- Store in a cool, dry and well-ventilated area away from incompatible substances such as strong oxidizing agents, ammonia, azide compounds, nitrate compounds, chlorate compounds, and copper compounds.
- 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.
- Purdue University has a Mercury Reduction Policy (see link below). The use of Mercury should be extremely limited and only used when absolutely necessary (i.e., extremely accurate or high temperature measurements are necessary. (http://www.purdue.edu/rem/home/booklets/HgPolicy.pdf)

Section 9 – Spill and Accident Procedures

Chemical Spill

Immediately evacuate area and ensure others are aware of the spill. If the spill occurs on the floor, do not continue to work around the spill; leave the area. If the spill is minor (i.e., mercury thermometer) and does not pose a serious 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). If the spill is large (i.e., large mercury monometer), **dial 911.**

Chemical Spill on Body or Clothes:

Remove clothing and rinse body thoroughly in emergency shower for at least 15 minutes. If personnel step on Mercury then the shoes must be removed immediately. Seek medical attention.

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.

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). Do not combine mercury waste with other waste streams such as organic solvent waste; the disposal cost is extremely high. Keep mercury waste separated from other wastes as much as possible.

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 Mercury 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

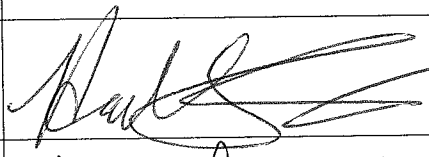
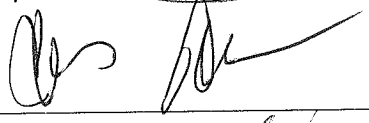
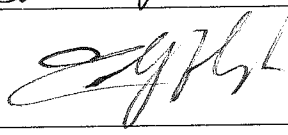
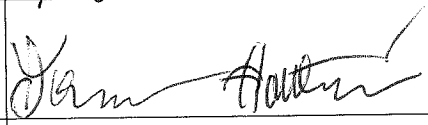
PPE required. Gloves, goggles, labcoat, pants must cover ankles, and closed toed shoes are required.

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

Section 14 – Documentation of Training

- Prior to conducting any work with Mercury, 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

PURDUE
UNIVERSITY

Name	Signature	Date
Youyun Zhou	Youyun Zhou	Click here to enter a date. 09/17/2014
Ramajeyam Salvaraj	S. Ramajeyam	Click here to enter a date. 09-17-2014
Aaron Spesard		Click here to enter a date. 9-18-14
Jordan Rogers	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.
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.

PURDUE
UNIVERSITY

Standard Operating Procedure

Methylene Chloride / Dichloromethane

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:	Click here to enter text.
Office Phone:	49-46102
Emergency Contact:	Heather Schoonover, 217-343-2996 *(Name and Phone Number)*
Location(s) covered by this SOP:	*Wetherill 419, 423A* *(Building/Room Number)*

Section 2 – Type of SOP:

☐ Process ☒ Hazardous Chemical ☐ Hazardous Class

Section 3 – Physical / Chemical Properties

Physical / Chemical Properties:

CAS#: 75-09-2

GHS Classification: Acute toxicity (oral and dermal), Skin and eye irritation, Carcinogenicity, Specific target organ toxicity – single exposure: respiratory system and central nervous system, Specific target organ toxicity – repeated exposure: inhalation and central nervous system

Molecular Formula: CH_2Cl_2

Form (physical state): Liquid

Color: Colorless

Boiling Point: 40 °C

Flash Point: NA (not flammable)

Density: 1.325 g/L at 25 °C

Relative Vapor Density: 2.93 (Air = 1.0)

Section 4 – Potential Hazards

Methylene chloride is an OSHA regulated carcinogen. It is an acutely toxic liquid that is extremely harmful if inhaled or absorbed through the skin. Methylene chloride is toxic to the liver, pancreas, blood, central nervous system, heart, and kidneys.

