

## Water-Sensitive Chemicals

***Principal Investigator (PI) Approval is Required Prior to Performing this Procedure***

### Description

*This standard operating procedure outlines the handling and use of water-sensitive chemicals. Review this document and supply the information required in order to make it specific to your laboratory. In accordance with this document, laboratories should use appropriate controls, personal protective equipment, and disposal techniques when handling water-sensitive chemicals.*

Water-sensitive chemicals are those that react violently with water. The alkali metals such as sodium, potassium and lithium react with water to produce heat and flammable hydrogen gas, which can ignite or combine explosively with atmospheric oxygen.

### Potential Hazards

Water-sensitive chemicals are materials which react violently with water to produce heat and flammable or toxic gas. Consider that these materials may present other hazards such as corrosivity, teratogenicity, peroxide formation, or systemic effects.

See the Department of Transportation's list of [Water Reactive Materials which Produce Toxic Gases](#) when spilled in water. Some classes of pyrophoric materials are listed below.

<i>Some Classes of Water Reactive Chemicals</i>	<i>Examples of class</i>
Grignard reagents	RMgX
Alkali metals	Li, Na, K
Alkali metal amides	
Alkali metal hydrides	Lithium aluminum hydride
Metal alkyls	Lithium and aluminum alkyls
Halides of nonmetals	BCl <sub>3</sub> , BF <sub>3</sub> , PCl <sub>3</sub> , PCl <sub>5</sub> , SiCl <sub>4</sub> , S <sub>2</sub> Cl <sub>2</sub>
Inorganic acid halides	POCl <sub>3</sub> , SOCl <sub>2</sub> , SO <sub>2</sub> Cl <sub>2</sub>
Anhydrous metal halides	AlCl <sub>3</sub> , AlBr <sub>x</sub> , TiCl <sub>4</sub> , ZrCl <sub>4</sub> , SnCl <sub>4</sub>
Organic acid halides and anhydrides of low molecular weight	

### Engineering Controls

Many water-sensitive chemicals will liberate hydrogen when they react with water. The use of a fume hood is recommended to prevent the buildup of combustible gases. A glove box may be used to handle water-sensitive chemicals when a dry atmosphere is required. A safety shower and eyewash must be available and accessible when working with water-sensitive chemicals.

## Work Practice Controls

- Before working with these compounds, read and follow the SDS and other reference material carefully.
- Purchase minimal amounts of water-sensitive materials.
- Have a class D fire extinguisher accessible for emergency use.
- Set up a designated area for storage and work with water-sensitive chemicals.
- Before conducting the actual procedure, always perform a dry run (without the water-sensitive material) to identify and resolve possible safety hazards.
- Work within sight and/or hearing of at least one other person who is familiar with the hazards and written procedures.
- Never work alone with extremely hazardous materials/operations.

## Personal Protective Equipment

- Wear a fully buttoned, flame-resistant lab coat (Nomex material or equivalent) with sleeves extended to the wrists, closed toe shoes, long pants, safety goggles and standard nitrile laboratory gloves.
- Leather or Kevlar gloves are recommended over nitrile gloves (for fire protection).
- If large quantities will be used, a chemical-resistant apron is also required. Note that personal clothing should not be of a type that may ignite (such as polyester or nylon).

## Transportation and Storage

- Store in a cool, dry location (never under a sink), off the floor, in a water-tight secondary container.
- Store alkali metals under mineral oil to prevent reaction with moisture in the air.

## Waste Disposal

Because most spent, unused and expired chemicals/materials are considered hazardous wastes, they must be properly disposed of. ***Do not dispose of chemical wastes by dumping them down a sink, flushing in a toilet or discarding in regular trash containers, unless authorized by UM Flint EHS.*** Contact Environment, Health and Safety (EHS) at (810) 766-6763 for waste containers, labels, manifests, waste collection and for any questions regarding proper waste disposal. Also refer to UM-Flint Hazardous Waste Management Program and EHS webpage <http://www.umflint.edu/ehs/environment-health-and-safety> for more information.

## Exposures/Unintended Contact



***If the employee is in need of emergency medical attention, call 911 immediately.***



Contact EHS for advice on symptoms of chemical exposure, or assistance in performing an exposure assessment.

