aaron Spesard</b>	<i>A Spesard</i>	Click here to enter a date. 9/18/14
<b>Jordan Rogers</b>	<i>Jordan Rogers</i>	Click here to enter a date. 9-22-14
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# Standard Operating Procedure

## Flammable and Combustible Liquids

Print a copy and insert into your *Lab-Specific Chemical Hygiene Plan*.

### Section 1 – Lab-Specific Information

<b>Department:</b>	Chemistry
<b>Date SOP was written:</b>	9/15/2014
<b>Date SOP was approved by PI/lab supervisor:</b>	9/15/2014
<b>Principal Investigator:</b>	Christopher Uyeda
<b>Internal Lab Safety Coordinator/Lab Manager:</b>	Heather Schoonover
<b>Lab Phone:</b>	Click here to enter text.
<b>Office Phone:</b>	49-46102
<b>Emergency Contact:</b>	Heather Schoonover, 217-343-2996 <i>(Name and Phone Number)</i>
<b>Location(s) covered by this SOP:</b>	Wetherill 419, 423A <i>(Building/Room Number)</i>

### Section 2 – Type of SOP:

Process       Hazardous Chemical       Hazardous Class

### Section 3 – Physical / Chemical Properties and Uses

#### Physical / Chemical Properties:

CAS#: N/A

GHS Classification: Flammable or Combustible Liquid (depending on the type of flammable liquid, other hazards such as toxicity often apply as well)

Molecular Formula: N/A

Form (physical state): Liquid

Color: N/A

Boiling Point: N/A

Flash Point: N/A

Lower Explosive Limit: N/A

Upper Explosive Limit: N/A

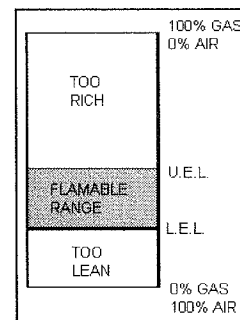
Relative Vapor Density: N/A

**Uses:**

Many laboratory applications require the use of flammable and/or combustible liquids. Uses include applications such as cleaning, preparing solutions, organic synthesis, spectrometry techniques, and many more. Examples of commonly used flammable and combustible liquids in the laboratory include: Acetone, Hexane, Tetrahydrofuran, Diethyl ether, and Kerosene. The safe use of flammable and combustible liquids is fundamental to any laboratory management system.

**Important Definitions:**

- **Flammable Liquid:** Liquids having a flash point below 38°C (100°F).
- **Combustible Liquid:** Liquids having a flash point at or above 38°C (100°F) and no greater than 93°C (200°F).
- **Flash Point:** The minimum temperature at which vapors are formed on the surface of a substance in sufficient quantity to ignite when exposed to an ignition source.
- **Fire Point:** The minimum temperature at which self-sustained combustion of a substance will occur upon or after exposure to an ignition source.
- **Boiling Point:** The temperature at which the vapor pressure of a liquid equals the atmospheric pressure and the liquid changes into a vapor.
- **Auto Ignition Temperature:** The minimum temperature at which self-sustained combustion will occur in the absence of an ignition source.
- **Lower Explosive Limit (LEL):** The lowest concentration (percentage) of a gas or a vapor in air capable of producing a flash of fire in presence of an ignition source (arc, flame, heat).
- **Upper Explosive Limit (UEL):** Highest concentration (percentage) of a gas or a vapor in air capable of producing a flash of fire in presence of an ignition source (arc, flame, heat).



**Section 4 – Potential Hazards**

Flammable or combustible liquid. Keep away from heat/sparks/open flames/hot surfaces. Flammable and combustible liquids often have other hazards associated with them such as toxicity and the ability to form explosive organic peroxides. Make sure that all of the potential hazards are understood before handling any chemical.



**Section 5 – Personal Protective Equipment (PPE)**

**Respirator Protection:**

If flammable and/or combustible liquids are being used outside of a chemical fume hood, respiratory protection may be required. If this activity is absolutely necessary, contact REM so a respiratory protection analysis can be performed. Respirators should be used under any of the following circumstances:

- As a last line of defense (i.e., after engineering and administrative controls have been exhausted).



