# University of Arizona

## Lead Compounds Standard Operating Procedure

*[This is a template. Fill in all necessary blanks and delete all highlighted areas when complete. Add any sections necessary for your laboratory. This will be appended to your Laboratory Chemical Hygiene Plan.]*

**Title:**  **Click here to enter the title of your SOP.**

**Approval Holder (AH):** Click here to enter text **Approval #:** Click here to enter text

**Approval Holder Phone Number(s):** Click here to enter text

**Approval Safety Coordinator (ASC):** Click here to enter text

**Approval Safety Coordinator Phone Number(s):** Click here to enter text

**Department:** Click here to enter text

1. **Purpose**

This standard operating procedure (SOP) is intended to provide guidance on how to safely store, handle, use, and dispose of lead compounds in Enter AH’s name’s laboratory. Laboratory personnel should review this SOP, as well as the appropriate Safety Data Sheet(s) (SDSs), before Describe the procedure or process this SOP will address. If you have questions concerning the requirements within this SOP, contact your Approval Holder (AH) or Approval Safety Coordinator (ASC).

1. **Scope**

*[Describe when this SOP applies and to whom this SOP applies.]*

1. **Hazard Description**

*[Describe the hazards presented by the procedure or process this SOP addresses. What makes it hazardous? Provide an example, if applicable.]*



Lead is a heavy, ductile, soft, gray solid. The acute toxicity of lead and its compounds is moderate to low. Lead is a heavy metal that has and continues to be widely used in industry for many years. Lead comes in different forms including its elemental state or combined chemically with other elements to form lead compounds. Inorganic lead compounds are commonly used in pigments, paints, glasses, plastics and rubber compounds. Lead is also a component in many metal alloys.

The toxic effects of lead compounds give rise to symptoms including agitation, insomnia, dizziness, tremors, and delirium, which can progress to mania, coma and death. These symptoms are accompanied by nausea, vomiting, loss of appetite, severe cramping, muscular aches and weakness, diarrhea, and abdominal pain. Lead can accumulate in the soft tissues and bones, with the highest accumulation in the liver and kidneys, and elimination is slow.

Lead and its compounds have shown developmental and reproductive toxicity in both male and female animals and humans. They are considered a probably/possible human carcinogen based of sufficient animal evidence and inadequate human evidence. There are differences between organic and inorganic lead compounds. The routes of exposure for inorganic lead are inhalation and ingestion. Adverse effects are reproductive toxicity, neurotoxicity, hematological toxicity, renal and hypertension. Inorganic lead compounds are also considered probable human carcinogens. Because of the nature of organic lead, tetraethyl lead passes the blood-brain barriers readily and accumulate in the limbic forebrain, frontal cortex and hippocampus. Symptoms of acute high-level exposure include delirium, nightmares, irritability and hallucinations.

Lead poisoning occurs when lead builds up in the body, usually months to years. When exposed to large amounts of lead, it can quickly lead to lead poisoning. Due to the severe effects and prolonged time to exposure, there are organizations such as OSHA and NIOSH that have implemented recommended exposure limits for lead. NIOSH recommended exposure limit (REL) is a time weighted average of 50 micrograms per cubic meter of air over 8-hours. In this case, the required (OSHA) permissible exposure limit (PEL) for lead is the same, no greater than 50 micrograms per cubic meter of air averaged over an 8-hour period. These are important limits as a PEL is the maximum amount or concentration of a chemical that a worker may be exposed to.

1. **Process & Hazard Controls**

*[Describe the steps needed to set up and complete the procedure or process in safe manner following the* [*hierarchy of controls*](https://www.cdc.gov/niosh/topics/hierarchy/default.html)*. Use as much detail as is necessary to ensure all laboratory workers can complete the procedure or experiment safely.]*

* 1. **Elimination/Substitution**
* bromide can be ordered in liquid form or purchase in pre-weighed amounts. Use these when possible.

*[Describe any eliminations of hazardous chemicals or processes; alternatively, any substitutions with less hazardous alternatives that could be used to accomplish the task.]*

* 1. **Engineering Controls**

*[Describe any engineering controls (e.g. fume hoods, gas cabinets, local exhausts, blast shields, etc.) that are used to safely accomplish the task.]*

**Fume hoods or other RLSS approved local exhaust ventilation are required for Lead compound use. Powder Weighing Station:** Powder Weighing Stations are hard, compact enclosures used to weigh fine powders and chemicals. They create a precise, horizontal airflow across the work surface. These enclosures are designed to protect the worker as well as the laboratory. Room air is drawn into the opening of the station and through a HEPA filter, removing any particles before the air is dispensed back into the room. The airtight connection between the weighing station and the exterior container prevents this difference from influencing the weighing procedure. Note that these are not fume hoods. Any vapors produced will be recirculated within a room.