Report all work related accidents, injuries, illnesses or exposures to UM-Flint DPS. Additionally, employees and supervisors must be sure to report the injury to EHS and complete and submit the [Illness and Injury Report Form](#) to WorkConnections within 24 hours. Follow the directions on the WorkConnections website [Forms Instructions](#) to obtain proper medical treatment and follow-up.

If you were involved in or observed an incident or near miss, please complete the [EHS Laboratory Incident and Near-Miss Report Form](#). This will be valuable in improving laboratory safety on UM-Flint campus.

## TREATMENT FACILITIES:

<u>MAJOR INJURIES</u>	<u>MINOR INJURIES –During Business Hours</u>	<u>MINOR INJURIES –After Business Hours</u>
<p><b>Genesys Hospital</b> One Genesys Parkway Grand Blanc, MI 48439 (810) 606-5710</p> <p><b>Hurley Medical Center</b> One Hurley Plaza Flint, MI 48503 (810) 262-9000</p> <p><b>McLaren Hospital Flint</b> 401 South Ballenger Hwy Flint, MI 48532 (810) 342-2000</p>	<p><b>Genesys Occupational Health Network</b> 1460 Center Rd. Burton, MI 48509 (810) 715-4620 Mon. to Fri. 7:30 am to 10 pm Sat. &amp; Sun. Noon to 8 pm</p> <p><b>McLaren Flint-Burton OCC Center</b> 1459 S. Center Rd. Burton, MI 48509 (810) 496-0900 Mon. - Fri. 8 am to 8 pm Sat &amp; Sun 10 am to 2 pm</p>	<p><b>Downtown Flint</b> 420 S. Saginaw St. Flint, MI 48502 (810) 762-1550</p> <p><b>Genesys East</b> 1096 S. Belsay Rd, Suite F Burton, MI 48509 (810) 743-3351</p> <p><b>Genesys North</b> 4154 W. Vienna Rd Clio, MI 48420 (810) 686-7397</p> <p><b>Genesys South</b> 8447 N. Holly Rd Grand Blanc, MI 48439 (810) 603-0856 Mon. - Fri. 6 to 10pm / Sat. &amp; Sun. 1-10pm</p>

Click [here](#) for more information on the UM – Flint Emergency Preparedness and Response Plan.

### Spill Procedure

Please refer to SDSs for specific guidelines for responding to spills. If uncertain, contact EHS at (810) 766-6763 and/or 911 for assistance. The following spill procedures may not apply to all reactive chemicals.

- When a spill occurs, ***personal safety should always come first.***
- Alert and clear everyone in the immediate area where the spill occurred.
- Open outside windows, if possible.
- Use proper personal protective equipment as indicated above.
- Do not flush with water or bring in contact with moisture.
- Pick-up and dispose of as hazardous waste without creating aerosols.
- Collect contaminated materials and place in suitable, tightly closed container. Contact EHS at (810) 766-6763 for proper disposal.

A **minor (small) chemical spill** is one of a known chemical that the laboratory staff is capable of handling safely without the assistance of safety and emergency personnel. A **major/large chemical spill** requires active assistance from emergency personnel.

### Additional Spill Links:

- [www.oseh.umich.edu/pdf/chemspil.pdf](http://www.oseh.umich.edu/pdf/chemspil.pdf)
- <http://www.oseh.umich.edu/emer-chemical.shtml>.

Report all emergencies, suspicious activity, injuries, spills, and fires to the UM-Flint Department of Public Safety (DPS) at 911 from any university telephone or (810) 762-3333 from cell phone or non-university telephone. Register with the [University of Michigan-Flint Emergency Alert System](#) via Wolverine Access. Also, preprogram the UM-Flint DPS telephone number (810) 762-3333 into your cell phone for quick, easy use.

### Training of Personnel

All personnel are required to complete Laboratory Safety Training. Documentation of the training is required. This training can be accomplished by completing the **Comprehensive Laboratory Safety** session (**BLS009** or equivalent) via [MyLINC](#), or UM-Flint EHS on-line training or other equivalent approved by EHS. Furthermore, all personnel shall read and fully adhere to this SOP when handling water-sensitive chemicals.

### Certification

I have read and understand the above SOP. I agree to contact my Supervisor or Lab Manager if I plan to modify this procedure.

Name	Signature	UM ID #	Date

Principal Investigator \_\_\_\_\_

Revision Date \_\_\_\_\_