Standard Operating Procedures

Acutely Toxic Chemicals (ATC)

Copper Cyanide

Print a copy and insert into your laboratory SOP binder.

Department:	Chemistry
Date SOP was written:	June 20, 2013
Date SOP was approved by PI/lab supervisor:	
Principal Investigator:	Name: Richmond Sarpong **Signature: _____**
Internal Lab Safety Coordinator or Lab Manager:	Name: Rebecca Murphy Lab Phone: 510-643-2485 Office Phone: 510-642-6312
Emergency Contact:	Name: Richmond Sarpong Phone Number: 626-644-2407
Location(s) covered by this SOP:	Latimer Hall: 834, 836, 837, 838, 839, 842, 847, 849, 907

1 - Purpose

This SOP covers the precautions and safe handling procedures for the use of Copper Cyanide in the Sarpong group, which include the following uses:

Chemical	Use
Copper Cyanide	1. Used in the lab as a reagent in chemical reactions.

2 - Physical & Chemical Properties/Definition of Chemical Group

CAS#:544-92-3

Molecular Formula: CuCN

Form: solid

Color: off white/pale beige to yellow-green

Melting point/freezing point: 474 °C (885 °F)

Boiling point: no data available

Vapor pressure: no data available

Density: 2.92 g/cm3 at 25 °C (77 °F)

Flash point: no data available

Lower explosion limit: no data available

Upper explosion limit: no data available

Odor: no data available

Odor Threshold: no data available

3 - Potential Hazards/Toxicity

GHS Classification

Acute toxicity, Oral (Category 2)
Acute toxicity, Inhalation (Category 2)
Acute toxicity, Dermal (Category 1)
Acute aquatic toxicity (Category 1)
Chronic aquatic toxicity (Category 1)

GHS Label elements, including precautionary statements

Pictogram

Signal word	Danger
Hazard statement(s)	
H300 + H310	Fatal if swallowed or in contact with skin
H330	Fatal if inhaled.
H410	Very toxic to aquatic life with long lasting effects.
Precautionary statement(s)	
P260	Do not breathe dust/ fume/ gas/ mist/ vapors/ spray.
P264	Wash hands thoroughly after handling.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing.
P284	Wear respiratory protection.
P302 + P350	IF ON SKIN: Gently wash with plenty of soap and water.
P310	Immediately call a POISON CENTER or doctor/ physician.
P501	Dispose of contents/ container to an approved waste disposal plant.

Cal/OSHA Permissible Exposure Limits (PEL):5 mg/m^3 (as CN) – 8 hour TWA (Skin Notation)

4 - Engineering Controls

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

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

5 - Personal Protective Equipment

For additional information on PPE requirements, go to:
http://ccehss.berkeley.edu/section5#Personnel_Protective_Equipment_Required_in_College_Laboratories

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

Eye and Face Protection

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

Skin and Body Protection

1. Gloves are required when handling hazardous chemicals.
    a. Specific glove type recommendations are provided in the Protocol/Procedure section.
    b. Inspect gloves prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Wash and dry hands after handling chemicals, before breaks, and at the end of the workday.
    c. For additional information on glove selection, go to: http://ehs.berkeley.edu/hs/63-laboratory-safety/94-glove-selection-and-usage.html
2. Lab coats are required when handling hazardous chemicals in the lab.
    a. Nomex 3A flame-resistant lab coats are required when working with pyrophorics (H250) and explosives (H200, H201, H202, H203)
    b. Flame resistant lab coats (Nomex or other material) should be worn when working with materials such as Category 1 or 2 flammable liquids (H224 and H225).
3. Cotton-based, non-synthetic clothing (including long pants; no skin exposed below the waist) should be worn.
4. Closed-toe and closed-heel shoes are required in the lab.

Respiratory Protection

Respiratory protection is normally not required for UC Berkeley laboratory activities. Any lab personnel considering the use of a respirator must contact EH&S for a workplace assessment. Respirator users will be provided with specific instructions if a respirator is deemed necessary by EH&S.

6 - First Aid Procedures and Medical Emergencies

Notify supervisor and EH&S immediately. Follow up with a call to 510-642-9090 to report the incident.

Life Threatening Emergency, After Hours, Weekends and Holidays – Call **911** or go to the nearest emergency room. Note: All serious injuries must be reported to EH&S within 8 hours. Follow up with a call to 510-642-9090 to report the incident.