- When Permissible Exposure Limit (PEL) has exceeded or when there is a possibility that PEL will be exceeded.
- Regulations require the use of a respirator.
- An employer requires the use of a respirator.
- There is potential for harmful exposure due to an atmospheric contaminant (in the absence of PEL)
- As PPE in the event of a chemical spill clean-up process

Lab personnel intending to use/wear a respirator mask must be trained and fit-tested by REM. This is a regulatory requirement. (<http://www.purdue.edu/rem/home/booklets/RPP98.pdf>)

**Hand Protection:**

Gloves must be worn. Use proper glove removal technique to avoid any skin contact. Nitrile gloves are recommended for low volume applications. Wearing two pairs of nitrile gloves is recommended. If handling a high volume (> 4 liters) of flammable or combustible liquid, then disposable gloves are likely not suitable; a more heavy duty glove such as a butyl rubber is required. Check the resources below for the most suitable glove.

**NOTE:** Consult with your preferred glove manufacturer to ensure that the gloves you plan on using are compatible with the specific flammable or combustible liquids being used.

Refer to glove selection chart from the links below:

[http://www.ansellpro.com/download/Ansell\\_8thEditionChemicalResistanceGuide.pdf](http://www.ansellpro.com/download/Ansell_8thEditionChemicalResistanceGuide.pdf)

OR

<http://www.showabestglove.com/site/default.aspx>

OR

<http://www.mapaglove.com/>

**Eye Protection:**

ANSI approved properly fitting safety glasses or chemical splash goggles are required. A face shield may also be appropriate depending on the specific application.

**Skin and Body Protection:**

Laboratory coats must be worn and be appropriately sized for the individual and buttoned to their full length (flame resistant lab coats must be worn when handling volumes greater than 1 liter). Laboratory coat sleeves must be of sufficient length to prevent skin exposure while wearing gloves. Personnel must also wear full length pants, or equivalent, and close-toed shoes. Full length pants and close-toed shoes must be worn at all times by all individuals that are occupying the laboratory area. The area of skin between the shoe and ankle must not be exposed.

**Hygiene Measures:**

Wash thoroughly and immediately after handling. Remove any contaminated clothing and wash before reuse.

## Section 6 – Engineering Controls

Use of flammable and combustible liquids should be conducted in a properly functioning chemical fume hood whenever possible. The chemical fume hood must be approved and certified by REM and have a face velocity between 85 – 125 feet per minute.

## Section 7 – First Aid Procedures

### If inhaled:

Move into the fresh air immediately. Consult a physician. If not breathing give artificial respiration and seek immediate medical attention.

### In case of skin contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash any contaminated clothing before reuse. Thoroughly clean shoes before reuse. Consult a physician.

### In case of eye contact:

Check for and remove any contact lenses. Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Seek immediate medical attention.

### If swallowed:

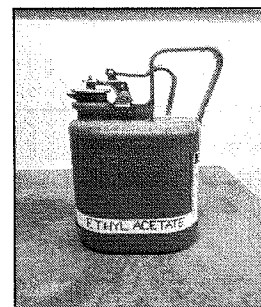
Do NOT induce vomiting unless directed by medical personnel. Never give anything by mouth to an unconscious person. Seek immediate medical attention.

## Section 8 – Special Handling and Storage Requirements

- A designated storage area must be established for flammable and combustible liquids such as a flammable storage cabinet (as shown to the right).
- No more than 37 liters (10 gallons) of flammable liquid is permitted to be stored outside of a flammable storage cabinet/area.
- Do not over purchase; only purchase what can be safely stored in the laboratory.
- Avoid contact with skin, eyes, and inhalation.
- Keep away from sources of ignition.
- Keep containers tightly closed. Store in a cool, dry, and well-ventilated area away from incompatible substances such as oxidizers. More handling details are described below in Section 13.
- Follow laboratory supervisor's instructions for PPE, which may differ depending on the type and/or quantity of flammable/combustible liquid being used.
- Use in the smallest practical quantities for the experiment being performed.
- Work must be conducted in a chemical fume hood if air concentrations above 10% of the LEL could be created, if the chemical is irritating to the eyes or respiratory system, and/or is toxic by inhalation.
- Containers should remain closed when not in use. This is key to preventing accumulation of flammable vapor concentrations and/or accidental ignition.
- Containers should be labeled appropriately. Label should indicate the name of the chemical(s) in the container. Avoid using chemical abbreviations (acceptable if a legend is present in the lab) and formulae.
- When not in use, store in flammable storage cabinets if possible.



