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| **Brueckner Lab-Specific Standard Operating Procedure (LSOP):****Alkyl/Aryl Organolithiums (e.g. methyl lithium, *n*-butyl lithium, *t-*butyl lithium, phenyl lithium, etc.) in, e.g., cyclopentane, hexane, THF, or toluene** |
| **Principal Investigator(PI):** Christian Brueckner |
| **Building:** Chemistry | **Lab(s) Covered by LSOP:** R413/R415 |
| **Department:** Chemistry | **Lab Phone Number(s):** 6-6596/6-6598 |
| **SECTION 1 – HAZARDOUS CHEMICALS and HAZARDS INVOLVED** |
| Alkyl/Aryl organolithium compounds are flammable materials generally stored in flammable and highly volatile liquids. In contact with water, they also release flammable gases, which may also ignite spontaneously. Organolithium compounds are pyrophoric, i.e., they catch fire spontaneously when exposed to air. May cause respiratory irritation. May be fatal if swallowed and enters airways; ingestion causes severe swelling. Causes severe skin burns and ocular damage. Organolithium compounds are strongly basic and thus corrosive materials.  |
| **SECTION 2 – ADMINISTRATIVE CONTROLS** |
| * Anyone using the chemicals and procedures described herein needs to have undergone the annual EH&S [Chemical Hygiene Training](http://www.ehs.uconn.edu/Chemical/?p=training)
* Be aware of the applicable safety data sheets (SDS): <http://www.msds.com>
* [Working Alone](http://policy.uconn.edu/2012/07/30/working-alone-policy/) is not permitted when using chemicals or processes described in this LSOP.
* Experiments should only be performed during normal business hours (i.e., 9:00 am-5:00 pm Mon-Fri).
* An eyewash and safety shower must be in the immediate work area where boron trifluoride is used
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| **SECTION 3- ENGINEERING CONTROLS** |
| * All research with organolithium must be conducted in a chemical fume hood, under dry conditions, with the sash at the lowest working height and with sliding sash panels aligned to form a barrier between the researcher and the experiment
* Work under an inert atmosphere (e.g., argon, nitrogen) using vacuum manifold (Schlenk) techniques
* Chemical fume hoods must have been tested by EHS within the last year. If the hood is not working properly, contact Facilities (486-3113) to repair the hood or EHS to retest (486-3613)
* Use a blast shield in front of the setup for extra protection, if possible, particularly when larger than 20 mL of organolithium solution are in a setup.
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| **SECTION 4 – WORK PRACTICES** |
| Design your experiment to use the least amount of material possible.Design a quenching scheme for residual materials prior to using organolithiums.Never use water to quench the material itself or a reaction; use chilled isopropanol or acetone as quenching reagents; begin quenching with a low reactivity quenching agent, keep the reaction chilled (but avoid ice baths, use dry ice baths), and slowly add more reactive quenching agents (such as technical grade ethanol or methanol); all in the fume hood!It is better to do multiple transfers of small volumes than attempt to handle larger quantities.Before transferring, make sure that the material is at room temperature (important for materials stored in the fridge or freezer).Organolithiums must be handled and stored in a dry place. Keep away from sources of ignition; keep away from incompatible materials and conditions; keep away from combustible materials such as open flames, non-explosion-proof hot plates, paper towels, waste containers, or Kimwipes; clear out the entire fumehood when working with organolithiums.Inform colleagues that organolithiums will be used, and where.Ensure the nearest eye wash/safety shower is unobstructed.Never use water to extinguish fires! Have a sand bucket at the ready.All containers of organolithium must be clearly labeled with the chemical name and hazard classes, and kept tightly-sealed.Ensure to use proper syringe or cannula techniques; make practice runs of canula transfers; always clamp reagent and receiving vessel to prevent from moving and connect bottle to an inert gas source with a bubbler, and ensure the bottle is not over-pressurized. |
| **SECTION 5 – PERSONAL PROTECTIVE EQUIPMENT (PPE)** |
| * At a minimum, a fire-proof (the blue labcoats from the labcoat program, for example), long pants, and closed-toed footwear covering the entire foot must be worn; chemical splash goggles or safety glasses that meet American National Standards Institute (ANSI) standard Z-87.1 must be worn when handling organolithiums.
* A full-face shield is required when working with larger than 20 mL of an organolithium solution.
* Nitrile gloves must be worn even while handling small quantities of organolithiums.
* Synthetics clothing is strongly discouraged.
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| **SECTION 6 – STORAGE** |
| * Keep the material under inert atmosphere (e.g., nitrogen, argon) when not in use.
* Ensure labels on original bottles remain legible and prominently displayed to identify contents.
* Ensure both original and secondary containers remain intact and are stored with tight-fitting caps or lids
* Store in the chemical fridge or freezer in A413; outside of the fridge/freezer, the bottles should only be put down in the fume hoods.
* Use/purchase only amount that is needed in a reasonable amount of time.
* Isolate from water and air.
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| **SECTION 7 – SPILL AND ACCIDENT PROCEDURES** |
| * Acceptable fire extinguishing media include Metal X, soda ash (lime) or dry sand to respond to small fires, and an ABC extinguisher for large fires.
* A sand bucket should be located near where the pyrophoric work is occurring; a small beaker of dry sand or soda ash (lime) in the work area is useful to extinguish any small fire that occurs at the syringe tip and to receive any last drops of reagent from the syringe.
* Do not use water to attempt to extinguish a pyrophoric/reactive material fire as it can enhance the combustion of some of these materials, and avoid using CO2 extinguishers on an organolithium fire
* In case of any fire lasting longer than seconds, evacuate the laboratory.
* Close door(s) to lab and post a “**NO ENTRY**” sign(s) or other warning information on the door specifically warning of organolithiums (if this is safe, otherwise evacuate immediately as instructed by the alarm)
* Activate the fire alarm and call 911.
* Do not re-enter area until instructed to do so by emergency personnel.

