Peroxide Former Safety

Bryant University

1150 Douglas Pike

Smithfield, Rhode Island

02917-1284

Prepared by:
Triumvirate Environmental, Inc.
200 Inner Belt Road
Somerville, MA 02143

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Reviewed and Approved by:
Triumvirate Environmental
200 Innerbelt Road
Somerville, MA 02134

Bryant University

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1.0 Purpose

Bryant University aims to provide a safe working environment for all employees, contractors, visitors, and students. This document establishes procedures for the safe storage, handling, and management of peroxide forming chemicals that may be used in the labs at Bryant University. Peroxides are crystals that are sensitive to heat, shock, or friction and may lead to explosions. These crystals can form in certain chemicals over time due to light, heat, oxygen, etc. so it is critical to properly manage and dispose of these chemicals to minimize formation of peroxides.

2.0 Hazards & Reactivity

Peroxides may form under normal storage conditions due to reactions with oxygen (air). When exposed to certain conditions such as shock, friction, or heat the peroxides may explode. Explosion of peroxides present serious physical hazards to those working with or near peroxide forming compounds.

Peroxide forming chemicals may be a liquid, solid, or a gas. Specific rates of peroxide formation depend on many factors, including specific chemical, oxygen exposure, light, heat, and presence of inhibitors. There may be other hazards associated with peroxide forming chemicals, so follow any additional precautions necessary, which may be found on the Safety Data Sheet (SDS).

3.0 Types of Peroxide Formers

There are different classes of peroxide forming chemicals based on their stability and formation of peroxides in different conditions. See **Appendix B** for specific chemicals relative to each class listed below.

3.1 Class A

Class A chemicals may form peroxides spontaneously upon exposure to air and oxygen. These present the most severe hazard, as these may form peroxides without additional factors such as heat, light, etc. Class A peroxide formers should be disposed of 3 months after opening, unless otherwise specified by

the manufacturer. Unopened containers should be regularly inspected for peroxide formation. Refer to the manufacturer's expiration date for disposal of unopened containers.

3.2 Class B

Class B chemicals may form peroxides upon evaporation, distillation, or concentration. Class B peroxide formers should be disposed of 12 months after opening, unless otherwise specified by the manufacturer. Unopened containers should be regularly inspected for peroxide formation. Refer to the manufacturer's expiration date for disposal of unopened containers.

3.3 Class C

Class C chemicals will autopolymerize due to peroxide formation. Class C peroxide formers with inhibitors should be disposed of 12 months after opening, unless otherwise specified by the manufacturer. Uninhibited Class C chemicals should be disposed of within 24 hours of opening. Unopened containers should be regularly inspected for peroxide formation. Refer to the manufacturer's expiration date for disposal of unopened containers.

4.0 Safety Procedures

4.1 Training

Before working with any peroxide forming chemicals, all workers should be trained on the proper handling and storage requirements outlined in this document. They must have completed the following items before working:

- Review this Peroxide Former Safety document, any lab specific Standard Operating Procedures, and safety data sheets (SDS) to familiarize themselves with all hazards.
- Be trained to and familiar with Bryant University's Chemical Hygiene Plan and emergency procedures for spills, fires, explosions, etc.
- Become aware of peroxide forming chemicals in their work area.
- Be aware of emergency exits and emergency equipment, fire alarms, emergency eyewash and safety showers, etc.
- Know emergency contact information.

- **Appendix A** contains contact information in the event of an emergency.

4.2 Storage and Work Practice Controls

- Purchase the smallest containers needed for the particular work being conducted.
  - When possible, purchase those with inhibitors.
- Utilize smallest amounts necessary for ongoing work or process.
- Date all peroxide forming chemicals with the date they are received.
- Date all peroxide forming chemicals with the date they are opened.
- Do not remove or deface the manufacturer label.
- Store chemicals in air-tight containers away from light and sources of heat, friction, or ignition.
  - Refer to the SDS for any additional specific storage recommendations.
  - Do not use secondary/working containers for extended storage.
- Dispose of unopened containers upon their manufacturer expiration date, regardless of peroxide concentration.
  - If the date is missing or illegible, dispose of immediately.
- Never allow peroxide forming chemicals evaporate or distill to dryness.
  - If distillation or concentration of peroxide forming chemicals is required as part of a particular work process, monitor closely and test for peroxide formation prior.
- Never return a peroxide forming chemical to the original container once removed or withdrawn.
- Do not use metal or metal-containing tools or materials for work with peroxide formers.
- This safety document will be reviewed annually, and updates will be made as necessary.
- If peroxides are found via inspection or peroxide level testing, regardless of dates:
  - Immediately discontinue use of the chemical.
  - Contact Risk Management & Safety (RMS) for immediate disposal.
- Never attempt to remove, neutralize, or treat peroxides.

4.3 Inspection of Containers

- Complete regular visual inspection of all containers (open or unopened) with peroxide formers for the presence of peroxide crystals. Look for:
  - Cloudiness of liquids;
  - Crystals around the cap/rim;
  - Discoloration of liquid;

  - Wisp-like structures in liquids; or
  - Crystals, chips, solids, or other structures in liquids.
- If peroxides are observed during inspection, regardless of dates:
  - Immediately discontinue use of the chemical. Do not perform peroxide testing.
  - Contact Risk Management & Safety (RMS) for immediate disposal.