- Containers should be in good condition and compatible with the material; store in safety cans (spring closing lid, as illustrated to the right) if possible.
- Avoid using ignition sources (flame burners or any open flame source, hot plates, electrical equipment with frayed or cracked wiring, etc.) and/or creating static electricity in areas where flammable/combustible chemicals are being used.
- Ground and bond containers when transferring more than 4 liters of flammable/combustible liquids.
- Transport all flammable/combustible liquids in secondary containment, such as polyethylene or other non-reactive acid/solvent bottle carrier.
- Flammable/combustible liquids must be segregated from incompatible materials such as oxidizers (e.g., Hydrogen peroxide, Nitric acid). Incompatibilities will be noted in Section 10 of the SDS, "Stability and Reactivity".
- If flammable liquids will be stored in refrigerators or freezers, these will be specially modified or purpose-made "flammable-safe" refrigerators and freezers which have no internal sources of ignition posed by an internal light or thermostat circuit.



## **Section 9 – Spill and Accident Procedures**

### **Chemical Spill Dial 911**

Immediately evacuate area and ensure others are aware of the spill. If there is an imminent threat of a fire, pull the nearest fire alarm station to evacuate the building and **dial 911**. If the spill is minor and does not pose a threat to personnel, contact REM at 49-40121 during normal business hours (7 AM – 4 PM) for spill cleanup assistance (dial 911 if spill occurs after hours and assistance is needed).

### **Chemical Spill on Body or Clothes:**

Remove clothing and rinse body thoroughly in emergency shower for at least 15 minutes. Seek medical attention; **dial 911**.

### **Chemical Splash into Eyes:**

Immediately rinse eyes and inner surface of eyelid with water from the emergency eyewash station for 15 minutes by forcibly holding the eye open. Seek medical attention; **dial 911**.

## **Section 10 – Medical Emergency**

### **Life Threatening Emergency, After Hours, Weekends And Holidays:**

**Dial 911**

### **Non-Life Threatening Emergency:**

Immediately report injury to supervisor and complete the First Report of Injury.  
(<http://www.purdue.edu/rem/injury/froi.htm>)

## **Section 11 – Waste Disposal Procedures**

### **Label Waste:**

Make sure the waste container(s) is properly labeled; label should indicate all of the contents of the container. REM provides hazardous waste labels free of charge, call 49-40121 to obtain labels.

**Store Waste:**

Store hazardous waste in closed containers, and in a designated area (flammable cabinet is recommended).

**Dispose of Waste:**

Complete a Chemical Waste Pickup Request Form to arrange for disposal by REM. Call REM at 49-40121 or visit the REM webpage for questions. (<http://www.purdue.edu/rem/hmm/wststo.htm>) No flammable or combustible liquids (including alcohols) are permitted to be poured down the drain.

**Section 12 – Safety Data Sheet (SDS)**

A current copy of the SDS for the specific flammable/combustible liquids being used must be made available to all personnel working in the laboratory at all times. To obtain a copy of the SDS, contact the chemical manufacturer or REM at 49-46371. Many manufacturers' SDSs can be found online on websites such as Sigma-Aldrich (<http://www.sigmaaldrich.com/united-states.html>) or Siri MSDS Index (<http://hazard.com/msds/>).

