UC | Center for Laboratory Safety

Standard Operating Procedure

Carbon monoxide

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

Carbon monoxide is listed as acutely toxic.

Carbon monoxide gas is **highly flammable**, colorless, odorless, and tasteless gas. It is **toxic/poisonous** and binds to myoglobin and mitochondrial cytochrome oxidase.

Carbon monoxide is hazardous if inhaled.

Carbon monoxide used in oxidation / reduction reactions.

Physical & Chemical Properties/Definition of Chemical Group

CAS#: 630-08-0

Class: **Acute toxin, flammable gas**

Molecular Formula: CO

Form (physical state): Gas

Color: Colorless

Boiling point: -191°C

Potential hazards/Toxicity

Carbon monoxide gas is **highly flammable**, colorless, odorless, and tasteless gas. It is highly **toxic/poisonous** and binds to myoglobin and mitochondrial cytochrome oxidase.

Carbon monoxide is extremely harmful if inhaled. May damage fertility or the unborn child. Causes damage to organs through prolonged or repeated exposure if inhaled.

Signs and symptoms of acute exposure may include headache, flushing, nausea, vertigo, weakness, irritability and unconsciousness. Repeated bouts of carbon monoxide poisoning may cause such as anorexia, headache, lassitude, dizziness and ataxia.

Has a threshold limit value of 25 ppm (TWA).

Personal Protective Equipment (PPE)

Respirator Protection
Use a full-face respirator with multi-purpose combination (US) respirator cartridges as a backup to engineering controls.

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.

Eye, body and skin protection
As a general practice when working in the laboratory, a labcoat and safety goggles have to be worn.

Engineering Controls

Carbon monoxide should be used in a well-ventilated area and all valves, connections, regulators and fittings should be checked for leaks. A carbon monoxide detector should be in use while CO is flowing.

First Aid Procedures

If inhaled
Move into the fresh air immediately and give oxygen. If not breathing give artificial respiration. Seek medical attention immediately.

Special Handling and Storage Requirements

Precautions for safe handling:

High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Store in tightly-closed container. Avoid contact with combustible materials. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Conditions for safe storage

Flammable materials should be stored in a separate safety storage cabinet or room. Keep container tightly closed in a cool, dry, and well-ventilated. Keep away from incompatible materials and conditions. Store in original container. Store away from heat sources and in a flame proof area.

Spill and Accident Procedure

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

- CO cylinders should be stored in gas cabinets when not in use. The cap should be affixed to the cylinder when not in use. When the cylinder pressure is too low for further use, label the cylinder as empty and schedule for the manufacturer to pick up the cylinder from the university gas cages.

Safety Data Sheet (SDS) Location

MSDS can be accessed online: http://ehs.ucsb.edu/units/labsfty/labrsc/chemistry/lschemmsdsacc.htm

Protocol/Procedure

Carbon monoxide is used for oxidation and reduction reactions in flowing reactors.

Due to its high toxicity, prior to any work with carbon monoxide, one has to make sure a carbon monoxide detector is on and in working order. The regulator and all fittings and connections must be leak checked

with snoop (soapy water). Snoop (soapy water) will bubble if there is a gas leak; tighten the fittings if there is a leak. All users should be familiar with attaching regulators, fittings, and leak checking connections or they should be accompanied by someone with experience. All vents are securely connected to the main exhaust lines to prevent gas exposure in the laboratory. The cylinder should be securely fastened with chains in a gas cage or to a rigid structure such as a wall.

In the laboratory, carbon monoxide cylinders that are not in use should be stored within ventilated cabinets equipped with a CO detector. If the cylinder is empty, affix and empty tag to the cylinder and schedule to have the cylinder picked up by the distributor.

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 carbon monoxide, 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 Kwanyi Ng			
Alessandro Gallo			
Anthony Crisci			
Haibo Yu			
Taeho Hwang			
Bethany Wigington			
Daniel Coller			

Zachary Jones			
Youhong Wang			
Jinghong Zhou			
Jason Fendi			