

**STANDARD OPERATING PROCEDURE TEMPLATE FOR ALKALI METAL WORK**

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| #1 | **CONTACT INFORMATION**  |

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| **Procedure Title** | **[Specify** – **Note: All gray guidance text in brackets may be deleted]** |
| **Procedure Author** | **[Specify]** |
| **Creation/Revision Date** | **[Specify]** |
| **Responsible Person**  | [Name of PI, Lab Supervisor, or Autonomous Researcher, as appropriate] |
| **Location of Procedure** | [Building and room number] |
| **Approval Signature** | [Obtain prior approval, as appropriate. See section #10 of this template.] |
| #2 | **THIS STANDARD OPERATING PROCEDURE (SOP) IS FOR A:**  |
| [ ]  **Specific laboratory procedure or experiment** **[Examples: Dissolving metal reduction of alkynes, preparation of lithium metal electrodes, etc.]**[ ]  **Generic laboratory procedure that covers several chemicals [Examples: cutting and dispensing pieces of alkali metal, removing surface tarnish from alkali metal, etc.]**[ ]  **Generic use of alkali metals** |
| #3 | **PROCESS OR EXPERIMENT DESCRIPTION** |
| [Provide a brief description of your process or experiment, including its purpose. Do not provide a detailed sequential description as this will be covered by section #6 of this template. Indicate the frequency and duration below.]

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| **Frequency:** |  [ ]  one time [ ]  daily [ ]  weekly [ ]  monthly [ ]  other: \_\_\_\_\_\_\_ |
| **Duration per Expt:** | \_\_\_\_\_\_\_ minutes; or \_\_\_\_\_\_\_hours |

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| #4 | **SAFETY LITERATURE REVIEW & HAZARD SUMMARY** |
| 1. Hazardous Substances

Alkali metals are soft, shiny metals that react with air to form caustic metal oxides. Heavier alkali metals (rubidium, cesium) will spontaneously ignite upon exposure to air.These metals also react with water to produce heat, hydrogen gas, and caustic metal hydroxides. The heat produced by the reaction may ignite the hydrogen or the metal itself, resulting in a fire or an explosion.Nitrogen is not an inert atmosphere for lithium, which will react to form a black lithium nitride tarnish.Potassium, even when stored under mineral oil, may form potassium superoxide if oxygen is present in the container. This can form an impact-sensitive explosive with mineral oil.[List other hazardous substances and their associated health and safety hazards. Examples of potential hazards include toxicity, reactivity, flammability, corrosivity, pressure, etc. Refer to Safety Data Sheets (SDSs) and other resources, as needed.] 1. Other Hazards

[List nonchemical hazards, e.g., biological hazards, electrical hazards, mechanical hazards, nonionizing radiation, or ionizing radiation.]1. References

[List all references you are using for the safe and effective design of your process or experiment, including safety literature and peer-reviewed journal articles. Safety resources are available at <http://web.stanford.edu/dept/EHS/cgi-bin/lcst/creating-standard-operating-procedures/>.]  |
| #5 | **STORAGE REQUIREMENTS** |
| [Describe how the alkali metals will be stored to prevent exposure to air and water. Possible solutions include storing under mineral oil or under an inert atmosphere such as argon. Storage in an inert atmosphere glove box is also an appropriate option.][Nitrogen is not an inert atmosphere for lithium. Potassium must always be stored under an inert atmosphere - even when kept under mineral oil, a yellowish coating of potassium superoxide may form after prolonged storage if oxygen is present in the headspace of the container.][Describe special handling and storage requirements for other hazardous materials used in the procedure, especially for highly reactive/unstable materials, highly flammable materials, and corrosives.]  |
| #6 | **STEP-BY-STEP OPERATING PROCEDURE** |
| [For each step’s description, include any step-specific information on hazards, personal protective equipment, engineering controls, and designated work areas in the left hand column. Describe the possible risks involved with failure to follow a step in the SOP in the right hand column.][If working with alkali metals outside of a glove box, include information on procedures used to minimize exposure of alkali metals to air and water. Also include information on the safe storage of any alkali metal waste generated during the course of the procedure.]

