CSUDH
CALIFORNIA STATE UNIVERSITY
DOMINGUEZ HILLS

Standard Operating Procedure

Benzene

Print a copy of this SOP and insert into your Safety Binder.

- SOP Information

Department:	**CSUDH – (Name of your Department)**
Date SOP was written:	Click or tap to enter a date.
Date SOP was approved by PI/lab supervisor:	Click or tap to enter a date.
Principal Investigator:	Click or tap here to enter text.
Chemical Hygiene Officer /Lab Manager:	**Ricardo Magallanes/**
Lab Phone:	**(XXX) – XXX – XXXX**
Office Phone:	**(XXX) – XXX – XXXX**
Emergency Contact:	**EHS (310) 243 – 3000** *(Name and Phone Number)*
Location(s) covered by this SOP:	**Campus** *(Building/Room Number)*

SOP Type:

[☐] Specific lab procedure or experiment

[☒] Generic use of specific chemical or class of chemicals w/ similar hazards

[☐] Generic use of equipment

Contents

Definitions

PI – Principal Investigator. Usually, a professor in charge of a laboratory or set of laboratories who is actively undertaking research. They are considered the front-line supervisor and are responsible for training and personnel safety in the laboratory.

SDS – Safety Data Sheet. An essential component of the Globally Harmonized System (GHS) and are intended to provide comprehensive information about a substance or mixture for use in workplace chemical management. Also formerly known as Material Safety Data Sheet (MSDS).

SOP – Standard Operating Procedure. A written set of instructions that document how to safely perform work involving hazardous chemicals or hazardous operations. Includes training documentation.

1. Purpose

This document covers basic chemical safety information for Benzene. The use of Benzene is subject to pre-approval by the Principal Investigator (PI) and/or Supervisor.

2. Subject Chemicals Used in this Laboratory

DO NOT USE BENZENE UNTIL YOU HAVE OBTAINED THE NECESSARY PRE-APPROVAL FROM YOUR PI OR SUPERVISOR.

3. Properties & Hazards

Benzene is clear, colorless to light yellow liquid at room temperature. It is highly flammable and reacts violently with oxidants and halogens, causing an explosion hazard Benzene can be absorbed into the body by inhalation, ingestion, or skin contact. It may cause specific target organ toxicity including impacts to the central nervous system. It may also cause drowsiness, dizziness, lightheadedness, or nausea.

The Cal/OSHA Permissible Exposure Limit (PEL) for **Benzene** is 1 part per million (ppm) for 8 hours or 5 ppm for 15 minutes. Consult the Safety Data Sheet (SDS) for additional information on hazards.

4. Administrative Controls

In addition to the practices described below, follow procedures as specified in the lab-specific and special handling/use sections of this SOP.

General practices:

1. Be sure to review the SDS for Benzene and all other chemicals to be used in the experiment.
2. **Never work alone.** At least one other person must be present in the same laboratory when any work involving hazardous chemicals is being done.
3. Eliminate or substitute for a less hazardous material when possible.
4. Design your experiment to use the least amount of material possible to achieve the desired result.

5. Verify your experimental set-up and procedure prior to use. Be familiar with the SDSs for all chemicals in use. Assess the hazards to ensure that appropriate controls are in place to minimize risk and address emergency shut-down procedures as appropriate.

6. Consult with your PI or supervisor if the work involves procedure scale-up or other large quantities or there are any questions regarding appropriate safety procedures.

MINIMIZE your purchases of Class 1 flammable liquids, including benzene, to only what is needed for a reasonable amount of time. There are significant fire code restrictions on the quantities of Class 1 flammable liquids allowed in use or storage within research buildings (see special use and storage requirements below).

5. Engineering Controls

In addition to the practices described below, follow procedures as specified in the lab-specific and special handling/use sections of this SOP.

General practices:

1. In general, it is preferable to perform all work with hazardous chemicals in a fume hood. Sash height should be kept as low as possible to avoid the escape of vapors, gases and particulates.