**Report any incident to the PI and fill out the** [**accident form**](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwiF3bPe1dPXAhVRRN8KHX4wDf4QFggmMAA&url=https%3A%2F%2Fchemistry.uconn.edu%2Fwp-content%2Fuploads%2Fsites%2F1259%2F2015%2F09%2FIncident-Report-Form.doc&usg=AOvVaw3Uov8IQ2Z-Kan) |
| **SECTION 8 – FIRST AID PROCEDURES** |
| *Eyes** Immediately move to the eyewash station, hold eyelids open and flush with water. Remove contact lenses while flushing (if applicable)
* Have another person from the lab dial 911 and specifically mention organolithium in xxx solvent exposure and continue flushing the eyes until emergency personnel arrives

*Skin** Immediately move to safety shower and begin rinsing affected area(s) with as much water as possible
* Remove contaminated clothing while flushing and keep rinsing affected area(s) until emergency personnel arrives
* Have another person from the lab dial 911

*Ingestion** Immediately rinse the mouth with cold water
* Do NOT induce vomiting
* Have another person from the lab dial 911 and specifically mention organolithium in 50 mL solvent exposure

*Inhalation** Move to fresh air
* Dial 911 and inform emergency responders that the accident involved organolithiums in 50 mL solvent

**Report any incident to the PI and fill out the** [**accident form**](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwiF3bPe1dPXAhVRRN8KHX4wDf4QFggmMAA&url=https%3A%2F%2Fchemistry.uconn.edu%2Fwp-content%2Fuploads%2Fsites%2F1259%2F2015%2F09%2FIncident-Report-Form.doc&usg=AOvVaw3Uov8IQ2Z-Kan) |
| **SECTION 9 – WASTE MANAGEMENT** |
| * All unquenched organolithium waste must remain in the original bottle and labeled with “Hazardous Waste” stickers or tags, and be stored alone or with other compatible chemicals.
* All quenched organolithium waste must be labeled with “Hazardous Waste” stickers or tags, use full chemical names to describe the waste (i.e., no chemical abbreviations or symbols), be stored in sturdy, plastic containers with tight-fitting caps or lids, and be stored alone or with other compatible chemicals.
* Hazardous wastes must be stored at or near a green “Satellite Accumulation Area” sign prior to disposal by EHS. Once the containers are 80% filled, fill our EH&S chemical [waste pickup form](http://ehs.uconn.edu/Regulated%20Waste%20Management/index.php):
* The [Chemical Waste Disposal Manual](http://ehs.uconn.edu/Chemical/ChemWasteDisp.pdf) must be used as a reference.
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| **SECTION 10 – DECONTAMINATION PROCEDURES** |
| **Work Area*** Soak up drops with inert absorbent material (sand, lime)
* Clean residues with water and detergent

**Personal Hygiene*** Use standard chemical hygiene practices regarding PPE (see abpve).
* Upon contamination, wash affected areas immediately.
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| **SECTION 11 – SPECIFIC PROCEDURE** |
| A safe use of organolithiums is described in: [Advanced Practical Inorganic and Metalorganic Chemistry](https://books.google.com/books?id=yI_mq_mCf2AC&pg=PA47&lpg=PA48#v=onepage&q&f=false)Further information provided by EH&S: [Pyrophoric and Water-Reactive- Chemicals Fact Sheet](http://www.ehs.uconn.edu/Chemical/Pyrophoric_and_Water-Reactive-FactSheet.pdf) |
| **SECTION 12A. APPROVAL** |
| I have reviewed, understand and agree to follow this lab-specific standard operating procedure (LSOP)*.* Failure to follow this LSOP or lab-specific training guidelines is a violation of the [*University Health & Safety Policy*](http://policy.uconn.edu/2011/05/19/health-and-safety-policy/) and [*University Code of Conduct*](http://policy.uconn.edu/2011/05/17/employee-code-of-conduct/).Further approval and/or review of this LSOP by the PI/Supervisor is required if any of the following events occur:* A significant change in amount (i.e., doubling of the scale of reaction) or substitution of the chemicals in the procedure is planned
* A major change in the agreed-upon experimental set-up is planned (heating instead of room temp, etc.)
* Any signs of a failure in safety design or equipment are observed
* Any signs or symptoms of a chemical exposure to any personnel are observed
* Unexpected and/or potentially dangerous experimental results occur (e.g., fire, uncontrolled buildup of heat and/or pressure, etc.)
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| **Researcher Name/Signature** | **Trainer Name/Signature** | **Training Date** |
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| **SECTION 12B. PRINCIPAL INVESTIGATOR CERTIFICATION** |
| I approve the contents of the lab-specific standard operating procedure listed above. |
| **PI Signature:** | **Date:** |
| **A HARD OR ELECTRONIC COPY (https://bruckner.research.uconn.edu/safety-resources/) OF EACH LAB-SPECIFIC STANDARD OPERATING PROCEDURE MUST BE READILY AVAILBALE IN THE LAB.** |