

Standard Operating Procedure

Styrene

This SOP is not complete until it has been signed and dated by the PI and relevant lab personnel.

Print a copy and insert into your
Laboratory Safety Manual and Chemical Hygiene Plan.
Refer to instructions for assistance.

Department:	Chemistry & Biochemistry – Chemical Engineering
Date SOP was written:	December 14, 2012.
Date SOP was approved by PI/lab supervisor:	January 18, 2013
SOP reviewed by:	Alessandro Moretto, Chem. Lab. Safety Officer
Principal Investigator:	Prof. Susannah Scott
Internal Lab Safety Coordinator/Lab Manager:	Stephanie Goubert-Renaudin
Lab Phone:	805-893-8941
Office Phone:	805-893-7403
Emergency Contact:	EH&S 24 hour line: 805-893-3194 (Name and Phone Number)
Location(s) covered by this SOP:	ESB 3324 and 3328 (Building/Room Number)

Type of SOP: ☐ Process ☒ Hazardous Chemical ☐ Hazardous Class

Purpose

Styrene is a flammable liquid that is also an irritant, and should be treated with care by researchers. Styrene is toxic and hazardous. It is generally used as a monomer for polymerizations. Styrene can undergo rapid polymerization, and an uncontrolled polymerization may produce a rapid release of energy in the form of heat, with the potential of an explosion of closed containers. Styrene containers should not be kept longer than one year after opening or purchase.

Physical & Chemical Properties/Definition of Chemical Group

CAS#: 100-42-5

Class: **Flammable liquid, Carcinogen, Irritant, Peroxide Former**

Molecular Formula: C₈H₈

Form (physical state): Liquid

Styrene.

Color: Colorless

Boiling point: 145 - 146 °C

Potential Hazards/Toxicity

Acute toxicity

Oral LD50

LD50 Oral - rat - 2,650 mg/kg

Remarks: Behavioral: Somnolence (general depressed activity). Liver: Other changes.

Inhalation LC50

LC50 Inhalation - rat - 4 h - 12,000 mg/m3

Skin corrosion/irritation

Skin - rabbit - Skin irritation

Serious eye damage/eye irritation

Eyes - rabbit - Eye irritation - 24 h

Germ cell mutagenicity

Laboratory experiments have shown mutagenic effects.

Personal Protective Equipment (PPE)

Respirator Protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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 EH&S. This is a regulatory requirement.

Hand Protection

Handle with gloves. *Polyvinyl alcohol, Viton/butyl or laminate film gloves* are recommended. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product.

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

Refer to glove selection chart from the links below:

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

OR

Styrene.

<http://www.allsafetyproducts.biz/page/74172>

OR

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

OR

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

Eye Protection

Safety glasses.

Skin and Body Protection

A lab coat

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Engineering Controls

Work with styrene should be conducted in a fume hood. Sash height should be kept low to avoid escaping fumes.

First Aid Procedures

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

Special Handling and Storage Requirements

Precautions for safe handling Avoid contact with skin and eyes. Avoid inhalation of vapor or mist. Keep away from sources of ignition

Conditions for safe storage Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Recommended storage temperature: 2 - 8 °C Light sensitive. If solids are found on the outside/inside of the container, DO NOT MOVE. Contact EH&S (805-893-3194) for hazardous waste pickup.

Do not store under inert atmosphere. Do not store longer than one year after opening or purchase.

Spill and Accident Procedure

Chemical Spill Dial **9-911** and EH&S (805-893-3194)

Spill – Assess the extent of danger. Help contaminated or injured persons. Evacuate the spill area. 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.).

Small (<1 L) – If you have training, you may assist in the clean-up effort. 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.

Large (>1 L) – Dial **9-911** from campus phones (and 805-893-3446 from a cell phone) and EH&S (805-893-3194) for assistance..