**Section 13 – Protocol/Procedure**

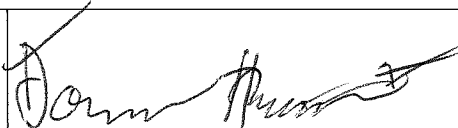


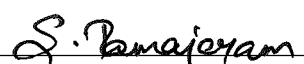
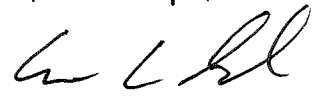

PPE required. Gloves, goggles, labcoat, pants must cover ankles, and closed toed shoes are required.

**Section 14 – Documentation of Training**

- Prior to conducting any work with flammable/combustible liquids, designated personnel must provide training to his/her laboratory personnel specific to the hazards involved in working with this substance, work area decontamination, and emergency procedures.
- The Principal Investigator must provide his/her laboratory personnel with a copy of this SOP and a copy of the SDS provided by the manufacturer.
- The Principal Investigator must ensure that his/her laboratory personnel have attended appropriate laboratory safety training or refresher training within the last one year.

I have read and understand the content of this SOP:

Name	Signature	Date
Heather Schoonover		Click here to enter a date. 9/15/14
Ian Powers		Click here to enter a date.
Colby Adolph		Click here to enter a date. 9.17.14
Talia Steiman		Click here to enter a date. 9/17/14

<b>Douglas Hartline</b>		Click here to enter a date. 9/17/2014
<b>Sudipta Pal</b>		Click here to enter a date. 9/19/14
<b>Youyun Zhou</b>		Click here to enter a date. 09/17/14
<b>Ramajeyam Salvaraj</b>		Click here to enter a date. 09-17-2014
<b>Aaron Spesard</b>		Click here to enter a date. 9-18-14
<b>Jordan Rogers</b>		Click here to enter a date. 9-22-14
Click here to enter text.		Click here to enter a date.
Click here to enter text.		Click here to enter a date.
Click here to enter text.		Click here to enter a date.
Click here to enter text.		Click here to enter a date.
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Click here to enter text.		Click here to enter a date.

# Standard Operating Procedure

## Lithium Alkyl Compounds

Print a copy and insert into your *Lab-Specific Chemical Hygiene Plan*.

### Section 1 – Lab-Specific Information

<b>Department:</b>	Chemistry
<b>Date SOP was written:</b>	9/15/2014
<b>Date SOP was approved by PI/lab supervisor:</b>	9/15/2014
<b>Principal Investigator:</b>	Christopher Uyeda
<b>Internal Lab Safety Coordinator/Lab Manager:</b>	Heather Schoonover
<b>Lab Phone:</b>	Click here to enter text.
<b>Office Phone:</b>	49-46102
<b>Emergency Contact:</b>	Heather Schoonover, 217-343-2996 <i>(Name and Phone Number)</i>
<b>Location(s) covered by this SOP:</b>	Wetherill 419, 423A <i>(Building/Room Number)</i>

### Section 2 – Type of SOP:

- Process     
  Hazardous Chemical     
  Hazardous Class

### Section 3 – Physical / Chemical Properties and Uses

#### Physical / Chemical Properties:

CAS#: N/A

GHS Classification: Pyrophoric, Water-Reactive, Flammable Liquid, Corrosive

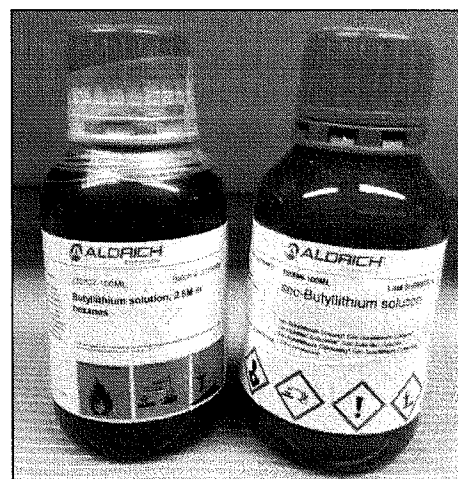
Molecular Formula: N/A

Form (physical state): solid or liquid

Color: N/A

Boiling point: N/A

#### Uses:



Lithium alkyl compounds are pyrophoric chemicals that spontaneously ignite on contact with air. These compounds react violently with water and vapors may form explosive mixture with air. Lithium alkyl compounds are widely used as a polymerization initiator in the production of elastomers such as polybutadiene or styrene-butadiene-styrene (SBS). Also, it is broadly employed as a strong base in organic synthesis, both industrially and in the laboratory. Lithium alkyl compounds are also used for the exchange of lithium with halogens and for the deprotonation of amines and activated C—H compounds.