Exposure Limits:

OSHA PEL (8 HR. TWA):	25 ppm
OSHA Short Term Exposure Limit:	125 ppm
ACGIH TLV/TWA:	50 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:

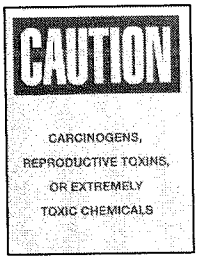
http://www.ansellpro.com/download/Ansell_8thEditionChemicalResistanceGuide.pdf

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 Methylene chloride 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 Methylene chloride 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 Methylene chloride, 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

PURDUE
UNIVERSITY

Name	Signature	Date
Youyun Zhou	Youyun Zhou	Click here to enter a date.
Ramajeyam Salvaraj	S. Ramajeyam	Click here to enter a date. 09-17-2014
Aaron Spesard		Click here to enter a date. 9-18-14
Jordan Rogers	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.
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.

PURDUE
UNIVERSITY

Standard Operating Procedure

Nitrate Compounds

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:	Click here to enter text.
Office Phone:	49-46102
Emergency Contact:	Heather Schoonover, 217-343-2996 *(Name and Phone Number)*
Location(s) covered by this SOP:	*Wetherill 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: Potentially explosive. Strong Oxidizer. Carcinogen.

Molecular Formula: $-NO_3^-$

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:

Nitrate compounds are a class of potentially explosive chemicals containing the nitrate anion ($-NO_3^-$). These chemicals can release a destructive amount of pressure, gas, or heat when subjected to certain conditions such as high temperatures or sources of ignition. These compounds also tend to be strong oxidizers. Nitrate salts, such as ammonium nitrate, sodium nitrate, and potassium nitrate, are often used as agricultural fertilizers. Nitrate compounds may also be used as oxidizing agents, especially in explosives.

Section 4 – Potential Hazards

Strong oxidizer. Contact with other material may cause and/or intensify a fire. Keep away from heat. Keep away from clothing and other combustible materials. Take any precaution to avoid mixing with combustibles. Store away from combustibles. Harmful if ingested, inhaled, or absorbed through the skin. Causes irritation to the gastrointestinal tract, respiratory tract, skin, and eyes. May be carcinogenic. Please refer to the SDS of the specific chemical for safe handling.

Section 5 – Personal Protective Equipment (PPE)

Respirator Protection:

If nitrates 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

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 nitrate salts 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 inhalation. Avoid inhalation and ingestion. Avoid formation of dust.
- Provide adequate ventilation.
- Keep away from combustible materials. Keep away from heat and sources of ignition - No smoking.
- Use spark-proof tools and explosion-proof equipment. Prevent build-up of electrostatic charge.
- Keep containers tightly closed. Store in a cool, dry, and well-ventilated area away from incompatible substances such as flammable and combustible liquids.
- Opened containers must be carefully resealed and kept upright to prevent leakage.
- Keep cool and protected from sunlight.
- Store segregated from incompatible chemicals.
- 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 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.
- 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 nitrate salts are being used.
- Transport all nitrate compounds in secondary containment, such as polyethylene or other non-reactive acid/solvent bottle carrier.
- Nitrates must be segregated from incompatible materials such as flammable and combustible 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:

When possible, do not mix nitrate waste streams with flammable or combustible 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 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 oxidizing liquid or solid 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 nitrate compounds, 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.

PURDUE
UNIVERSITY

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. 09/17/14
Ramajeyam Salvaraj	S. Ramajeyam	Click here to enter a date. 09-17-2014
Aaron Spesard		Click here to enter a date. 9-18-14
Jordan Rogers	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.
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.
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.
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.

PURDUE
UNIVERSITY

Standard Operating Procedure

Nitric Acid

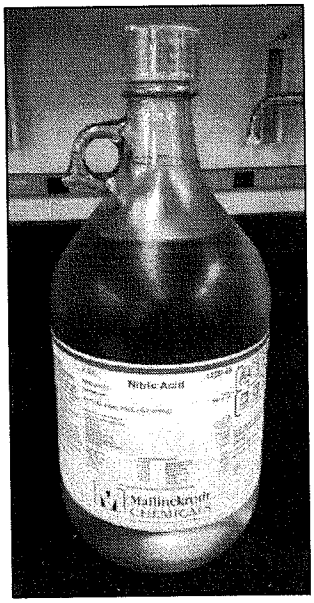
Print a copy and insert into your *Lab-Specific Chemical Hygiene Plan*.