2. Supplemental equipment such as blast shields should be used when working with chemicals or processes that may result in explosions or pressure releases.

3. Consider the use of a glove box, toxic gas cabinet or other local exhaust in order to further contain hazards as appropriate.

4. Supplemental equipment such as blast shields should be used when working with chemicals or processes that may result in explosions or pressure releases.

Use a fume hood when working with highly flammable chemicals.

This restriction may be lifted when using small volumes. This requires PI approval, after reviewing the specific application.

Flammable liquids burn only when their vapor is mixed with air in the appropriate concentration.

Therefore, such liquids should always be handled to minimize the creation of flammable vapor concentrations.

Dilution of flammable vapors by ventilation is an important means of avoiding flammable concentrations.

6. Personal Protective Equipment

In addition to the practices described below, follow procedures as specified in the lab-specific and special handling/use sections of this SOP.

Respiratory Protection
Respiratory protection is generally not required for lab research, provided the appropriate engineering controls are in place and used. Respirators may be warranted if benzene is used outside of a fume hood (only upon approval from EH&S).

Lab personnel intending to use/wear a respirator must be trained and fit-tested by EH&S and medically cleared. This is a regulatory requirement. If you think that your process may require respirator use, contact EH&S for assistance.

Hand Protection

When handling benzene, Viton, Neoprene, or polyethylene vinyl alcohol (PVA) gloves are recommended. NOTE: benzene can penetrate through nitrile gloves and are not recommended for use when working with benzene.

For additional information on selection of glove material, review the SDS. Consult with your preferred glove manufacturer's website to ensure that the gloves you plan on using are compatible with a specific chemical substance. Common manufacturer glove selection guidance can be found at:

http://www.ansellpro.com/download/Ansell_8thEditionChemicalResistanceGuide.pdf
http://www.allsafetyproducts.biz/page/74172
http://www.showabestglove.com/site/default.aspx
http://www.mapa-pro.com/our-gloves/protections/chemical-protection/b/handled_product.html

Eye Protection

Use safety glasses with side shields or tightly fitting safety goggles whenever working in the laboratory.
Skin and Body Protection

Long pants, closed toed-shoes, shirt and a lab coat must be worn whenever working in the laboratory. Flame resistant Nomex® lab coats should be used when working with chemicals or processes that increase the risk of fire. Fully extend sleeves to the wrists and keep buttoned at all times. Avoid wearing synthetic clothing when practicable.

Hygiene Measures

Avoid contact with skin, eyes, and clothing. Wash hands before breaks and immediately after handling the product Any contaminated clothing should be disposed of or washed before reuse.

Lab Coat
Chemical-resistant lab coat.

Gloves
Consult with your PI or supervisor to determine the proper glove for your operation

Eye Protection
ANSI Z87.1-compliant safety glasses or safety goggles.

7. Special Handling & Storage Requirements

In addition to the practices described below, follow procedures as specified in the lab-specific and special handling/use sections of this SOP.

Keep container in cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Store in secondary containment away from moisture, strong oxidizers, strong caustics, plastics, rubber, nitric acid, water + heat, and chemically active metals, such as aluminum and magnesium powder, sodium, potassium, and lithium. **AVOID** storing on the floor. **AVOID** ignition sources.

Transport Benzene in secondary containment, preferably a polyethylene or other non-reactive acid/solvent bottle carrier.

8. First Aid

In addition to the practices described below, follow procedures as specified in the lab-specific and special handling/use sections of this SOP.

Consult the SDS for the subject chemical for specific first aid procedures. General first aid procedures for hazardous chemicals are provided below.

If inhaled
Move to fresh air. Have victim rest in half-upright position. Artificial respiration victim is not breathing. Seek medical attention immediately.

In case of skin contact
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately

In case of eye contact
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water from emergency eyewash station for at least 15 minutes. Get medical attention immediately.