Assess the extent of danger. If you cannot assess the conditions of the environment well enough to be sure of your own safety, do not enter the area. If possible, help contaminated or injured persons. Obtain medical attention for the individual as soon as possible by calling **911**. Provide a copy of the appropriate SDS to the emergency responders or physician, as needed.

If inhaled

Move into fresh air. Go to the Occupational Health Facility (Tang Health Center) and after hours, go to the nearest emergency room. If person is not breathing, call **911** and give artificial respiration. If unconscious, call **911**.

In case of skin contact

Immediately flush with flowing water for no less than 15 minutes; remove any jewelry or clothing as necessary to facilitate clearing of any residual materials. Wash off with soap and plenty of water for 15 minutes. If skin contact requires medical assistance, go to the Occupational Health Facility (Tang Health Center) and after hours, go to the nearest emergency room. If this is a large or serious injury, call **911**.

In case of eye contact

Rinse thoroughly with plenty of water using an eyewash station for at least 15 minutes, occasionally lifting the upper and lower eyelids. Remove contact lenses if possible. Call **911**.

If swallowed

Call **911**. Do not induce vomiting unless directed otherwise by the SDS. Never give anything by mouth to an unconscious person. Rinse mouth with water. Go to the Occupational Health Facility (Tang Health Center) and after hours, go to the nearest emergency room.

Needle stick/puncture exposure

Wash the affected area with antiseptic soap and warm water for 15 minutes. For mucous membrane exposure such as eyes, mouth and/or nose, flush the affected area for 15 minutes using an eyewash station. Go to the Occupational Health Facility (Tang Health Center) and after hours, go to the nearest emergency room.

All needle stick/puncture exposures must be reported to EH&S within 8 hours. Follow up with a call to 510-642-9090 to report the incident.

7 - Special Handling and Storage Requirements

Lab-specific information on handling and storage may be included in the Protocol/Procedure section.

Working alone - Certain extremely hazardous operations should not be performed if the PI or Lab Safety Contact(s) are not present. Never work alone with extremely hazardous materials/operations. See the Protocol/Procedure section below for specific prohibitions (if any) on working alone.

Precautions for safe handling

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

Conditions for safe storage

- Keep quantities to a minimum.
- Keep containers tightly closed and in a cool, dry and well-ventilated location.
- Keep in proper storage cabinets and shelving. Use lowest shelve possible.
- Assure chemicals are properly labeled.
- Segregate incompatible chemicals.
- Store carcinogens in a designated area.
- Provide secondary containment for chemicals in accordance with the ccEHS "Chemical Hygiene Plan": http://ccehss.berkeley.edu/section5#Chemical_Handling_Storage_and_Transportation

8 - Chemical Spill

Spill – Assess the extent of danger; if necessary request help by calling **911** and 510-642-9090. If you cannot assess the conditions of the environment well enough to be sure of your own safety, do not enter the area. If possible help contaminated or injured persons. Evacuate the spill area. Avoid breathing

vapors from spill. If possible, confine the spill to a small area using a spill kit or absorbent material. Keep others from entering contaminated area (e.g., use caution tape, barriers, etc.).

Minor Spill – In the event of a minor spill, if there is no potential for hazardous chemical exposure, report the spill to 510-642-9090 and proceed to clean it, if you are trained. Use appropriate personal protective equipment and clean-up material for chemical spilled. Double bag spill waste in clear plastic bags, label and take to the next chemical waste pick-up location.

Call 510-642-9090 to report the spill to ccEHSS and for assistance.

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

Call **911** and 510-642-9090 to report the spill to ccEHSS and for assistance.

9 - Cleaning and Decontamination

Lab-specific information on decontamination may be included in the Protocol/Procedure section.

- Wearing proper PPE, laboratory work surfaces should be cleaned at the end of each work day.
- Dispose of contaminated materials in accordance with hazardous waste disposal guidelines referenced below.
- Decontaminate all equipment before removing from a designated area.

10 - Hazardous Waste Disposal

Label Waste

Label all containers with the label provided at:
http://ehs.berkeley.edu/hm/279-new-hazardous-waste-program-hwp.html.
See the EH&S Fact Sheet, "Hazardous Waste Management" for general instructions on procedures for disposing of hazardous waste.

Dispose of Waste

- Dispose of regularly generated chemical waste within 6 months.
- Call EH&S with questions.