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:	Click here to enter text.
Office Phone:	49-46102
Emergency Contact:	Heather Schoonover, 217-343-2996 *(Name and Phone Number)*
Location(s) covered by this SOP:	*Wetherill 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#: 7697-37-2

GHS Classification: Target Organ Effect, Corrosive, Oxidizer

Molecular Formula: HNO_3

Form (physical state): Liquid

Color: Colorless, light yellow

Boiling point: 83.9 – 100°C

Uses:

Nitric acid is commonly found in the laboratory and there are several uses. A few common uses include nitration, purification of metals, cleaning agents (Aqua Regia), and the production of nylon precursors and agricultural fertilizers.

Section 4 – Potential Hazards

Nitric acid is an oxidizer that may intensify fires. Fire conditions may cause the formation of hazardous nitrogen oxides. Can react violently with organic chemicals such as organic solvents. Nitric acid may be harmful if inhales, ingested, or absorbed through the skin. It is extremely destructive to the tissue of the mucous membranes and upper respiratory tract. Causes severe skin and eye burns. May cause blindness and permanent eye damage. Inhalation may cause spasms, inflammation and edema of the bronchi or larynx. Other symptoms include burning sensation, coughing, wheezing, shortness of breath, headache, nausea, vomiting, and pulmonary edema. Effects may be delayed. Large doses may conversion of hemoglobin to methemoglobin, producing cyanosis or a drastic fall in blood pressure, leading to collapse, coma, and possibly death. Chronic exposure may cause erosion of the teeth, jaw necrosis, and kidney damage.

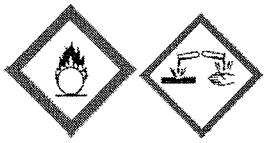
Potential Health Effects:

Inhalation: May be harmful if inhaled. Material is extremely destructive to the tissue of the mucous membranes and upper respiratory tract.

Skin: May be harmful if absorbed through skin. Causes skin burns.

Eyes: Causes eye burns. Causes severe eye burns.

Ingestion: May be harmful if swallowed.



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:

Handle with gloves. Viton-butyl, butyl rubber, or neoprene gloves are recommended for handling concentrated nitric acid (>70%). Latex and nitrile gloves are not recommended for handling concentrated nitric acid.

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

Refer to glove selection chart from the links below:

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 goggles are required. A face shield is also recommended.

Skin and Body Protection:

Lab coat, full-length pants, and closed-toe shoes are required.

Hygiene Measures:

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

Section 6 – Engineering Controls

Use of nitric acid 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

- Avoid contact with skin, eyes, and clothing.
- Keep container tightly closed in a dry and well-ventilated area. If possible, store in corrosive/acid/lab storage cabinet within a secondary containment (nalgene/ polypropylene tray or tub). Store in original container away from direct sunlight.
- Avoid contact with alkali metals, reducing agents, cyanides, aldehydes, powdered metals, ammonia, and acetic anhydride, and all organic materials including organic solvents.
- Do not store in the top most shelf of the storage cabinet. In general, do not store chemicals at or above eye level.
- Ensure the container is tightly closed at all times.

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 begin first aid procedures (Section 7) immediately. Seek medical attention; **dial 911**.

Chemical Splash into Eyes:

Immediately rinse eyes and begin first aid procedures (Section 7) immediately. 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). HF waste should be segregated from all incompatible chemicals such as caustics.

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 nitric acid 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/).

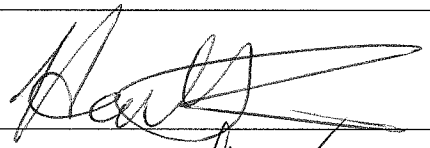
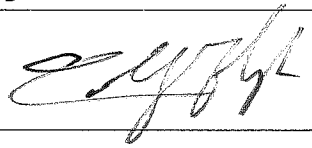
Section 13 – Protocol/Procedure

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

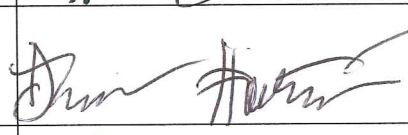
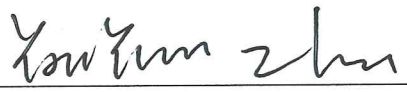
Section 14 – Documentation of Training

- Prior to conducting any work with nitric acid, 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

PURDUE
UNIVERSITY

Name	Signature	Date
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.
Youyun Zhou		Click here to enter a date. 9/17/2014
Ramajeyam Salvaraj		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.
Click here to enter text.		Click here to enter a date.

