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| **Brueckner Lab-Specific Standard Operating Procedure (LSOP):****Hydrazine (H2N-NH2), Methyl Hydrazine (H2N-NHCH3), all isomers of Dimethyl Hydrazine (H2N-N(CH3)2 CH3NH-NHCH3)** |
| **Principal Investigator(PI):** Christian Brueckner |
| **Building:** Chemistry | **Lab(s) Covered by LSOP:** R413/R415 |
| **Department:** Chemistry | **Lab Phone Number(s):** 6-6596/6-6598 |
| **Chemical** | **GHS Pictograms** | **Definitions** |
| **Hydrazine and methyl hydrazines** |   | **Acute Toxicity.** Adverse affects to oral, dermal, or inhalation pathways within 24 hours of exposure. May be fatal if prolonged exposure.**Flammable.** Refers to flammable liquids, aerosols, gases, and solids.**Respiratory Sensitization**. Refers to a material which poses an aspiration hazard.***Aquatic Hazard.*** May cause chronic or acute hazards to the environment.**Corrosion** refers to a substance that causes irreversible damage to living tissue. This includes, but is not limited to, skin or ocular damage.  |
| **SECTION 1 – CHEMICAL(S) and HAZARDS**  |
| Hydrazines as their free bases are a severe skin irritants and may produce burns. Liquid or spray mist may produce tissue damage particularly in the mucous membranes of the eyes, mouth, and respiratory tract. Inhalation causes irritation of the respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over exposure may result in death. Confirmed carcinogenic. Mutagenic and teratogenic effects N/A. Target Organs: Kidney, Lungs. |
| **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).
* Lab-specific safety training must be provided by the principal investigator (PI) or other qualified personnel to all researchers working with hydrazine. Documentation of training is required.
* Read the safety data sheet (SDS) for hydrazine prior to use: [http://www.msds.com.](http://www.msds.com)
* Researchers must not work alone with hydrazine.
* Experiments should be performed during normal business hours, if possible.
* An eyewash and safety shower must be in the immediate work area where hydrazine is used.
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| **SECTION 3 – ENGINEERING CONTROLS** |
| * All research with hydrazine 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.
* Chemical fume hoods must be running and tested by EH&S within the last year. If the hood is not working properly, contact Facilities (860-486-3113) to repair the hood or EH&S to retest (860-486-3613).
* Use of hydrazines outside of chemical fume hoods is not permitted.
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| **SECTION 4 – WORK PRACTICES** |
| * Hydrazine must be handled and stored in a dry and dark place. Keep away heat and sources of ignition.
* Containers of hydrazines must be labeled with the chemical name, hazard classes and kept well-sealed.
* Empty containers of hydrazine must be handled carefully since product residues (vapors, liquid) are still harmful.
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| **SECTION 5 – PERSONAL PROTECTIVE EQUIPMENT** |
| * At a minimum, a lab coat, long pants as well as closed-toed footwear and chemical safety glasses that meet American National Standards Institute (ANSI) standard Z-87.1 must be worn when handling hydrazines.
* Chemical splash goggles are required handling larger quantities (>250 mL) of hydrazines.
* Nitrile Gloves must be worn while handling small quantities of hydrazines.
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| **SECTION 6 – STORAGE** |
| * Store hydrazine stored in a dry, cool, well-ventilated, and dark place (flammable cabinet for bases in R413).
* Ensure labels on original bottles remain legible and prominently displayed to identify contents and that both original and secondary containers remain intact and are stored with tight-fitting caps or lids.
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| **SECTION 7 – SPILLS AND ACCIDENTS PROCEDURES** |
| * Evacuate the laboratory if a larger spill of hydrazines has occurred outside the fume hood.
* Close door(s) to lab and post a “NO ENTRY” sign spelling out the origin of the danger.
* Activate the fire alarm and call **911** and inform them of the nature of the chemical spill.
* Do not re-enter area until instructed to do so by UCFD or other 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** |
| First Aid- Eyes | 1. Immediately move to the eyewash station, hold eyelids open and flush with water. Remove contact lenses while flushing (if applicable).
2. Have another person from the lab dial **911** and specifically mention hydrazine exposure.
3. Continue flushing the eyes until emergency personnel arrives.
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| First Aid- Skin | 1. Immediately move to safety shower or other water source and begin rinsing affected area(s). Remove contaminated clothing (if applicable) while flushing.
2. Have another person from the lab dial **911** and specifically mention hydrazine exposure.
3. Flush affected area(s) under safety shower for 5 minutes.
4. Keep rinsing affected area(s) until emergency personnel arrives.
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| First Aid- Ingestion | 1. Immediately rinse the mouth with cold water. Do NOT induce vomiting. Do NOT give emetics or baking soda.
2. Have another person from the lab dial **911** and specifically mention hydrazine exposure.
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| First Aid- Inhalation | 1. Move to fresh air.
2. Dial **911.**
3. Inform emergency responders that the accident involved hydrazine.
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| **SECTION 9 – HAZARDOUS WASTE MANAGEMENT** |
| * All hydrazine wastes 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 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 | Removal – Decontaminate equipment through a water rinse; use surfactants. |
| Personal Hygiene | Use standard chemical hygiene practices regarding PPE.Upon contamination, wash affected areas immediately. |
| **SECTION 11 – SPECIFIC PROCEDURE**  |
| A typical use of hydrazine in our laboratories is described in: Akhigbe, J.; Haskoor, J. P.; Krause, J. A.; Zeller, M.; Brückner, C. ‘Oxazolochlorins. 10. Formation, Structure and Reactivity of meso-Tetraaryl-chlorolactones, -porpholactames, and chlorolactames, Porphyrin and Chlorin Analogues Incorporating Oxazolone or Imidazolone Moieties’ *Org. Biomol. Chem.***2013**, *11*, 3616–3628.*meso*-Tetraphenyl-2-oxa-3-oxoporphyrin **3a** (56 mg, 8.85 × 10‑5 mol) was dissolved in THF (20 mL) and magnetically stirred. Hydrazine hydrate (N2H4·2H2O, 11 mL) was added and the mixture was heated to reflux for 5 d. When the starting material was consumed (reaction monitored by TLC), the reaction mixture was allowed to cool and was evaporated to dryness by rotary evaporation. The residue was taken up in CH2Cl2, washed with H2O (2 × 10 mL), dried over anhyd Na2SO4, and reduced by rotary evaporation. The reaction mixture was separated by preparative TLC (silica–CH2Cl2/2% MeOH), providing **7a** in 12% (7.0 mg) as a red-purple solid, **8a** as a purple solid in 37% (21.0 mg), and **9a** as a purple solid in 25% (15.0 mg) yields. When the reaction was performed under an atmosphere of N2, the formation of **7a** is almost totally suppressed, and **8a** and **9a** were isolated in 81-90% and 3-5% yields, respectively. |

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| **SECTION 12A. APPROVAL** |
| I have reviewed, understand and agree to follow this lab-specific standard operating procedure (LSOP) for working with hydrazines*.* 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.** |