

# Standard Operating Procedure

## Toluene

*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

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

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

### Purpose

Toluene is a 'Reproductive Toxin'. If not stored and handled properly, this can pose a serious threat to the health and safety of laboratory personnel, emergency responders and chemical waste handlers. Hence, it is important to follow safety protocols to handle this chemical.

Toluene is a common solvent, able to dissolve paints, paint thinners, silicone sealants, many chemical reactants, rubber, printing ink, adhesives (glues), lacquers, leather tanners, and disinfectants. It can also be used as a fullerene indicator, and is a raw material for toluene diisocyanate (used in the manufacture of polyurethane foam) and TNT. In addition, it is used as a solvent to create a solution of carbon nanotubes. It is also used as a cement for fine polystyrene kits (by dissolving and then fusing surfaces) as it can be applied very precisely by brush and contains none of the bulk of an adhesive. ]

## Physical & Chemical Properties/Definition of Chemical Group

CAS#: 108-88-3

Class: **Reproductive Toxin and Flammable**

Molecular Formula:  $C_6H_5CH_3$

Form (physical state): liquid

Color: Colorless

Boiling point: 110.6 °C

## Potential Hazards/Toxicity

- OSHA Permissible Exposure Limit (PEL):

200 ppm (TWA); 300 ppm (acceptable ceiling conc.); 500 ppm (maximum conc.).

### Toxicological Data:

Oral rat LD50: 636 mg/kg; skin rabbit LD50: 14100 uL/kg; inhalation rat LC50: 49 gm/m<sup>3</sup>/4H; Irritation data: skin rabbit, 500 mg, Moderate; eye rabbit, 2 mg/24H, Severe. Investigated as a tumorigen, mutagen.

**Reproductive Toxicity:** Has shown some evidence of reproductive effects in laboratory animals.

**Inhalation:** Inhalation may cause irritation of the upper respiratory tract. Symptoms of overexposure may include fatigue, confusion, headache, dizziness and drowsiness. Peculiar skin sensations (e. g. pins and needles) or numbness may be produced. Very high concentrations may cause unconsciousness and death.

**Ingestion:** Swallowing may cause abdominal spasms and other symptoms that parallel over-exposure from inhalation. Aspiration of material into the lungs can cause chemical pneumonitis, which may be fatal.

**Skin Contact:** Causes irritation. May be absorbed through skin.

**Eye Contact:** Causes severe eye irritation with redness and pain.

**Chronic Exposure:** Reports of chronic poisoning describe anemia, decreased blood cell count and bone marrow hypoplasia. Liver and kidney damage may occur. Repeated or prolonged contact has a defatting action, causing drying, redness, dermatitis. Exposure to toluene may affect the developing fetus.

## Personal Protective Equipment (PPE)

### Respiratory Protection

Toluene should be handled inside the fume hood. When a respirator is the sole means of protection, use a full-face supplied air respirator.

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

Wearing [neoprene](#) or [nitrile](#) gloves are recommended.

**NOTE:** Consult with your preferred glove manufacturer to ensure that the gloves you plan on using are compatible with toluene. Refer to glove selection chart from the links below:

[http://www.ansellpro.com/download/Ansell\\_8thEditionChemicalResistanceGuide.pdf](http://www.ansellpro.com/download/Ansell_8thEditionChemicalResistanceGuide.pdf)

OR

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

OR

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

OR

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

### Eye Protection

Use chemical safety goggles or ANSI approved safety glasses.

### Skin and Body Protection

Wear impervious protective clothing, including boots, neoprene or nitrile gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

### Hygiene Measures

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

### Engineering Controls

Always handle toluene in a certified chemical fume hood, ducted biosafety cabinet, or a glove box.

### First Aid Procedures

#### If inhaled

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. CALL A PHYSICIAN IMMEDIATELY.

#### In case of skin contact

In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician immediately.

### **In case of eye contact**

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

### **If swallowed**

Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately. If vomiting occurs, keep head below hips to prevent aspiration into lungs.

## **Special Handling and Storage Requirements**

All work with toluene is to be done in a chemical fume hood or ducted biosafety cabinet in order to keep toluene contamination to a minimum. Any persons in this area are required to wear personal protective equipment. Safety shower and eye wash stations should be easily accessible where toluene is used. Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Separate from incompatibles. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

## **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 (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.

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

Wearing proper PPE, please decontaminate equipment and bench tops. Call EH&S (805-893-3194) if assistance is needed. Please dispose of the used toluene and disposables contaminated with toluene as hazardous waste.

*General hazardous waste disposal guidelines:*

### Label Waste

- Affix an on-line 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 (
  - 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: <http://ehs.ucsb.edu/units/labsfty/labrsc/chemistry/lchemmsdsacc.htm>

## Protocol/Procedure

In the Group, toluene is used as a solvent. Toluene containers are stored in ventilated storage cabinets or in the glove box and are kept sealed at all time when not in use. Toluene is also dispensed via the solvent system which can be used in connection with the glove box.

Toluene is always handled wearing neoprene or nitrile gloves, safety goggles and a lab coat. Gloves are changed as soon as they are contaminated.

Due to its inhalation toxicity, when not handled in the glove box, toluene is handled within a ventilated fume hood all the time, including measuring and transferring to the reaction vessel. Toluene containers

(including Schlenk flask) have to be cap-sealed/closed when not within the fume hood, including transferring the reaction vessel to the rotary evaporator. Due to its flammability, toluene is kept away from all sources of ignition.

Glassware having contained toluene has to be rinsed with acetone before being moved from the fume hood space to limit the inhalation. Hazardous wastes containing toluene 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 toluene, 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
<b>Prof. Susannah Scott</b>			
Stephanie Goubert-Renaudin			
Gary Kwanyi Ng			
Alessandro Gallo			
Anthony Crisci			
Haibo Yu			
Taeho Hwang			
Bethany Wigington			
Daniel Coller			
Zachary Jones			

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