PURDUE
UNIVERSITY

Standard Operating Procedure

Oxidizers

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:	Click here to enter text.
Office Phone:	49-46102
Emergency Contact:	Heather Schoonover, 217-343-2996 *(Name and Phone Number)*
Location(s) covered by this SOP:	*Wetherill 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: Oxidizing Liquid or Oxidizing Solid

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:

Common oxidizers include Hydrogen peroxide, Nitric acid, Nitrate and Nitrite compounds, Perchloric acid and Perchlorate compounds, and Hypochlorite compounds, such as household bleach. Oxidizers have a wide variety of applications including cleaners and disinfectants, agricultural fertilizers, rocket propellant and fuel, and explosives.

Important Definitions:

- **Oxidizing liquid**- a liquid which, while in itself is not necessarily combustible, may generally by yielding oxygen, cause or contribute to the combustion of other material. Hydrogen peroxide, nitric acid, and nitrate solutions are examples of oxidizing liquids commonly found in a laboratory.
- **Oxidizing solid**- a solid which, while in itself not necessarily combustible, may generally by yielding oxygen, cause or contribute to the combustion of other material.

Section 4 – Potential Hazards

Oxidizer. Keep away from heat. Keep away from clothing and other combustible materials. Take any precaution to avoid mixing with combustibles. Store away from combustibles. Oxidizers can have other associated hazards, such as corrosive or toxic (e.g., Nitric acid, Sodium nitrite). Make sure that all of the potential hazards are understood before handling any chemical.

Section 5 – Personal Protective Equipment (PPE)

Respirator Protection:

If oxidizing liquids or solids 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

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 oxidizing liquids and solids 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 inhalation. Avoid inhalation of vapor or mist. Avoid formation of dust.
- Keep away from combustible materials. Keep away from sources of ignition - No smoking.
- Keep containers tightly closed. Store in a cool, dry, and well-ventilated area away from incompatible substances such as flammable and combustible liquids.
- Keep cool and protected from sunlight.
- Opened containers of oxidizing liquids must be carefully resealed and kept upright to prevent leakage.
- Carefully follow manufacturer's instructions if oxidizing liquid needs to be vented during storage.

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:

When possible, do not mix oxidizer waste streams with flammable or combustible 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 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 oxidizing liquid or solid 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)

- 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.
- 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 oxidizing chemicals are being used.
- Transport all oxidizing liquids and solids in secondary containment, such as polyethylene or other non-reactive acid/solvent bottle carrier.
- Oxidizers must be segregated from incompatible materials such as flammable and combustible materials. Incompatibilities will be noted in Section 10 of the SDS, "Stability and Reactivity".

Click here to enter text.

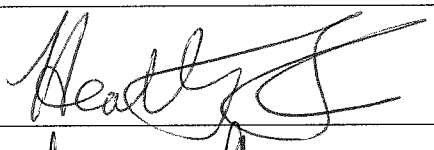
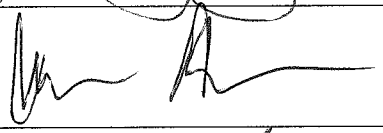
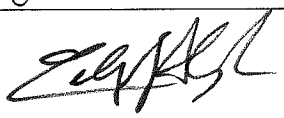
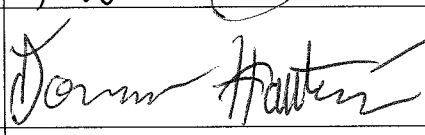
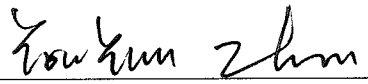
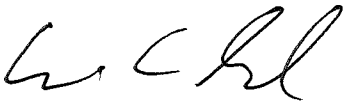
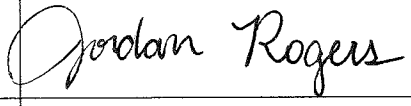
NOTE: Any deviation from this SOP requires approval from PI.

Section 14 – Documentation of Training

- Prior to conducting any work with oxidizers, 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.

PURDUE
UNIVERSITY

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. 09/17/14
Ramajeyam Salvaraj		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.
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.