* 1. **Work Practices**

*[Describe any work practices (e.g. staggering schedules, additional cleaning measures for particulates, etc.) that are used to safely accomplish the task.]*

**Housekeeping and cleaning**: As with other metals and powders, the use of wet cleaning methods and disposable mats are recommended to prevent contamination of the use and surrounding areas when working with cadmium compounds.

* Place a disposable mat under all cadmium use and storage areas.
* Dispose of mats after uses of lead.
* Always use a pre-wetted, disposable cloth to wipe down lead use areas once work has concluded for the day.
  + Also wipe the floor in front of and/or around the use area to prevent general laboratory contamination.
* Use a specific lab coat for cadmium compound work; clean regularly via professional dry cleaning service. Lead and other related compounds easily cling to clothing and can be taken home to expose workers and relatives in the home.
* Wash hands rigorously and regularly to prevent accidental ingestion after working with lead compounds.
  1. **Personal Protective Equipment**

*[Describe the personal protective equipment needed to adequately protect laboratory workers when performing the process or procedure addressed by this SOP. Ensure to specify any personal protective equipment beyond the minimum (i.e. safety glasses, lab coat, gloves, long pants and closed-toed shoes).]*

* **Hand and Arm Protection**: Standard nitrile gloves should be used; follow any SDS for the lead compound(s) to ensure the appropriate type is used.
* **Face and Eye Protection**: Safety glasses are a minimum protection; goggles are preferred.
* **Body Protection**: A 100% cotton lab coat should be used.
* **Respiratory Protection:** All respiratory protection requires RLSS assessment and approval; for exposures that require respiratory protection, contact RLSS at rlss-chem-support@arizona.edu.
  1. **Transportation and Storage**

*[Describe how to safely transport and/or store (e.g. ventilated cabinet, flammable cabinet, under inert blanket, etc.) the hazardous chemical(s) or processes.]*

**Storage**

* The lead compounds must be stored in a tightly closed secondary containment container.
* Do not store this material with incompatible materials. Avoid contact with strong acids, bases, halides, oxidizers, halogenates, potassium nitrate, permanganate, peroxides, nascent hydrogen and reducing agents.
* Storage cabinets containing this material must be labeled with the appropriate hazard communication label (i.e., toxic or poison).
* The secondary containment container must be labeled in accordance with OSHA regulations and University policy.
* Due to the hazardous nature of the material only minimal quantities of material should be purchased and stored.

1. **Spills, Cleanup & Disposal**

*[Describe how to safely end the procedure or process, clean up the process or spills, and/or dispose of any waste generated.]*

**Spills**

Spill response should always follow the [University Chemical Hygiene Plan](https://rgw.arizona.edu/sites/default/files/cs-univeristy_chemical_hygiene_plan.pdf) Section 8.2. Do not attempt to clean a large spill of lead powder without wetting (if safe to do) or the use of approved respiratory protection.

**Exposure Response**

|  |  |  |  |
| --- | --- | --- | --- |
| **Inhalation** | **Ingestion** | **Skin Contact** | **Eye Contact** |
| Remove to fresh air. If not breathing, give artificial respiration. Get medical attention if  symptoms occur | Clean mouth with water and drink afterwards plenty of water. Get medical attention if  symptoms occur. | Wash off immediately with plenty of water for at least 15 minutes. If skin irritation persists, call a physician. | Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get  medical attention |

**Disposal**

* All waste must be collected in a sealable compatible container and disposed as hazardous waste as per University Hazardous Waste Guidelines.
* All residual materials and rinse water from empty containers of this material must be collected and disposed as hazardous waste.
* The rinse water from decontamination of all non-disposable equipment must be collected and disposed as hazardous waste.
* All disposable materials contaminated with this material must be disposed as hazardous waste.
* **Drain disposal of any of these materials is strictly forbidden**.
* A chemical pick-up request form must be completed and submitted when the hazardous waste needs to be removed.

1. **Enter Additional Section Title**

*[Add as many sections as necessary to adequately describe how to safely perform the procedure or process addressed by this SOP.]*

1. **References:**

* <https://www.cdc.gov/niosh/npg/npgd0368.html>
* <https://ehs.utoronto.ca/wp-content/uploads/2014/06/Lead-SOPs-PDF-20171109b.pdf>
* <https://www.mayoclinic.org/diseases-conditions/lead-poisoning/symptoms-causes/syc-20354717>
* <https://ehs.wisc.edu/wp-content/uploads/sites/1408/2020/08/WeighingHazardousPowder.pdf>