**Peroxide Forming Chemicals Guidance**

The following information is intended to provide general guidance on how to safely work with a specific class of chemical or hazard. This information is generic in nature. It addresses the use and handling of substances by hazard class only.

**Hazard Definition**

Peroxide-forming chemicals are a class of materials that have the ability to form shock-sensitive and explosive peroxide crystals. When triggered by friction or shock the peroxides will explode. Peroxide forming chemicals include solids, liquids and gases. Chemicals in this class may also be flammable or reactive. The Safety Data Sheet and label for peroxide-forming chemicals may or may not include the following hazard statement: 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS: May form explosive peroxides.

**Securing of gas cylinders**

Not applicable

**Designated area**

Not applicable

**Emergency procedure**

Emergency procedures which address response actions to fires, explosions, spills, injury to staff, should be developed by each laboratory. The procedures should address as a minimum the following:

* **Who to contact:** (University police, Principal investigator of the laboratory including evening phone number and Office of Environmental Health Safety)
* The location of all safety equipment (showers, spill equipment, eye wash, fire extinguishers, etc.)
* The location of all Peroxide forming chemicals in the laboratory
* The method used to alert personnel in nearby areas of potential hazards
* Special first aid treatment required by the type of Peroxide forming chemicals handled in the laboratory

**Fume hood**

The use of a fume hood is recommended.

**Hazard assessment**

Hazard assessment of work involving peroxide forming chemicals should address proper use and handling techniques, fire safety (including the need for Class D fire extinguishers), storage, water reactivity, and waste disposal issues.

**Protective apparel**

Lab coats, closed toed shoes and long sleeved clothing should be worn when handling water-reactive chemicals. Additional protective clothing should be worn if the possibility of skin contact is likely.

The Principal Investigator/course director is responsible to the select the appropriate PPE.

The Office of Environmental Health and Safety is available to provide guidance.

**Eye protection**

Eye protection in the form of safety glasses must be worn at all times when handling water-reactive chemicals. Ordinary (street) prescription glasses do not provide adequate protection. (Contrary to popular opinion these glasses cannot pass the rigorous test for industrial safety glasses.) Adequate safety glasses must meet the requirements of the American Standard Practice for Occupational and Educational Eye and Face Protection (ANSI Z.87. 1 1989) and must be equipped with side shields. Safety glasses with side shields do not provide adequate protection from splashes; therefore, when the potential for splash hazard exists other eye protection and/or face protection must be worn.

The Principal Investigator/Course Director is responsible to the select the appropriate eye protection.

The Office of Environmental Health and Safety is available to provide guidance.

**Gloves**

Gloves should be worn when handling peroxide forming chemicals.

The Principal Investigator/Course Director is responsible to the select the appropriate chemical resistant glove when direct or prolonged contact with hazardous chemicals is anticipated.

The Office of Environmental Health and Safety is available to provide guidance.

**Safety shielding**

Safety shielding is required any time there is a risk of explosion, splash hazard or a highly exothermic reaction. All manipulations of peroxide forming 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.

The Principal Investigator/Course Director is responsible to the select the appropriate shielding.

The Office of Environmental Health and Safety is available to provide guidance.

**Eyewash**

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

**Safety shower**

A safety or drench shower should be available in a nearby location where the peroxide forming chemical is used.

**Signs and labels**

**Containers:** All water reactive chemicals chemical must be clearly labeled with the correct chemical name, health hazard and CAS#. Handwritten labels are acceptable; chemical formulas and structural formulas are not acceptable. Chemical containers must be dated upon receipt as well as when opened.

**Storage**

Peroxides form after exposure to air. The rate of peroxide formation is dependent on the specific chemical, the amount of air exposure and whether the chemical contains and inhibitor to retard peroxide formation. Therefore, it is imperative that potential peroxide-forming chemicals be entered into the lab’s chemical inventory and assigned an expiration date based the storage limitations for the chemical’s class (see class descriptions below). Peroxide-forming chemicals should be stored away from light and heat with tightly secured caps and labeled with dates of receipt and opening.