11 - Safety Data Sheet (SDS) Location

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

12 - Protocol/Procedure – Copper Cyanide

Preparation	Know the location of the nearest fire extinguisher, eyewash, and safety shower before beginning work. Never work alone. Make sure there is another worker present who is also trained in the Copper cyanide SOP.
Chemical Storage and Disposal	Keep containers tightly closed and in a cool, dry and well-ventilated location. Keep in proper storage cabinets and shelving. Use lowest shelve possible. Assure chemicals are properly labeled. Segregate incompatible chemicals. Keep away from acids!
Lab-specific Information	Maintain the smallest amount necessary for ongoing work. Use in the smallest practical quantities for the experiment being performed. Care must be taking when working with copper cyanide to minimize the exposure to strong acid. Contact with acid can generate hydrogen cyanide which is volatile and more toxic than copper cyanide. All waste containing cyanide should be collected and kept at a basic pH to prevent the generation of hydrogen cyanide. Any gloves, lab coats, paper towels, etc. that come into contact with copper cyanide should be collected and disposed of as solid hazardous waste and not simply thrown in the trash. After working with cyanide, all researchers should wash their hands thoroughly to prevent the risk of cross contamination.

Procedure/Use	Scale	Engineering Controls/Equipment	PPE (eye, face, gloves, clothing)	Procedure Steps and Special Precautions for this Procedure
1. Copper cyanide is used in the lab as a reagent in chemical reactions.	< 10 mg up to 5 g Copper cyanide per reaction. Permission of the PI is needed to use an amount greater than that indicated.	All work using copper cyanide must be performed in a ventilated fume hood. Eliminate ignition sources such as open flames, hot surfaces, steam baths, static electricity, and operation of mechanical and electrical equipment that is not intrinsically safe. Ensure proper grounding and avoid creating static electricity. Be sure to ground metal containers when transferring flammable liquids.	**Eye protection**: Wear tight-fitting safety goggles or safety glasses with side shields. **Face protection**: Wear a face shield when handling containers of copper cyanide that are not behind a lab hood sash or blast shield. **Gloves**: Use latex or nitrile gloves. **Clothing**: Wear fire/flame resistant lab coat (100% cotton based); cotton based clothing/attire; full length pants or equivalent; and close-toed, close-heeled shoes.	**Copper cyanide is a SEVERE hazard and extremely toxic by inhalation, skin contact or ingestion.** Use in a fume hood and cap container when not in use. Draw out necessary amount and dispose of copper cyanide-contaminated gloves and glassware in the appropriate labeled and sealed containers.
Notes	**Any deviation from this SOP requires approval from PI.**			
Initials of individuals using this procedure				

Sarpong Group Notes for Copper Cyanide

Copper cyanide (cuprous cyanide) is an acute toxin. Very harmful or fatal if swallowed, inhalation, or absorbed through skin. Causes eye and skin irritation and may be absorbed through skin contact. Exposure may cause respiratory and digestive tract irritation. May also cause central nervous system effects and blood abnormalities. May be metabolized to cyanide which then inhibits cytochrome oxidase to impair cellular respiration. Copper cyanide is a useful reagent in organic synthesis and is used for electroporation of copper.

Potential Hazards/Toxicity

Copper cyanide is an acute toxin, and extremely hazardous or fatal in case of ingestion, inhalation or absorbed through skin. May be absorbed through the skin in harmful amounts and is an irritant to skin and eye. If absorbed, causes symptoms similar to those of inhalation and ingestion. May be metabolized to cyanide which in turn acts by inhibiting cytochrome oxidase impairing cellular respiration. Contact with acids liberates very toxic gas.

Acute: Ingestion may cause gastrointestinal irritation with nausea, diarrhea, and vomiting. Exposure may cause tissue anoxia with symptoms of weakness, confusion, weak and irregular heartbeat, collapse, unconsciousness, convulsions and death. May cause cyanosis, bloody stools, low blood pressure, jaundice and coma and produce systemic toxic effects to the kidney and liver and central nervous excitation. Inhalation may cause respiratory tract irritation and nausea, headache, dizziness, unconsciousness and coma.

Chronic: Repeated exposure to copper cyanide may cause central nervous system damage. This material may be metabolized to cyanide, impairing cellular respiration. Chronic exposure may lead to the development of a "cyanide" rash, characterized by itching, vesicular eruptions, and may be accompanied by secondary infections. Exposure may also produce loss of appetite, headache, weakness, nausea, dizziness, and upper respiratory tract irritation.

13 - Documentation of Training (signature of all users is required)

- ✓ Prior to conducting any work with copper cyanide, 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.

I have read and understand the content of this SOP:

Name	Signature	Identifier	Date