

### **SOP 3. Standard Operating Procedure for Water Reactive Chemicals**

#### **I. General Statement of Coverage**

Water reactive chemicals are chemicals that react vigorously with water or moist air. The most common water sensitive chemicals include sodium, potassium, lithium metals, metal hydrides, and aluminum alkyls.

#### **II. Hazard Assessment**

A Job Hazard Assessment should be performed for work involving corrosive materials and should address the issues of proper use and handling, chemical toxicity, storage, disposal, spill response, and required PPE. See Section 21 and Form 4 of Section 25.0 of the Chemical Hygiene Plan.

#### **III. Resources**

A. Existing Standards

B. Operating Manual Instructions

C. Text and Literature References

Department of Chemistry Safety Handbook

A. D. CHP Appendix III (Section 23.3) Chemical Information Tables

Table 5. Water Reactive Chemicals

Table 8. Peroxide Forming Chemicals

#### **IV. Chemical Storage**

##### **A. Special Storage**

1. Water sensitive chemicals should be stored in a cool and dry location. Keep water sensitive chemicals segregated from all other chemicals in the laboratory. Minimize the quantities of water sensitive chemicals stored in the laboratory.
2. Date all containers upon receipt. Potassium will form peroxides and superoxides when stored under oil at room temperature. Examine storage containers frequently. Dispose of any containers that exhibits salt build up on its exterior or after three months, whichever comes first. Refer to the "Chemical Storage" section of the Department Safety Handbook. Dispose of all water sensitive chemicals whenever they are no longer required for current research.
3. Never return excess chemicals to the original container. Small amounts of impurities may be introduced into the container which may cause a fire or explosion.

##### **B. Gas Cylinders**

Gas cylinders must be secured while in use or in storage (empty or full). They should be stored with the valve cap secured. Refer to SOP #6-Compressed Gases.

#### **V. Personal Protective and Emergency Equipment**

##### **A. Eye and Face Protection**

Refer to the Eye Protection Policy, Appendix IIB (Section 23.2). At a minimum, safety glasses with permanently attached top and side shields must be worn in the laboratory. These glasses, however, do NOT protect against splash hazards. When performing a hazardous activity, a face shield must be worn in addition to the safety glasses OR switch to chemical splash goggles (with shielded ventilation ports). Face shields are available from the Safety Office (free of charge).

##### **B. Gloves**

Appropriate gloves should be worn when handling hazardous materials. The selection of glove materials should be made from Appendix II, Part A (Section 23.2) of the CHP. If this chart is insufficient, please see the Safety Coordinator/CHO.

C. **Protective Clothing**

Lab coats, closed toed shoes and long sleeved clothing should be worn when handling hazardous materials. Additional protective clothing, such as aprons or full-length arm protection, should be worn if the possibility of skin contact is likely.

D. **Hearing Protection**

The use of hearing protection requires monitoring and training. See the Safety Coordinator/CHO for details.

E. **Respirators**

The use of respirators require medical certification, fit testing, and training. See the Safety Coordinator/CHO for details.

F. **Eye Wash**

Where the eyes or body of any person may be exposed to hazardous materials suitable facilities for quick drenching or flushing of the eyes and body shall be provided within, or near, the work area for immediate emergency use. Bottle type eyewash stations are not acceptable.

G. **Safety Showers**

A safety shower should be available and functioning as specified by ANSI Z358.1.

H. **Fire Extinguishers**

All laboratories must contain at least one Carbon Dioxide (Type B-C) or Dry Chemical (Type A-B-C) fire extinguisher. Additional fire extinguishers are located near exits and/or stairwells in each building. Special Class D fire extinguishers (for certain metal and water sensitive material fires) are available from the Safety Office.

VI. **Controls**

A. **Designated Areas**

Some reactive materials such as Pentaborane and Phosphorous Oxychloride require Designated Areas. See Section 18 of the CHP.

B. **Chemical Fume Hoods**

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.

C. **Glove Boxes**

A glove box may be used to handle water sensitive chemicals when a dry atmosphere is required.