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 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 immediately.*

Medical Emergency Dial **9-911**

Life Threatening Emergency, After Hours, Weekends and Holidays – Dial **9-911** (or 805-893-3446 from a cell phone) or go to the Emergency Room of Goleta Valley Cottage Hospital at 351 South Patterson Avenue, Goleta (Phone number: 805-967-3411). *Note: All Serious injuries must be reported to EH&S within 8 hours.*

Non-Life Threatening Emergency – Go to the Student Health Building, Building 588 (phone number: 893-5361, hours: M, T, R, F 8am-4.30pm, W 9am - 4.30pm, R 5pm to 7pm by appointment). After hours go to the Emergency Room of Goleta Valley Cottage Hospital at 351 South Patterson Avenue, Goleta (Phone number: 805-967-3411) *Note: All serious injuries must be reported to EH&S within 8 hours.*

Needle stick/puncture exposure (as applicable to chemical handling procedure) – Wash the affected area with antiseptic soap and warm water for 15 minutes. For mucous membrane exposure, flush the affected area for 15 minutes using an eyewash station. Page the needle stick nurse \ and then enter your extension. After hours go to the nearest emergency room: the Emergency Room of Goleta Valley Cottage Hospital at 351 South Patterson Avenue, Goleta (Phone number: 805-967-3411). *Note: All needle stick/puncture exposures must be reported to EH&S within 8 hours.*

Decontamination/Waste Disposal Procedure

Empty containers of styrene can still pose a significant hazard. The containers should be triple rinsed and the first rinse liquid collected for disposal as hazardous waste immediately after the last amount is removed. After triple rinsing, if the container is deemed to be free of residue, the label must be crossed out or defaced and the container can be discarded into the regular trash.

General hazardous waste disposal guidelines:

Label Waste

Styrene.

- Affix an hazardous waste tag on all waste containers as soon as the first drop of waste is added to the container

Store Waste

- Store hazardous waste in closed containers, in secondary containment and in a designated location
- Waste must be under the control of the person generating & disposing of it

Dispose of Waste

- Dispose of regularly generated chemical waste within 90 days
 - Call EH&S for questions
 - Empty Containers
 - Dispose as hazardous waste if it once held extremely hazardous waste (irrespective of the container size)
 - Consult waste pick-up schedule
- Prepare for transport to pick-up location
- Check on-line waste tag
 - Write date of pick-up on the waste tag
 - Use secondary containment

Safety Data Sheet (SDS) Location

SDS can be found online at <http://ehs.ucsb.edu/units/labsfty/labrsc/chemistry/lchemmsdsacc.htm>

Protocol/Procedure

Styrene can be used in the Group as a polymerization monomer to get polystyrene or as a co-monomer to get copolymers.

Styrene containers are stored in the refrigerator.

Due to the risk of uncontrolled polymerization that can lead to explosion of closed containers, styrene should not be stored longer than one year after opening, or one year after purchase. Date the containers upon delivery AND upon opening. Do not store under inert atmosphere. Do not overheat. If solids are observed, do not open or move the container but contact EH&S for disposal.

When handling styrene, polyvinyl alcohol, Viton/butyl or laminate film gloves, a lab coat and safety goggles have to be worn. Change gloves when contaminated, punctured, or torn. Wash hands immediately after removing gloves.

Work in a chemical fume hood is required, including measuring and transferring to the reaction vessel.

Due to its flammability, styrene is kept away from all sources of ignition.

Glassware contaminated by styrene has to be rinsed with acetone before being moved from the fume hood space. Styrene has to be diluted with acetone before being discarded in the appropriate hazardous waste container. Hazardous wastes containing styrene have to be kept closed at all times.

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

Documentation of Training (signature of all users is required)

- Prior to conducting any work with styrene, designated personnel, i.e. approved users listed below, 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 as required by EH&S.

I have read and understand the content of this SOP:

Name	Signature	Trainer	Date
Prof. Susannah Scott			
Stephanie Goubert-Renaudin			
Gary Kwanyu Ng			
Alessandro Gallo			
Anthony Crisci			
Haibo Yu			
Taeho Hwang			
Bethany Wigington			
Daniel Coller			
Zachary Jones			
Youhong Wang			
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Jason Fendi			
