



Hydrogen Cyanide (HCN)

H224 H300 H310 H330 H370



This SOP is not a substitute for hands-on training.

Print a copy and insert into your laboratory SOP binder.

Department:	Chemistry
Date SOP was written:	Wednesday April 25, 2016
Date SOP was approved by PI/lab supervisor:	
Principal Investigator:	Name: R. Sarpong
	Signature: _____
Internal Lab Safety Coordinator or Lab Manager:	Name: Melissa Hardy/Justin Jurczyk
	Lab Phone: 406-696-1225/412-728-1952
	Office Phone: 510-642-6312
Emergency Contact:	Name: Melissa Hardy/Justin Jurczyk
	Lab Phone: 406-696-1225/412-728-1952
Location(s) covered by this SOP:	Latimer Hall 831,832,834,836,837,838,839,842,844,847,849

1. Purpose

This SOP covers the precautions and safe handling procedures for the generation, use, and storage of Hydrogen Cyanide (HCN).

If you have questions concerning the applicability of any recommendation or requirement listed in this procedure, contact the Principal Investigator/Laboratory Supervisor or the campus Chemical Hygiene Officer at ucbcho@berkeley.edu.

2. HCN Information

Before working with HCN, review the UC-Berkeley EH&S publication ***Toxic Gas Program on the EH&S website***. If you have questions about Toxic Gas Program requirements, contact EH&S at 642-3073.

3. Potential Hazards/Toxicity



GHS Classification

Flammable liquids - Category 1

Acute Oral Toxicity - Category 1

Acute Dermal Toxicity - Category 1

Acute Inhalation Toxicity - Category 1

Specific target organ toxicity (single exposure) - Category 1

Acute Aquatic Toxicity - Category 1

Chronic Aquatic Toxicity - Category 1

GHS Label elements, including precautionary statements

SIGNAL WORD: DANGER

Hazard Statement(s): H224 Extremely flammable liquid and vapour.

H300+H310+H330 Fatal if swallowed, in contact with skin or if inhaled.

H370 Causes damage to organs.

4. Engineering Controls

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

- Work with HCN must be conducted in a fume hood unless other controls are designated in the lab-specific Protocol/Procedure section. Sash height must be kept low to avoid escaping fumes and provide a physical barrier.
- Laboratories and rooms where HCN is used must have general room ventilation that is negative pressure with respect to the corridors and external environment. The laboratory/room door must be kept closed at all times.
- The area for working with HCN must be appropriately labeled.
- All regulators, valves, piping, tubing and fittings must be chemically compatible with the gases being used. Regulators must be compatible with the size and type of gas cylinder being used and rated for full cylinder pressure. Consult your gas supplier for approved regulators, valves, piping, tubing, and fittings.

5. Personal Protective Equipment

At a minimum, the following PPE must be worn at all times.

Eye and Face Protection

- A. ANSI Z87.1-compliant safety glasses with side shields, or chemical splash goggles.
 - Ordinary prescription glasses will NOT provide adequate protection unless they also meet ANSI standard and have compliant side shields.
- B. If the potential for explosion/splashing exists, and adequate coverage is not provided by the hood sash, a face shield must be worn.

Skin and Body Protection

1. Gloves are required when handling hazardous chemicals. Double gloves are recommended.
 - Refer to specific chemical SDS for information on glove selection.
 - 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. Select the type of lab coat according to the hazards at the specific workplace.
3. Long pants, closed-toe/closed-heel shoes, covered legs, and ankles.

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.

6. First Aid Procedures and Medical Emergencies

In the event of an injury, notify your supervisor immediately and EH&S within 8 hours.



Go to the Occupational Health Facility (Tang Health Center, on campus); if after hours, go to the nearest emergency room (Alta Bates, 2450 Ashby Ave in Berkeley); or



Call 911 (from a cell phone: 510-642-3333) if:

- *it is a life threatening emergency; or*
- *you are not confident in your ability to fully assess the conditions of the environment and/or the condition of the contaminated/injured person, or you cannot be assured of your own safety; or*
- *the contaminated/injured person is not breathing or is unconscious.*
- *Call 911 immediately in case of HCN exposure.*

Please remember to provide a copy of the appropriate manufacturer SDS (if available) to the emergency responders or physician. At a minimum, be ready to provide the identity/name of any hazardous materials involved.

In case of skin contact

Call 911 immediately – medical treatment is necessary. If skin contact occurs, and/or skin or clothing are on fire, immediately drench in the safety shower with copious amounts of water for no less than 15 minutes to remove any remaining contaminants. If possible to do so without further injury, remove any remaining jewelry or clothing.

In case of eye contact

Call 911 immediately – medical treatment is necessary. 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.