#### Section 4 – Potential Hazards

Lithium alkyls are classified as **flammable liquids**, **pyrophorics** and **water reactives**. They react violently with water liberating extremely flammable gas. Spontaneously flammable in air and causes burns. Dangers of serious damage to health by prolonged exposure through inhalation. Pose a possible risk of an impaired fertility. Extreme caution is advised. Keep away from heat and sources of ignition. Material is extremely destructive to the tissue of the mucous membranes and upper respiratory tract. Vapors may cause drowsiness and dizziness.

While it is possible to work with this compound using cannula transfer, traces of these compounds at the tip of the needle or cannula may catch fire and clog the cannula with lithium salts. Some workers prefer to enclose the needle tip or cannula in a short glass tube which is flushed with an inert gas and sealed via two septa.

Examples include tert-butyllithium and n-butyllithium.



#### Section 5 – Personal Protective Equipment (PPE)

##### Respirator Protection:

Respirators should be used only under any of the following circumstances:

- As a last line of defense (i.e., after engineering and administrative controls have been exhausted).
- When Permissible Exposure Limit (PEL) has exceeded or when there is a possibility that PEL will be exceeded.
- Regulations require the use of a respirator.
- An employer requires the use of a respirator.
- There is potential for harmful exposure due to an atmospheric contaminant (in the absence of PEL)
- As PPE in the event of a chemical spill clean-up process

Lab personnel intending to use/wear a respirator mask must be trained and fit-tested by REM. This is a regulatory requirement. (<http://www.purdue.edu/rem/home/booklets/RPP98.pdf>)

##### Hand Protection:

Gloves must be worn. Use proper glove removal technique to avoid any skin contact. Nitrile gloves are recommended. Wearing two pairs of nitrile gloves is recommended.

**NOTE:** Consult with your preferred glove manufacturer to ensure that the gloves you plan on using are compatible with Lithium alkyls.

Refer to glove selection chart from the links below:

[http://www.ansellpro.com/download/Ansell\\_8thEditionChemicalResistanceGuide.pdf](http://www.ansellpro.com/download/Ansell_8thEditionChemicalResistanceGuide.pdf)

OR

<http://www.showabestglove.com/site/default.aspx>

OR

<http://www.mapaglove.com/>

**Eye Protection:**

ANSI approved properly fitting safety glasses or chemical splash goggles. Face shield is also recommended.

**Skin and Body Protection:**

Flame resistant lab coats must be worn and be appropriately sized for the individual and buttoned to their full length. Laboratory coat sleeves must be of sufficient length to prevent skin exposure while wearing gloves. Personnel should also wear full length pants, or equivalent, and close-toed shoes. Full length pants and close-toed shoes must be worn at all times by all individuals that are occupying the laboratory area. The area of skin between the shoe and ankle should not be exposed.

**Hygiene Measures:**

Wash thoroughly and immediately after handling. Remove any contaminated clothing and wash before reuse.

**Section 6 – Engineering Controls**

Use of pyrophoric material must be conducted in an inert atmosphere; use of a glove box is recommended. The chemical fume hood must be approved and certified by REM and have a face velocity between 85 – 125 feet per minute.

**Section 7 – First Aid Procedures**

**If inhaled:**

Move into the fresh air immediately and give oxygen. If not breathing give artificial respiration. Seek medical attention immediately.

**In case of skin contact:**

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash any contaminated clothing before reuse. Thoroughly clean shoes before reuse. Seek medical attention immediately.

