# Standard Operating Procedures - Use of carbon monoxide to create metal complexes under pressure

Figure G-2

**Standard Operating Procedure**

**Use of Carbon Monoxide to Create Metal Complexes under Pressure**

|  |
| --- |
| NOTE: You must read this entire document and both you and the Principal Investigator must sign it before commencing any work. |

Principal Investigator/Supervisor: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Room and Building where SOP is used: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Summary of how material will be used**

Carbon monoxide will be used to create metal complexes by conducting reactions up to 24 hours in a chamber under pressure with a palladium catalyst, all in a fume hood.

**Potential hazards**

CO is classified as an extremely flammable gas, with an acute toxicity rating of 3 under GHS. The gas is colorless and odorless (no warning properties). There is also the possibility of explosion.

**Regulatory Issues**

The National Fire Protection Association requires CO greater than lecture bottle-size to be stored “in approved continuously mechanically ventilated gas cabinets.”

**Engineering Controls**

Use in fume hood. Keep shield and/or hood sash between reaction vessel and laboratory worker. Work should be conducted in a laboratory where there are sprinklers in the hood and/or the general laboratory. Install flow restrictors, normally closed pneumatic valves that will close on loss of exhaust, loss of power, or activation of the CO detector.

**Work Practice Controls**

New workers must review the “Structured Development of SOPs spreadsheet” and this SOP with the PI, supervisor, or experienced lab worker prior to conducting work. At the beginning of the experiment, review at least two references on carbon monoxide properties and/or incidents. Review emergency procedures—both how to request assistance and how to notify other nearby workers. Do not work alone. Use in fume hood. Make sure the cylinder is secured. Verify that appropriate piping with adequate safety mechanisms is being used. Check connections to cylinder for leaks before each use. Verify that CO monitor is working. Make sure there are no oxidizers or open flames that could react with or ignite the gas. Make sure that laboratory equipment is structurally sound and capable of maintaining integrity under pressure. If reaction is allowed to proceed unattended, label fume hood with appropriate signage. After initial experiment and when encountering changes or unexpected reactions, review this SOP with other experienced researchers. When done with the experimental work, close all valves, clear lines, and put all experimental materials in their proper places.

**Specific experimental procedures**

(Use this space for the specific procedures to be used in your laboratory)

**Personal Protective Equipment**

Wear protective eyewear and lab coat made of flame resistant material at all times. Appropriate gloves (specify type: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) should also be worn.

**Storage**

CO must be stored in a gas cabinet or fume hood. Purchase the smallest amount necessary for the work. A small cylinder that could be stored in the fume hood is preferred, if the scale of the experiment is small. All cylinders must be secured to prevent damage to the valve.

**Waste disposal**

(Use this space to indicate how any wastes from the experiment are to be handled.)

**Spills and Releases**

If exposure symptoms are present, seek medical help immediately. If a release occurs, immediately stop all work. If safe to do so, close the main valve on the cylinder to prevent any additional gas escape. Alert other nearby workers and supervisor to the situation. Evacuate area and allow any residual CO to escape through the fume hood or gas cabinet. Make sure no one has received a hazardous exposure. Thoroughly check lines and equipment for leaks before restarting the experimental work.

**Emergency Procedures**

The nearest fire extinguisher is located \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. In the event of a fire, do not attempt to fight it unless you have had fire extinguisher training and you are confident you can safely extinguish the fire. Emergency assistance can be obtained by calling 911 or activating a pull station (specify location). If emergency responders are requested, meet them when they arrive on scene and be available to provide information about the incident. Contact (your institution’s) Occupational Medicine Department for medical advice on exposure to CO. Have a copy of the CO Safety Data Sheet available when meeting with medical personnel. Complete your institution’s work injury or illness report form.

**Training Records**

**“By my signature, I verify that I have read and understand this SOP, and have discussed any questions I have had with the indicated trainer. I agree to fully adhere to its requirements.”**

| **Last** | **First** | **Signature** | **Trainer/PI** | **Date** |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Prepared by: ACS Hazard Assessment Task Force Date:

Updated by: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

This file is excerpted from “Identifying and Evaluating Hazards in Research Laboratories: Guidelines developed by the Hazard Identification and Evaluation Task Force of the American Chemical Society’s Committee on Chemical Safety”.

© Copyright 2015 American Chemical Society