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| **Step-by-Step Description of YourProcess or Experiment** | **Potential Risks if Step is Not Done or Done Incorrectly (if any)** |
| 1. Don personal protective equipment. [ ]  appropriate street clothing (long pants, closed-toed shoes)[ ]  gloves; indicate type: \_\_\_\_\_\_\_[ ]  safety goggles [ ]  safety glasses [ ]  face shield [ ]  lab coat [ ]  flame-resistant lab coat[ ]  other: \_\_\_\_\_\_\_ |  |
| 2. Check the location/accessibility/certification of the safety equipment that serves your lab:

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| **Item** | **Status** |
| **Laboratory Fume Hood/Glove Box or other Ventilation Control** | Location: \_\_\_\_\_\_\_*Check sticker to ensure that hood was certified within last 12 months.* |
| **Eyewash/Safety Shower** | Location: \_\_\_\_\_\_\_*Ensure that it is accessible, not blocked.**Check tag to ensure that it has been tested within the last month.* |
| **First Aid Kit**  | Location: \_\_\_\_\_\_\_ |
| **Chemical Spill Kit**  | Location: \_\_\_\_\_\_\_ |
| **Fire Extinguisher** | Location: \_\_\_\_\_\_\_ |
| **NOTE: A Class D fire extinguisher must be used for fires involving alkali metals. Do not use an ABC or CO2 fire extinguisher for this purpose. Contact the Stanford University Fire Marshal’s Office at 723-0448 to obtain a Class D extinguisher.**  |
| **Telephone** | Location: \_\_\_\_\_\_\_ |
| **Fire Alarm Manual Pull Station** | Location: \_\_\_\_\_\_\_ |

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| 3. [Describe the next step in the procedure.] |  |
| 4. [Describe the next step in the procedure. Insert additional rows in table, as needed.] |  |
| 5. Dispose of hazardous solvents, solutions, mixtures, and reaction residues as hazardous waste. Ensure alkali metal waste is stored under mineral oil or under an inert atmosphere and labeled with a hazardous waste tag. |  |
| 6. Clean up work area and lab equipment.[Describe specific cleanup procedures for work areas and lab equipment that must be performed after completion of your process or experiment.][Consult with PI to choose an appropriate method for cleaning equipment and tools used to handle alkali metals – possible techniques include rinsing with isopropanol or tert­-butanol, or immersion in a large quantity of ice water.] |  |
| 7. Remove PPE and wash hands. |  |

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| #7 | **EMERGENCY PROCEDURES**  |
| 1. **Health-Threatening Emergencies**
2. **Fire, explosion, health-threatening hazardous material spill or release, compressed gas leak, or valve failure, etc.**
3. Call 9-911 (or 286 in the School of Medicine).
4. Alert people in the vicinity and activate the local alarm systems.
5. Evacuate the area and go to your Emergency Assembly Point (EAP): [Indicate EAP location]
6. Remain nearby to advise emergency responders.
7. Once personal safety is established, call EH&S at 725-9999 (or 286 in the School of Medicine).
8. Provide local notifications (local notifications are listed at the end of this section).

Note: For compressed gas leaks, shut off gas supply only if this can be done safely, without risk to personnel.1. **Injuries and Exposures:**
2. Remove the injured/exposed individual from the area, unless it is unsafe to do so because of the medical condition of the victim or the potential hazard to rescuers.
3. Call 9-911 (or 286 in the School of Medicine) if immediate medical attention is required.
4. Call 725-9999 (or 286 in the School of Medicine) to report the exposure to EH&S.
5. Administer first aid as appropriate.
6. Flush contamination from eyes/skin using the nearest emergency eyewash/shower for a minimum of 15 minutes. Remove any contaminated clothing.
7. Bring to the hospital copies of SDSs for all chemicals the victim was exposed to.
8. **Non-Health-Threatening Emergencies**
9. **Injuries and Exposures**

For injuries and exposures that are not considered [serious or a medical emergency](http://www.stanford.edu/dept/EHS/prod/researchlab/IH/SUOHC/hurt_at_work.html#serious), call the Occupational Health Center (OHC) at 725-5308 between 8:00 am-5:00 pm M-F at (650) 725-5308 for immediate phone triage and to schedule an appointment. For [urgent conditions](http://www.stanford.edu/dept/EHS/prod/researchlab/IH/SUOHC/hurt_at_work.html#serious) when SUOHC is closed, go to the Stanford University Medical Center Emergency Department. 1. **Spills**

For hazardous material spills or releases which have impacted the environment (via the storm drain, soil, or air outside the building) or for a spill or release that cannot be cleaned up by local personnel:1. Notify Stanford University responders by calling 725-9999 (or 286 in the School of Medicine). These services are available 24 hours a day, 7 days a week.
2. Provide local notifications (local notifications are listed at the end of this section).
3. **Local Cleanup of Small Spills**