If swallowed
If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

9. Medical Emergency

Be familiar with information in the CSUDH Emergency procedures (see poster).

a. Life Threatening Emergency (all times: Business Hours, After Hours, Weekends and Holidays)--CALL 911 if the condition is LIFE THREATENING or REQUIRES IMMEDIATE MEDICAL ATTENTION. *Note: All serious injuries must be reported to EH&S at* **ext. 2895** *within 8 hours.* Complete online incident report at https://www.csudh.edu/Assets/csudh-sites/rm-ehos/docs/risk-management-ehos/accident-report-form-std-268.pdf

b. Non-Life Threatening Emergency – Notify your supervisor or faculty staff if condition is not life threatening or does not require immediate medical attention.

ALL WORK RELATED INJURIES MUST BE REPORTED via the On-line Incident Form https://www.csudh.edu/hr/workers-compensation/ **or call Human Resources, Workers Compensation (310) 243-3771.**

10. Spill & Accident Procedures

In addition to the practices described below, follow procedures as specified in the lab-specific and special handling/use sections of this SOP.

Evacuate the spill area. Post someone or mark-off the hazardous area with tape and warning signs to keep other people from entering the area. Keep the appropriate fire extinguisher nearby. Avoid incompatible extinguishing agents. Use Class A-B-C or B-C for flammable liquids. **Fire extinguishers containing water are not suitable for flammable liquid fires.**

Spill – Assess the extent of danger. Help contaminated or injured persons if safe to do so. Avoid breathing vapors. 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.).

NOTE: *If there is respiratory irritation associated with exposure, remove all persons from the contaminated area and contact EH&S at* **ext. 3000.**

Small (<1 L, <100 g) – If you have training, you may assist in the clean-up effort of small spills. Wearing Silvershield or other gloves protective for spills (not nitrile), splash goggles, face shield and lab coat (and impermeable apron, if available), use absorbent pads to absorb spilled material. Wipe down contaminated area with soap and water solution.

Contaminated PPE and clean-up materials must be placed in a compatible container.

NOTE that Benzene will attack some forms of plastic, so a plastic bag may not be appropriate. Call EH&S at (310) 243-2895 to arrange for a waste pick-up.

Large (>1 L, >100 g) – Dial **911** and evacuate the spill area. Post someone or mark-off the hazardous area with tape and warning signs to keep other people from entering the area. *Notify EH&S at* **ext. 3000** *after dialing 911 and evacuating.*

Chemical Spill on 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 at* **ext. 3000** *immediately.*

Chemical Splash Into Eyes – Immediately rinse eyeball and inner surface of eyelid with water from the emergency eyewash station for 15 minutes by forcibly holding the eye open. Seek medical attention. *Notify supervisor and EH&S at* **ext. 3000** *immediately.*

11. Decontamination & Waste Disposal Procedure

In addition to the practices described below, follow procedures as specified in the lab-specific and special handling/use sections of this SOP.

Waste Benzene must be disposed of as a hazardous waste per the CSUDH Chemical Hygiene Plan.

Label Waste

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

Store Waste

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

Dispose of Waste

- Hazardous waste must be transferred to EH&S for disposal within 6 months of being generated.
- Empty Containers: At no time should full or partially full containers be placed in the trash.
- Hazardous Waste Disposal:
    - Visit: https://www.csudh.edu/ehs/environmental/hazardous-waste
    - Fill out the "CSUDH Hazardous Waste Label"
    - EH&S will pick up your waste within 1-3 days.

- **DO NOT** dispose of chemicals by pouring them down the drain or placing them in the trash.
- **DO NOT** use fume hoods to evaporate chemicals.

Refer to the CSUDH Chemical Hygiene Plan for more information on waste management.

12. Safety Data Sheet (SDS) Location

Online SDSs can be accessed at **http://hq.msdsonline.com/csuedusl**

13. Required Approvals

In addition to the practices described below, follow procedures as specified in the lab-specific and special handling/use sections of this SOP.

All work with the subject chemical (s) requires the following approvals prior to beginning work:

1. Use of Benzene must be approved by the PI or supervisor prior to use and all training must be documented and made available to EH&S upon request.