**In case of eye contact:**



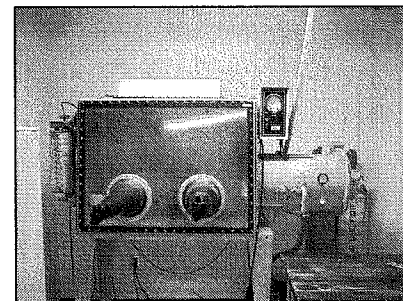
Check for and remove any contact lenses. Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Seek immediate medical attention and continue eye rinse during transport to hospital.

**If swallowed:**

Do NOT induce vomiting unless directed by medical personnel. Never give anything by mouth to an unconscious person. Seek medical attention immediately.

**Section 8 – Special Handling and Storage Requirements**

- Precautions for safe handling: **Pyrophoric**, use extreme care when handling.
- Only handle under inert gas; use a glove box if possible. Do not expose to air.
- Avoid contact with skin and eyes and inhalation.
- A “dry-run” of the experiment should be performed using low-hazard materials such as water or an organic solvent.
- Never work with lithium alkyl compounds alone.
- Conduct the procedure only after a supervisor has observed the user performing the proper technique unassisted.
- All glassware used for lithium alkyl compounds should be oven-dried and free of moisture.
- Keep away from sources of ignition. Avoid heat and shock or friction when handling.
- Secure all lithium alkyl containers to a stand.
- Keep containers tightly closed. Store in a cool, dry and well-ventilated area away from incompatible substances.
- The amount of pyrophoric materials stored should be kept at a minimum.
- Any expired or unnecessary reactive materials should be properly disposed of as hazardous waste.
- All pyrophoric materials should be clearly labeled with the original manufacturer’s label, which should have the chemical name, hazard labels, and pictograms. The label should not be defaced in any way.
- All pyrophoric material should be placed into secondary containment as a precautionary measure.
- Suitable storage locations include inert gas-filled desiccators or glove boxes, flammable storage cabinets that do not contain aqueous or other incompatible chemicals, or intrinsically safe refrigerators or freezers that also do not contain aqueous or other incompatible chemicals.
- If pyrophoric materials are received in a specially designed shipping, storage, or dispensing container (such as the Aldrich Sure-Seal packaging system), ensure that the integrity of that container is maintained. Ensure that sufficient protective solvent, oil, kerosene, or inert gas remains in the container while pyrophoric materials are stored.



**Additional Resources:**

- Aldrich Technical Bulletins [AL-134](#) and [AL-164](#)
- [Handling Pyrophoric Reagents](#) from U.S. Dept. of Energy and Pacific Northwest National Laboratory
- [Chemical Hygiene and Safety Plan](#) from Berkeley National Laboratory

**Section 9 – Spill and Accident Procedures**

### **Chemical Spill Dial 911**

Once spilled all liquid or solid pyrophoric chemicals may instantly ignite. Immediately evacuate area and ensure others are aware of the spill. If there is an imminent threat of a fire, pull the nearest fire alarm station to evacuate the building and **dial 911**. If the spill is minor and does not pose a threat to personnel, contact REM at 49-40121 during normal business hours (7 AM – 4 PM) for spill cleanup assistance (dial 911 if spill occurs after hours and assistance is needed).

#### **Chemical Spill on Body or Clothes:**

Remove clothing and rinse body thoroughly in emergency shower for at least 15 minutes. Seek medical attention; **dial 911**.

#### **Chemical Splash into Eyes:**

Immediately rinse eyes and inner surface of eyelid with water from the emergency eyewash station for 15 minutes by forcibly holding the eye open. Seek medical attention; **dial 911**.

## **Section 10 – Medical Emergency**

### **Life Threatening Emergency, After Hours, Weekends And Holidays:**

**Dial 911**

### **Non-Life Threatening Emergency:**

Immediately report injury to supervisor and complete the First Report of Injury.  
(<http://www.purdue.edu/rem/injury/froi.htm>)

## **Section 11 – Waste Disposal Procedures**

### **Label Waste:**

Make sure the waste container(s) is properly labeled; label should indicate all of the contents of the container. REM provides hazardous waste labels free of charge, call 49-40121 to obtain labels.