D. **Safety Shielding**

Safety shielding is required any time there is a risk of explosion, splash hazard or a highly exothermic reaction. All manipulations of water sensitive chemicals which pose this risk should occur in a fume hood with the sash in the lowest feasible position. Portable shields, which provide protection to all laboratory occupants, are acceptable.

E. **Special Ventilation**

Special ventilation is required if these materials are used outside of a fume hood. If your research does not permit the handling of water sensitive chemicals in a fume hood, contact the Chemical Hygiene Officer or the Division of Environmental Health and Safety to review the adequacy of all special ventilation.

F. **Vacuum Protection**

1. Evacuated glassware can implode and eject flying glass, and splattered chemicals. Vacuum work involving hazardous materials must be conducted in a fume hood, glove box or isolated in an acceptable manner.

2. Mechanical vacuum pumps and the "House Vacuum System" must be protected using cold traps and, where appropriate, filtered to prevent particulate release. See the article in the Department Safety Handbook under "Compressed Gases." The exhaust for the pumps must be vented into an exhaust hood.

G. **Signs and Labels**

1. Doorways: All OSHA Select Carcinogens, Reproductive Toxins, Highly Toxic materials, and NFPA Level 4 Flammable Liquids (Appendix III, Tables 10-15) must be indicated on the acrylic door sign.
2. Containers: All hazardous materials must be clearly labeled with the correct chemical name.

H. **Utilities**

In Evans and Celeste Labs, utility shut-off valves are located in pipe chases just outside of the laboratories. In Newman/Wolfrom, the valves are located above the ceiling in the hallways. Look for the ceiling tiles with the green dots.

I. **Fire Protection**

Older buildings, such as Evans and Johnston Labs, do not have sprinkler suppression systems. This could be a consideration for storing or using large quantities of hazardous materials.

VII. **Specific Procedures**

Refer to the MSDS or other sources of information to become familiar with the properties of the particular substances including: chemical and physical properties, health hazard information, symptoms of over-exposure, etc.

VIII. **Emergency Procedures**

A. **Notification**

Refer to the "Emergency Response" section of the Department Safety Handbook for generic emergency response procedures. Specific emergency procedures should be developed for each group or laboratory. The procedures should address as a minimum the following:

1. Who to contact: (University police at 292-2121 or 292-2525, and Division of Environmental Health and Safety at 292-1284 during normal working hours, and the Principal Investigator of the laboratory including evening phone number).
2. The method used to alert personnel in nearby areas of potential hazards.
3. Special spill control materials required by the type of hazardous materials handled in the laboratory.
4. Special first aid treatment required by the type of water sensitive chemicals handled in the laboratory

B. **Spill Response**

1. Anticipate spills by having the appropriate clean up equipment on hand. The appropriate clean up supplies can be determined by consulting the material safety data sheet. This should occur prior to the use of any water sensitive chemicals. Spill control materials for water sensitive chemicals are designed to be inert and will not react with the reagent. Do not put water on the spill.
2. In the event of a spill alert personnel in the area that a spill has occurred. Do not attempt to handle a large spill of water sensitive chemicals. Turn off all ignition sources and vacate the laboratory immediately. Call 911 for assistance.
3. Remain on the scene, but at a safe distance, to receive and direct safety personnel when they arrive.

IX. **Decontamination and Waste Disposal**

A. **Decontamination Procedures**

1. Personnel: Wash hands and arms with soap and water immediately after handling chemicals.
2. Area: Carefully clean work area after use.
3. Equipment:

B. **Waste Disposal**

All materials contaminated with water sensitive chemicals should be disposed of as hazardous waste. Alert the Chemical Hygiene Officer or the Division of Environmental Health and Safety if you generate wastes contaminated by water sensitive chemicals. These wastes may pose a flammability risk and should not remain in the laboratory overnight.

X. **Approvals**

Some hazardous materials require special handling or prior approvals. See Section 18 and 20 of the CHP.

XI. SOP Prepared by \_\_\_\_\_ Date \_\_\_\_\_

Reviewed by \_\_\_\_\_ Date \_\_\_\_\_