2. Must be familiar with the CSUDH Chemical Hygiene Plan.
   https://www.csudh.edu/ehs/health-safety-programs-policies/

3. Must have documented Laboratory Safety training and training on this SOP.

4. Must read and understand the relevant SDS (formerly referred to as Material Safety Data Sheet).

5. Any additional laboratory specific training that is needed is referenced in the 'Laboratory Specific Use Procedures' section. Signed and dated training documents must be uploaded into each assigned researchers training records.

6. Use of Benzene outside of a fume hood requires prior approved from EH&S.

7. Establishing a Regulated area requires prior approval from EH&S.

14. Additional Notes

Any deviation from this SOP requires approval from EH&S. PIs and supervisors are responsible for using Benzene in a safe manner and protecting the health and safety of personnel under their supervision.

15. Documentation of Training

- Prior to working with Benzene, personnel must be trained on this SOP and on the laboratory specific procedures involved in working with Benzene.

- The Principal Investigator must provide laboratory personnel with a copy of this SOP and a copy of the SDS provided by the manufacturer.

- The Principal Investigator must ensure that laboratory personnel have received laboratory safety training or refresher training within the last one year.

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

Name	Signature	CSUDH ID #	Date

16. Lab Specific Procedures

The following describe how the subject chemicals are used in this laboratory beyond the practices described above.

This section must describe lab-specific procedures to address the safe use of all highly hazardous chemicals from this band in use in the laboratory. These procedures may be organized around specific chemicals, specific tasks or the band as a whole. The following minimum requirements must be met:

- Identify designated use areas within the laboratory for highly hazardous chemicals
- Identify maximum use quantities for which the procedures in this band apply.
- If it is determined that this SOP is sufficient to address the safe use of subject chemical in this lab, then include the following statement in this section: *"Procedures described in this SOP are sufficient for addressing the safe use of subject chemical in this laboratory within the listed quantity limitations."*
- If it is determined that this SOP is not sufficient to address the safe use of a chemical from the lab, then write lab-specific procedures for to address these high hazard operations. Such operations are generally indicated by:
    - tasks requiring the use of specialized PPE,
    - tasks using highly hazardous chemicals outside of the fume hood,
    - tasks using larger quantities of hazardous chemicals,
    - tasks involving the use of particular chemicals considered by CSUDH EHS to be extremely hazardous, and
    - tasks considered to present high risk by lab personnel.

A few examples of what lab-specific tasks may look like are provided below:

Task #1: Title of the specific procedure being done.

1) Provide step-by-step instructions in a numbered/lettered format.
2) Include in the procedure any relevant:
    a) Locations of "designated areas" as called for in the special handling section of the SOP, or as otherwise required by regulations. *The entire laboratory, fume hood, or a portion of the laboratory may be considered as a designated area.*
    b) Use of specific administrative, engineering and PPE controls.
    c) Specific quantity use limits/restrictions.
    d) Specific storage requirements.
    e) Specific first aid and spill procedures (including what should be handled by whom).
    f) Specific disposal procedures.
    g) Process-specific PI approvals required.

Task #2: Making dilutions of the acids and bases.

1) Consult with PI and obtain approval if quantities greater than 4 L are needed.
2) In a fume hood, add the appropriate amount of concentrated acid or base to the calculated amount of water.
3) Return the concentrated acids/bases to the proper secondary containment or cabinet.

Task #3: Using the pH meter.

1) Calibrate on the day of pH testing using at least 2 standards.
2) Before use, rinse the electrode with deionized water and blot dry with a kim-wipe.
3) Transfer the electrode to the test solution.
4) If using a stir plate, make sure the electrode does not touch the stir bar.

5) Record the pH when the reading is stable (5–20 seconds after insertion of the electrode into the solution)
6) Add dilute acid or dilute base drop-wise until the correct pH is reached.
7) Rinse the electrode with deionized water and store according to the manufacturer's instructions.
8) Make sure the acid and base caps are on tightly.

Add as many tasks as necessary.