If inhaled

Call 911 immediately – medical treatment is necessary. Move into fresh air.

7. Special Handling, Storage, and Disposal Requirements

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

Precautions for safe handling

- Never work with HCN alone.
- Work must be conducted during normal business hours to ensure fast medical response in the event of an exposure.
- Eliminate or substitute for a less hazardous material when possible.
- Do not exceed the scale of procedures specified in Protocol/Procedure section without approval of the PI.



- Verify your experimental set-up and procedure prior to use.
- Know the location of the nearest phone to call 911 in case of emergency.
- Know the location of the nearest eyewash, safety shower and fire extinguisher before beginning work.
- Maintain acid stabilizer at sufficient concentration (explosion hazard)
- Keep away from ignition sources (highly flammable).

Conditions for safe storage

- Empty containers may contain residue which are hazardous, quench or dispose of properly.
- Store in cool, dry ventilated area out of direct sunlight.
- Do not store more than 90 days.
- Waste streams (cyanides produced) should be kept away from acids.

Disposal

- HCN compounds should be disposed as hazardous waste.

8. Chemical Release

Chemical Release Dial **911**

- Accidental Release – Help contaminated or injured persons. If conditions and time permit, close any open valve. Evacuate the release area. Avoid breathing vapors. Eliminate sources of ignition. Keep others from entering this area (e.g., use caution tape, barriers, etc.). *Notify supervisor and EH&S immediately.*
- Contact with body or clothes – Remove clothing and rinse body thoroughly in emergency shower for at least 15 minutes. Seek medical attention. *Notify supervisor and EH&S immediately.*
- Contact with Eyes – Immediately rinse eyeballs and inner surface of eyelid with water for 15 minutes using an eyewash station by forcibly holding the eye open. Seek medical attention. *Notify supervisor and EH&S immediately.*

9. Cleaning and Decontamination

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

- Wearing proper PPE, laboratory work surfaces shall be cleaned at the conclusion of each procedure and 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



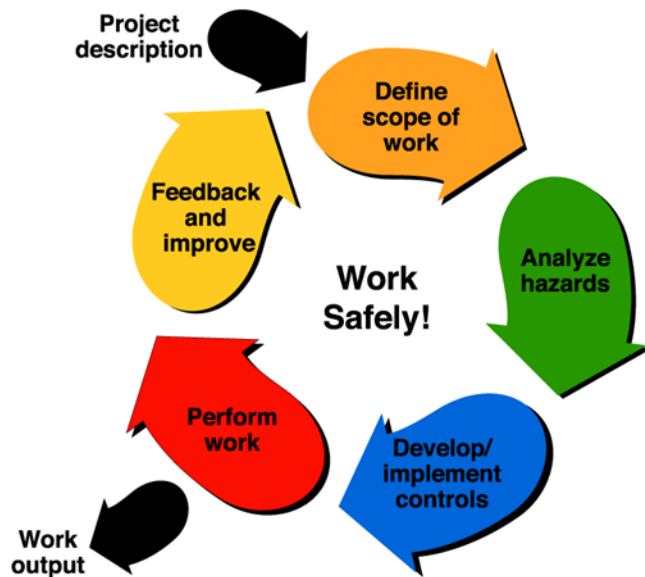
- a. Dispose of regularly generated chemical waste as it's produced (within 1 week)
- b. Keep waste that may contain cyanides away from acids.
- c. Call EH&S with questions.

11. Safety Data Sheet (SDS) Location

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



-Take Ownership of Your Safety-



Before starting any work, ask yourself:

- 1- **What will I be doing?**
- 2- **Do I know what the hazards are?**
- 3- **Do I have everything I need to do the job safely?**
- 4- **Am I doing the job safely?**
- 5- **What can we do better?**



12. Protocol/Procedure – Hydrogen Cyanide (HCN)

Section 12 must be customized to your specific needs. Delete any procedure that does not apply to your laboratory.