### **Store Waste:**

Store hazardous waste in closed containers, and in a designated area (flammable cabinet is recommended). Pyrophoric waste should be segregated from all incompatible chemicals such as aqueous solutions.

### **Dispose of Waste:**

Complete a Chemical Waste Pickup Request Form to arrange for disposal by REM. Call REM at 49-40121 or visit the REM webpage for questions. (<http://www.purdue.edu/rem/hmm/wststo.htm>)

## **Section 12 – Safety Data Sheet (SDS)**

A current copy of the SDS for the specific lithium alkyl (i.e., butyllithium) must be made available to all personnel working in the laboratory at all times. To obtain a copy of the SDS, contact the chemical manufacturer or REM at 49-46371. Many manufacturers' SDSs can be found online on websites such as Sigma-Aldrich (<http://www.sigmaaldrich.com/united-states.html>) or Siri MSDS Index (<http://hazard.com/msds/>).


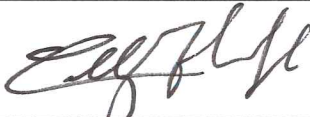







## **Section 13 – Protocol/Procedure**

PPE required. Gloves, goggles, labcoat, pants must cover ankles, and closed toed shoes are required.

**Section 14 – Documentation of Training**

- Prior to conducting any work with Lithium alkyls, designated personnel must provide training to his/her laboratory personnel specific to the hazards involved in working with this substance, work area decontamination, and emergency procedures.
- The Principal Investigator must provide his/her laboratory personnel with a copy of this SOP and a copy of the SDS provided by the manufacturer.
- The Principal Investigator must ensure that his/her laboratory personnel have attended appropriate laboratory safety training or refresher training within the last one year.

I have read and understand the content of this SOP:

Name	Signature	Date
Heather Schoonover		Click here to enter a date. 9/15/14
Ian Powers		Click here to enter a date.
Colby Adolph		Click here to enter a date. 9.17.14
Talia Steiman		Click here to enter a date. 9/17/14
Douglas Hartline		Click here to enter a date. 9/17/2014
Sudipta Pal		Click here to enter a date. 9/19/14
Youyun Zhou		Click here to enter a date. 9/17/14
Ramajeyam Salvaraj		Click here to enter a date. 09-17-2014
Aaron Spesard		9-18-14
Jordan Rogers		10/1/14

# Standard Operating Procedure

## Mercury

Print a copy and insert into your *Lab-Specific Chemical Hygiene Plan*.

### Section 1 – Lab-Specific Information

<b>Department:</b>	Chemistry
<b>Date SOP was written:</b>	9/15/2014
<b>Date SOP was approved by PI/lab supervisor:</b>	9/15/2014
<b>Principal Investigator:</b>	Christopher Uyeda
<b>Internal Lab Safety Coordinator/Lab Manager:</b>	Heather Schoonover
<b>Lab Phone:</b>	Click here to enter text.
<b>Office Phone:</b>	49-46102
<b>Emergency Contact:</b>	Heather Schoonover, 217-343-2996 <i>(Name and Phone Number)</i>
<b>Location(s) covered by this SOP:</b>	Wetherill 419, 423A <i>(Building/Room Number)</i>

### Section 2 – Type of SOP:

Process       Hazardous Chemical       Hazardous Class

### Section 3 – Physical / Chemical Properties

#### Physical / Chemical Properties:

CAS#: 7493-97-6

GHS Classification: Acute toxicity (inhalation); Reproductive toxicity; Specific target organ toxicity – repeated exposure; Acute aquatic toxicity; Chronic aquatic toxicity

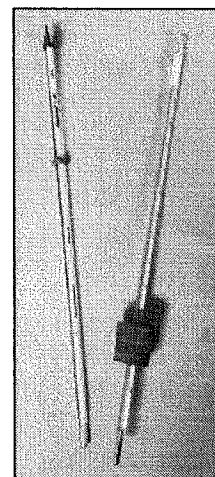
Molecular Formula: Hg

Form (physical state): Liquid

Color: Silver

Boiling Point: 356.6 °C

Flash Point: NA (not flammable)