PURDUE
UNIVERSITY

Standard Operating Procedure

Pyrophoric Materials

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:	Click here to enter text.
Office Phone:	49-46102
Emergency Contact:	Heather Schoonover, 217-343-2996 *(Name and Phone Number)*
Location(s) covered by this SOP:	*Wetherill 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: Pyrophoric, Water-Reactive, Flammable Liquid, Corrosive (majority of pyrophorics have these hazards)

Molecular Formula: N/A

Form (physical state): N/A

Color: N/A

Boiling point: N/A

Section 4 – Potential Hazards

Pyrophoric materials are classified as pyrophoric; and typically also classified as flammable liquids/solids, water reactives, and corrosives. Many are often toxic. 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. Extreme caution is advised. Keep away from heat and sources of ignition.

While it is often possible to work with these compounds 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 triethylaluminum.

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 the specific pyrophoric chemical being used.

Refer to glove selection chart from the links below:

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:

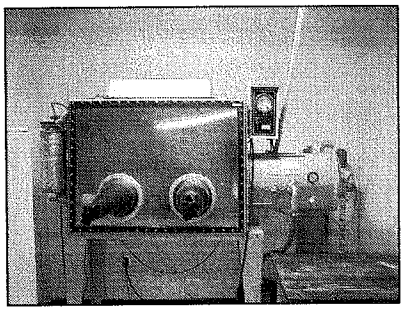
Check for and remove any contact lenses. Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Seek immediate medical attention and continue eye rinse during transport to hospital.

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 pyrophoric materials alone.



- Conduct the procedure only after a supervisor has observed the user performing the proper technique unassisted.
- All glassware used for pyrophoric materials should be oven-dried and free of moisture.
- Keep away from sources of ignition. Avoid heat and shock or friction when handling.
- Secure all pyrophoric material 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 pyrophoric compound (i.e., butyllithium) 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

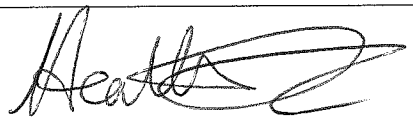
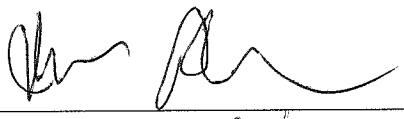
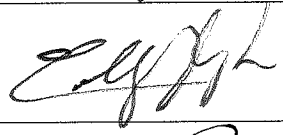
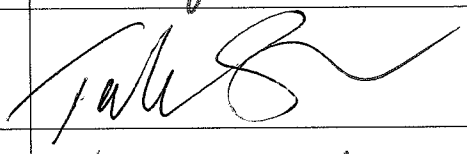
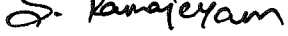
PPE required. Gloves, goggles, labcoat, pants must cover ankles, and closed toed shoes are required.

Section 14 – Documentation of Training

- Prior to conducting any work with pyrophoric 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.

PURDUE
UNIVERSITY

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		Click here to enter a date.
Ramajeyam Salvaraj		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.

PURDUE
UNIVERSITY

Standard Operating Procedure

Sulfuric acid, concentrated

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:	Click here to enter text.
Office Phone:	49-46102
Emergency Contact:	Heather Schoonover, 217-343-2996 *(Name and Phone Number)*
Location(s) covered by this SOP:	*Wetherill 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#: 7664-93-9

GHS Classification: Corrosive

Molecular Formula: H_2SO_4

Form (physical state): Liquid

Color: Clear, colorless to slightly yellow

Boiling Point: 290 °C (554 °F)

Flash Point: N/A

Relative Vapor Density: 3.39

Uses:

Sulfuric acid (alternative spelling Sulphuric acid) is a highly corrosive mineral acid. The historical name of this acid is oil of vitriol. Possessing different chemical properties, Sulfuric acid has a wide range of applications including domestic acidic drain cleaner, electrolyte in lead-acid batteries, and various cleaning agents. It is also a central substance in the chemical industry. Principal uses include mineral processing, fertilizer manufacturing, oil refining, wastewater processing, and chemical synthesis.

Section 4 – Potential Hazards

Highly corrosive chemical. Sulfuric acid is 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, and 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.

Section 5 – Personal Protective Equipment (PPE)

Respirator Protection:

If Sulfuric acid 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. Nitrile gloves are acceptable for minimal or splash contact only. Viton gloves are recommended for full contact exposure. 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 chemical being used.