Procedure/Use	Scale	Engineering Controls/Equipment	PPE (eye, face, gloves, clothing)	Procedure Steps and Precautions
1. Generating HCN to collect in schlenk flask.	<p>Up to 30 g of HCN to form a 1-2 M solution in toluene.</p> <p style="color: red;">Remember to obtain PI approval before generating HCN.</p>	<p>All reactions using these materials must be performed in a properly operating fume hood with the sash as low as possible.</p> <p>In case of power outage or the fume hood ceasing to work, the area would be immediately evacuated.</p>	<p>Eye protection: Wear ANSI Approved tight-fitting safety goggles or safety glasses with side shields.</p> <p>Face protection: Face shields are to be used when there is no protection from the hood sash.</p> <p>Hand protection: Use double nitrile or heavier gauge nitrile or neoprene gloves. Gloves must be inspected prior to use. Remove gloves immediately upon contamination. Wash and dry hands after use.</p> <p>Clothing: Wear traditional (white) lab coat; full length pants or equivalent; and close-toed, close-heeled shoes.</p>	<p>Perform this reaction during normal business hours (9am-5pm) to ensure medical help is readily available in case of an emergency.</p> <p>Ensure that the fume hood is working properly – contact Igor Kligman to request someone come check that the hood is working properly no more than 7 days before the reaction will take place.</p> <p>Avoid inhalation of these materials.</p> <p>Use reaction in progress signs to alert others that HCN is being generated.</p> <p>Grease all ground-glass joints to ensure no gas may escape.</p> <p>In case of accidental inhalation, call 911 immediately.</p>



Hydrogen Cyanide

Chemical Specific Standard Operating Procedure
Berkeley **EH&S**

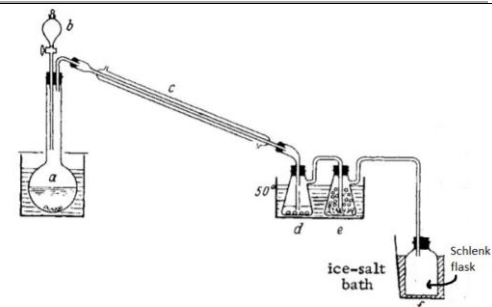


Fig. 212. Preparation of hydrogen cyanide. a) five-liter generating flask heated to 90°C; b) dropping funnel; c) condenser; d and e) filter flasks; f) ground joint flask.

Procedure is adapted from the Handbook of Inorganic Chemistry, 1963, pg 658.

Mix reagents bottom flask set up according to the diagram above. Before the addition of water, ensure that the setup has no leaks and all ground glass joints are greased.

Use addition funnel for careful dropwise addition of water.

When the reaction is complete

- Schlenk flask should be sealed before removing from apparatus
- flush apparatus with nitrogen for 1 hour (open to the back of a closed fume hood).



Notes	Any deviation from this SOP requires approval from PI.
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Procedure/Use	Scale	Engineering Controls/Equipment	PPE (eye, face, gloves, clothing)	Procedure Steps and Precautions
2. Storing HCN	N/A	n/a	<p>Eye protection: Wear ANSI Approved tight-fitting safety goggles or safety glasses with side shields.</p> <p>Face protection: Face shields are to be used when there is no protection from the hood sash.</p> <p>Hand protection: Use double nitrile or heavier gauge nitrile or neoprene gloves. Gloves must be inspected prior to use. Remove gloves immediately upon contamination. Wash and dry hands after use.</p> <p>Clothing: Wear traditional (white) lab coat; full length pants or equivalent; and close-toed, close-heeled shoes.</p>	<ol style="list-style-type: none"> 1. HCN should be stored under an inert atmosphere in a sealed schlenk flask in a refrigerator (2-8°C). 2. Use immediately when possible, do not store more than 7 days. 3. Do not bring into glovebox.



Notes	Any deviation from this SOP requires approval from PI.
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Procedure/Use	Scale	Engineering Controls/Equipment	PPE (eye, face, gloves, clothing)	Procedure Steps and Precautions
<p>3. Disposing of HCN and associated waste</p>	<p>Up to 15 g of HCN as a 1-2 M solution in toluene.</p> <p style="color: red;">Remember to obtain PI approval if higher scale is necessary.</p>	<p>All reactions using these materials must be performed in a properly operating fume hood with the sash as low as possible.</p> <p>In case of power outage or the fume hood ceasing to work, the area would be immediately evacuated.</p>	<p>Eye protection: Wear ANSI Approved tight-fitting safety goggles or safety glasses with side shields.</p> <p>Face protection: Face shields are to be used when there is no protection from the hood sash.</p> <p>Hand protection: Use double nitrile or heavier gauge nitrile or neoprene gloves. Gloves must be inspected prior to use. Remove gloves immediately upon contamination. Wash and dry hands after use.</p> <p>Clothing: Wear traditional (white) lab coat; full length pants or equivalent; and close-toed, close-heeled shoes.</p>	<ol style="list-style-type: none"> 1. In a schlenk flask under inert atmosphere, carefully add NaOH (1-2M, aq) solution. 2. Confirm pH > 10 with pH paper. 3. Request for EH&S pickup in standard manner.]
Notes	Any deviation from this SOP requires approval from PI.			



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

- Prior to conducting any work with HCN, 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 relevant SDSs provided by the manufacturer.

I have read and understand the content of this SOP:

Name	Signature	Identifier	Date