Date all containers upon receipt. Potassium will form peroxides and super oxides when stored under oil at room temperature. Examine storage containers frequently. Dispose of any container that exhibits salt build up on its exterior. Dispose of all peroxide forming chemicals whenever they are no longer required for current research.

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.

**Special ventilation**

Special ventilation is required if these materials are used outside of a fume hood. If your research does not permit the handing of peroxide forming chemicals in a fume hood you must contact the Office of Environmental Health and Safety to review the adequacy of all special ventilation.

**Spill response**

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-reactive chemicals. Spill control materials for peroxide forming chemicals are designed to be inert and will not react with the reagent. Do not put water on the spill.

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-reactive chemicals. Turn off all ignition sources and vacate the laboratory immediately. Call for assistance.

* University Police 856-256-4911. This is a 24 hour service.
* Office of Environmental Health & Safety 856-256-5105 or ehs@rowan.edu

Remain on the scene, but at a safe distance, to receive and direct safety personnel when they arrive.

**Vacuum protection**

Not applicable

**Waste disposal**

All materials contaminated with peroxide forming chemicals should be disposed of as hazardous waste.

**Classes of Peroxide-Forming Chemicals**

Peroxide formers fall into three classes. Class I peroxide forming chemicals can form explosive levels of peroxides while sitting on the shelf. These chemicals should be tested before use or disposed of through the chemical waste system three months after opening or three months prior to the expiration date on the container if unopened. Contact EHS if there crystals are present or if the solvent is discolored.

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| **CHEMICAL** | **SYNONYMS** |
|  |  |
| Isopropyl Ether | Diisopropyl Ether, Diisopropyl Oxide |
| Diethyl Ketene | 2-Ethyl-1-butene-1-one |
| Divinyl Ether | Vinyl Ether, Divinyl Oxide |
| Potassium Metal | Potassium |
| Potassium Amide |  |
| Sodium Amide | Sodamide |
| Sodium Ethoxyacetylide |  |
| Vinylidene Chloride | 1,1-Dichloroethylene, 1,1-Dichloroethane |
|  |  |

Class II peroxide formers are only a hazard if the peroxides are concentrated, which may happen upon evaporation or distillation of the solvent. These materials should be disposed of 1 year after opening or three months prior to the expiration date on the container if unopened.

**Expire 1 year after opening:**

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| --- | --- |
| Acetal | 2-Cyclohexen-1-ol |
| Acetaldehyde | Cyclopentene |
| Benzyl alcohol | Decahydronaphthalene (decalin) |
| 2-Butanol Dioxanes | Diacetylene (butadiyne) |
| Chlorofluoroethylene | Dicyclopentadiene |
| Cumene (isopropylbenzene) | Diethylene glycol dimethyl-ether (diglyme) |
| Cyclohexene | Methyl-isobutyl ketone |
| Ether, Diethyl ether, Ethoxyethane | 4-Methyl-2-pentanol |
| Ethylene glycol ether acetates (cellosolves) | 2-Pentanol |
| Furan | 4-Penten-1-ol |
| 4-Heptanol | 1-Phenylethanol |
| 2-Hexanol | 2-Phenylethanol |
| Methyl Acetylene | Tetrahydrofuran |
| 3-Methyl-1-butanol | Tetrahydronphthalene |
| Vinyl Ethers | p-Dioxane |
| Methyl-isobutyl ketone | Cyclopentene |
| Furan | Methyl Cyclopentene |

Class III peroxide formers may auto-polymerize as a result of peroxide formation. These materials should be disposed of 1 year after opening or three months prior to the expiration date on the container if unopened.

**Expire 1 year after opening:**

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| --- | --- |
| Butadiene | Vinyldiene Chloride |
| Chlorobutadiene | Vinyl Acetylene |
| Chloroprene | Vinyl Chloride |
| Vinyl Acetate | Vinyl Pyridine |
| Chlorotrifluoroethylene | Tetrafluoroethylene |
| Styrene |  |
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