Relative Vapor Density: 6.93 (Air = 1.0)

## Section 4 – Potential Hazards

Mercury is toxic by inhalation and a teratogen. Can be fatal if inhaled. May damage fertility or the unborn child. Causes damage to organs through prolonged or repeated exposure. May cause skin rash and cold and clammy skin with cyanosis or pale skin color. May cause perforation of the digestive tract. Causes chemical burns to the respiratory tract. Prolonged or repeated exposure may cause inflammation of the mouth and gums, excessive salivation, and loosening of the teeth. Very toxic to aquatic life with long lasting effects.

### Exposure Limits:

OSHA PEL (8 HR. TWA): 0.1 mg/m<sup>3</sup>  
ACGIH TLV/TWA: 0.025 mg/m<sup>3</sup>



## Section 5 – Personal Protective Equipment (PPE)

### Respirator Protection:

Respirators should be used only under any of the following circumstances:

- As a last line of defense (i.e., after engineering and administrative controls have been exhausted).
- When Permissible Exposure Limit (PEL) has exceeded or when there is a possibility that PEL will be exceeded.
- Regulations require the use of a respirator.
- An employer requires the use of a respirator.
- There is potential for harmful exposure due to an atmospheric contaminant (in the absence of PEL)
- As PPE in the event of a chemical spill clean-up process

Lab personnel intending to use/wear a respirator mask must be trained and fit-tested by REM. This is a regulatory requirement. (<http://www.purdue.edu/rem/home/booklets/RPP98.pdf>)

### Hand Protection:

Gloves must be worn. Use proper glove removal technique to avoid any skin contact. Nitrile or neoprene gloves are recommended. Wearing two pair of gloves is recommended. Check the resources below for a more suitable glove.

**NOTE:** Consult with your preferred glove manufacturer to ensure that the gloves you plan on using are compatible with Mercury.

Refer to glove selection chart from the links below:

[http://www.ansellpro.com/download/Ansell\\_8thEditionChemicalResistanceGuide.pdf](http://www.ansellpro.com/download/Ansell_8thEditionChemicalResistanceGuide.pdf)

OR

<http://www.showabestglove.com/site/default.aspx>

OR

<http://www.mapaglove.com/>

**Eye Protection:**

ANSI approved properly fitting safety glasses or chemical splash goggles.

**Skin and Body Protection:**

Lab coats (100% cotton) must be worn and be appropriately sized for the individual and buttoned to their full length. Laboratory coat sleeves must be of sufficient length to prevent skin exposure while wearing gloves. Personnel must also wear full length pants, or equivalent, and close-toed shoes. Full length pants and close-toed shoes must be worn at all times by all individuals that are occupying the laboratory area. The area of skin between the shoe and ankle must not be exposed.

**Hygiene Measures:**

Wash thoroughly and immediately after handling. Remove any contaminated clothing and wash before reuse.

**Section 6 – Engineering Controls**

Use of Mercury must be conducted in a properly functioning chemical fume hood. The chemical fume hood must be approved and certified by REM and have a face velocity between 85 – 125 feet per minute.

**Section 7 – First Aid Procedures**

**If inhaled:**

Move into the fresh air immediately and give oxygen. If not breathing give artificial respiration. Consult a physician.

**In case of skin contact:**

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash any contaminated clothing before reuse. Consult a physician.

**In case of eye contact:**

Check for and remove any contact lenses. Rinse thoroughly with plenty of water for at least 15 minutes. Consult a physician.

**If swallowed:**

Do NOT induce vomiting unless directed by medical personnel. Never give anything by mouth to an unconscious person. Consult a physician.

**Section 8 – Special Handling and Storage Requirements**

- A designated storage area must be established for Mercury and the area should be posted with a “Caution, Carcinogen, Reproductive Toxins, or Extremely Toxic Chemicals” label provided by REM (as shown to the right).
- Avoid contact with skin and eyes and inhalation.
- Keep containers tightly closed.