4.4 Engineering Controls

Only open and use peroxide forming chemicals in fume hoods with proper ventilation. Some chemicals may need additional engineering controls, such as a glove box. Refer to the chemical SDS for any specific recommendations.

4.5 Personal Protective Equipment (PPE)

Proper personal protective equipment (PPE) should be utilized when handling or using any chemical in addition to all work practice and engineering controls. Workers, at a minimum, should always use appropriate lab attire including gloves/hand protection, lab coat, and safety glasses/goggles when handling chemicals, including peroxide formers. Refer to the SDS and hazard assessments for specific glove recommendations, and any addition PPE required or recommended for chemical use.

4.6 Peroxide Testing

It is important that opened containers of peroxide formers are tested regularly. Utilization of peroxide test strips from a chemical supply company are the easiest method for routine testing in the lab. Document dates and observed peroxide levels of all tests performed. Labs that utilize peroxide forming chemicals must purchase test strips to keep in their lab space. Testing should be performed in accordance with the manufacturer instructions for use of that particular test strip. Test strips do have a limited shelf life, and the expiration date of these should be observed prior to use. Never use an expired test strip to perform peroxide testing. Discard and purchase new strips as soon as possible.

If the test strips purchased by the lab require water, and the peroxide former being tested is water reactive, do not utilize this test method. Reach out to RMS for further information on testing. If workers are not comfortable or do not have the proper materials to complete testing, chemicals should be disposed of.

If any level of peroxides is detected from peroxide level testing, regardless of dates:

- Immediately discontinue use of the chemical.
- Contact Risk Management & Safety (RMS) for immediate disposal.

5.0 Emergency Procedures

In the event of a spill, follow procedures outlined in the Bryant University Chemical Hygiene Plan. Notify the Department of Public Safety (DPS) and RMS with as much information relative to the spill as possible.

In the event of an explosion or fire, follow all University emergency procedures including evacuation. Locate the nearest fire alarm and activate it, notify others and evacuate the area, and immediately call DPS or 911. Provide as much information regarding the materials related to the fire or explosion to emergency responders and RMS. If you are injured, remove yourself from the area if possible and seek medical attention from DPS or other emergency medical services (EMS).

6.0 Waste Disposal

All peroxide forming chemicals must be treated as hazardous waste when ready for disposal, regardless of date or peroxide concentration. Waste containers free of peroxides must meet all applicable regulations for labeling, storage, etc. in the lab's satellite accumulation area (SAA).
If peroxides are observed or detected during testing, special handling or disposal procedures may be required. Do not attempt to move, label, or dispose of these materials on your own; contact RMS immediately.

Contact Risk Management and Safety (RMS@Bryant.edu) with any questions.

Appendix A: Emergency Contacts

Contact Type/Name	Contact Info
Department of Public Safety	Office (401) 232-6001 Emergency (401) 232-6911
Risk Management & Safety Bill Thomas (Risk Manager)	RMS@bryant.edu BThomas12@bryant.edu (401) 232-6006
Town of Smithfield Fire Department	911
Town of Smithfield Police Department	911

Appendix B: Peroxide Forming Chemicals

The following list is meant to identify common peroxide forming chemicals that may be used in the lab. It should not be considered all inclusive, and workers should always refer to chemical SDS and labels for hazards.

Class A

- Butadiene
- Chloroprene
- Divinylacetylene
- Isopropyl Ether
- Tetrafluoroethylene
- Vinylidene Chloride

Class B

- Acetal
- Acetaldehyde
- Benzyl alcohol
- Benzyl Ethyl Ether
- Benzyl Ether
- 2-Butanol
- Cumene
- Cyclohexanol
- Cyclohexene
- Di-n-propoxymethane
- Dioxane
- 1,2-Dibenzyloxyethane
- Decahydronapthalene
- Diacetylene
- Dicyclopentadiene
- Diethyl ether (ethyl ether)
- Diethylene Glycoldimethyl Ether (diglyme)

- Diethoxymethane
- Ethylene Glycol Dimethyl Ether
- 4-Heptanol
- 2-Hexanol
- Isoamyl Ether
- Isophorone
- Methyl Acetylene
- 2-Methyl-1-butanol
- Methylcyclopentane
- Methyl Isobutyl Ketone
- 4-Methyl-2-pentanol
- 2-Pentanol
- 4-Penten-1-ol
- 2-Propanol
- 2-Phenylethanol
- 2-Propanol
- Diallyl Ether
- p-Dibenzyloxybenzene
- p-Isopropoxypropionitrile
- Tetrahydrofuran
- Tetrahydronapthalene
- Vinyl Ethers

Class C

- Acrylic Acid
- Acrylonitrile
- Butadiene
- Chloroprene
- Chlorotrifluoroethylene
- Methyl Methacrylate
- Styrene
- Tetrafluoroethylene

- Vinyl Acetate
- Vinyl Acetylene
- Vinyl Chloride
- Vinyl Pyridine
- Vinyladiene chloride