In the event of a minor spill or release that can be safely cleaned up by local personnel using readily available equipment (e.g. absorbent available from EH&S in the Small Spill Kit) and laboratory PPE: 1. Notify personnel in the area and restrict access. Eliminate all sources of ignition.
2. Review the SDS for the spilled material, or use your knowledge of the hazards of the material to determine the appropriate level of protection (do not clean up spills requiring respiratory protection locally).
3. Wearing appropriate personal protective equipment, clean up spill. Collect spill cleanup materials in a tightly closed container. Manage spill cleanup debris as hazardous waste.
	1. Note: For spills of alkali metals, if the metal is not vigorously reacting, cover the metal with mineral oil, then a layer of dry sand. Transfer the material to a container and add enough mineral oil to cover the container. Flush the container headspace with an inert gas before closing.
		1. If the metal is vigorously reacting, use a Class D fire extinguisher instead.
4. Submit online [waste pickup request](http://www.stanford.edu/dept/EHS/prod/enviro/waste/pickup/WastePickup_form.htm) to EH&S.
5. Reporting Requirements: All spills cleaned up locally must be reported if they occur outside of secondary containment. A spill that occurs within secondary containment (a laboratory hood is considered secondary containment) must be reported if it is greater than 30 ml or if it takes longer than 15 minutes to clean up. To report a spill, call EH&S at 725-9999 (or in the School of Medicine, x286) as soon as possible.
6. **Lab-Specific Procedures**

[This section is for any emergency procedures different from standard responses, or for additional emergency information due to the nature of materials or task. Include information on gas leaks, chemical spills, and personal exposure/medical emergency as appropriate.]1. **Building Maintenance Emergencies**

Call Facilities Operations at 723-2281 (or 721-2146 in the School of Medicine) for building maintenance emergencies (e.g., power outages, plumbing leaks).1. **Local Notifications**

[Identify the area management staff that must be contacted and include their work and after-hours numbers. This must include the principal investigator and may include the lab safety coordinator, facilities manager, and/or business manager.] |
| #8 | **WASTE DISPOSAL**  |
| [Scraps of alkali metal waste may be stored under mineral oil or an inert atmosphere such as argon. Containers of alkali metal waste must be labeled with a hazardous waste tag (<http://wastetag.stanford.edu>) and picked up by EH&S as hazardous waste. Consult with PI to choose an appropriate method for cleaning equipment and tools used to handle alkali metals – possible techniques include rinsing with isopropanol or tert­-butanol, or immersion in a large quantity of ice water.][Do not quench alkali metals unless it is a necessary part of the experimental procedure. If quenching is necessary, provide a detailed description of the quenching procedure here, and contact EH&S for guidance at (650) 723-0448.][Describe the quantities of waste you anticipate generating and appropriate waste disposal procedures. Include any special handling or storage requirements for your waste. Contact EH&S at 723-0448 for questions and additional guidance.]  |
| #9 | **TRAINING REQUIREMENTS** |
| **General Training** ***(check all that apply):***[x]  General Safety & Emergency Preparedness (EHS-4200)[x]  Chemical Safety for Laboratories (EHS-1900)[ ]  Compressed Gas Safety (EHS-2200)[ ]  Biosafety (EHS-1500)[ ]  Life Sciences Research Laboratory Safety Training (EHS-4875)**[**In the School of Medicine, EHS-4875 is required for laboratory personnel in lieu of EHS-1900, 2200, and 1500.] [ ]  Other: \_\_\_\_\_\_\_[Depending on the hazardous materials and processes you will be working with in this SOP, additional safety training may be required by the University. To evaluate if additional safety training is required, go to<http://web.stanford.edu/dept/EHS/prod/training/index.html>.]

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| **Location Where Records Maintained:** |  |

**Laboratory-specific training** ***(check all that apply):***[ ]  Review of SDS for chemicals involved in process/experiment[ ]  Review of this SOP[ ]  Other: \_\_\_\_\_\_\_

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| **Location Where Records Maintained:** |  |

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| #10 | **PRIOR APPROVALS**  |
| [You **must** seek prior approval from your principal investigator (PI) or lab supervisor if you plan to use **restricted chemicals** (dimethylmercury and [toxic gases regulated by Santa Clara County](http://www.stanford.edu/dept/EHS/prod/researchlab/lab/tgo/tgodata.html)). You should also consult your PI or lab supervisor if your experiments involve **high-risk chemicals and operations,** as special safety precautions may need to be taken. High-risk chemicals and operations may involve chemicals with a high level of acute toxicity, carcinogens, reproductive toxins, and highly reactive materials. For additional guidance, see section 5.3 of the [Chemical Hygiene Plan](http://www.stanford.edu/dept/EHS/cgi-bin/lcst/docs/Chemical_Hygiene_Plan.pdf). Your PI or lab supervisor’s prior approval may be documented by his/her signature in the Approval Signature section of this document. For granting prior approval to individuals other than the procedure author, use one of the methods described at <http://web.stanford.edu/dept/EHS/cgi-bin/lcst/restricted-chemicals-high-risk-procedures/>.]**Prior Approval *(check if applicable):***[ ]  Prior approval from the PI or lab supervisor is required for this procedure  |