Refer to glove selection chart from the links below:

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 Sulfuric acid should be conducted in a properly functioning chemical fume hood whenever possible. Avoid inhalation of vapor or mist. 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.
- Always use inside a chemical fume hood.
- Do not allow water to get into the container because of violent reaction.
- Note: In case you need to dilute the concentration of Sulfuric acid, always add the acid to water.
- Do not use with metal spatula or other metal items.
- Use in the smallest practical quantities for the experiment being performed.
- 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.
- Store in original container. Do not store Sulfuric acid in metal containers.
- Sulfuric acid must be segregated from incompatible materials. Sulfuric Acid is incompatible with metals, oxidizing agents, reducing agents, bases, Acrylonitrile, azides, cyanides, chlorates, finely powdered metals, nitrates, perchlorates, permanganates, Epichlorohydrin, Aniline, carbides, fulminates, halides, picrates, organic materials, Zinc salts, and flammable liquids.
- Containers should be labeled appropriately; the original manufacturer's label is acceptable. 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.
- Transport all corrosives in secondary containment, such as polyethylene or other non-reactive acid/solvent bottle carrier.

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)

PURDUE
UNIVERSITY

Section 11 – Waste Disposal Procedures

Label Waste:

Sulfuric acid 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)

Section 12 – Safety Data Sheet (SDS)

A current copy of the SDS for Sulfuric acid 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/).

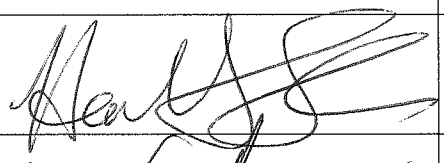
Section 13 – Protocol/Procedure

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

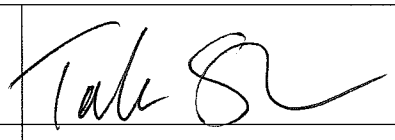
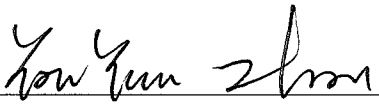
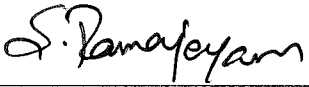
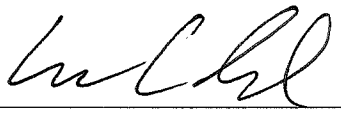
Section 14 – Documentation of Training

- Prior to conducting any work with Sulfuric acid, 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

PURDUE
UNIVERSITY

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. 09/17/14
Ramajeyam Salvaraj		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.
Click here to enter text.		Click here to enter a date.

Tab 2:

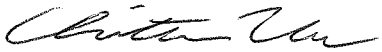
Lab-Specific Protocols, Requirements, Rules

Please refer to Tab 3 under Hazard Assessment for lab-specific protocols, requirements, and rules

Tab 3:

Lab-Specific Hazard Assessments

CERTIFICATION OF HAZARD ASSESSMENT

Supervisor (print): Chris Uyeda	Assessment Date(s): 9/15/14
Signature: 	Location(s) posted: Doors to WTHR 419, 423A

Hazards	**Task:** hands-on work or being within reach of potential hazards of described activity/items:	Minimum Requirements
Skin/eye damage, poisoning, inhalation of vapor or aerosol	Volume > 10 mL any unshielded corrosive liquids, organic liquids or liquid mixtures, or toxic inorganic liquids/mixtures	Splash goggles, chemical resistant gloves, lab coat, skin cover to knees/elbows, closed shoes with socks. Work in hood. Shower and eyewash must be available in work area
	Volume > 1 L	Same, but cover to ankles/wrists/throat
Skin/eye damage	Cryogenic liquids	Splash goggles, skin cover to elbows/knees/throat, closed shoe easily removed, socks. Cryogloves for dispensing.
Skin/eye damage, asphyxiation, body injury, frostbite,	Transport of liquid nitrogen in hallways and elevators	See cryogenic liquids; also all wheeled vessels or carts must restrain Dewar and have wheels large enough to safely traverse elevator door and scales gap.
Frostbite, eye impact	Dry ice, very cold frozen solids.	Safety glasses, insulated gloves, skin cover to elbows/knees/throat, closed shoe w/ socks
Skin/eye damage	Hot liquid (rxn mixture, water bath, oil bath, autoclave, still...)	Splash goggles, insulated gloves, skin cover to knees/elbows, closed shoe w/ socks