UF Environmental Health and Safety
UNIVERSITY of FLORIDA

Fact Sheet: Peroxide Forming Chemicals

INTRODUCTION

BACKGROUND

Peroxide forming chemicals are a class of compounds that have the ability to form shock-sensitive explosive peroxide crystals. To reduce this risk, EHS has dating requirements and other guidelines. While peroxide formers break down at different rates and some may have inhibitors, the EHS guidelines apply to all peroxide formers equally. The peroxide formation rate varies dependent of the chemical and exposure to oxygen, light, and time.

Note: At this time, peroxide formation falls under "Hazard not otherwise classified" (HNOC) on SDSs as it is not a hazard defined by GHS guidelines, not all peroxide formers will have it appear on the SDS.

Peroxide formers can be split into 3 classes:

- Class A peroxide formers can autoxidize and form explosive levels even in unopened containers and can form explosive levels of peroxides without concentration.
- Class B peroxide formers can form explosive levels of peroxides, but typically require concentration of some variety. Most of these are volatile enough that repeated opening of their container can allow for evaporation thus forming enough concentration to form peroxides.
- Class C peroxide formers are not particularly hazardous, but decomposition can initiate explosive polymerization of the bulk monomer.

REQUIREMENTS

LABELING

- All containers of peroxide formers must be labeled with the date received and opened.

Peroxide Forming Chemicals
Date Received_____
Expires 12 months after receiving
Date Opened_____
Expires ☐3/ ☐ 6 months after opening

- Non original containers must be labeled with the original container's dates.

STORAGE AND DISPOSAL

- **All three classes must be disposed of after 12 months from receipt, or 3 (Category A) or 6 (Category B/C) months after opening, whichever occurs first.**

Safe storage of peroxide formers	
Description	**Time period**
Unopened chemicals from manufacturer	12 months
Opened chemicals:	
Category A Chemicals	3 months
Category B Chemicals	6 months
Category C Chemicals	6 months

- Testing for peroxides does not exempt containers from the time-based disposal requirements.
- Do not open a liquid organic peroxide or peroxide-forming chemical if crystals or a precipitate are present, immediately label and dispose of as hazardous waste.
    - If there is any feeling of grit in the threads when opening a container, immediately stop and contact Hazardous Waste.

ORIGINAL CONTAINERS

- Bottles from manufacturers must be dated when received and when opened.
- The container must remain in good condition and stored safely in accordance with EHS guidelines.

FILLED CONTAINERS

- Clean containers between refills, a triple rinse with a polar solvent such as water with the rinsate collected as hazardous waste.
- Only use bottles previously used for solvents, not acids.

SOLVENT STILLS

- Solvent kegs can have a buildup of organic peroxides from the purification process.
    - Solvent kegs should be emptied of any residual solvent to be disposed of as waste before refilling.
    - Solvent kegs should be cleaned in order to remove any organic peroxide residue in the container.
    - Do not fill the kegs with any solvent older than 3 months.
    - Date the kegs at the time of filling with the opened date of the bottle they were filled from.
    - Replace and dispose of the solvent in the kegs within 6 months of the open date of the container they were filled from.
- Dispensed solvents have no inhibitors and can form organic peroxides rapidly.
    - Do not dispense more than will be used during the work period.
    - Excess dispensed solvents should be disposed of as waste within a month.
    - Maintain vigilance for any crystal formation, precipitate, or residue as they are signs of organic peroxide formation.
    - If any containers are reused for dispensing solvents into, they must be cleaned thoroughly between fills.

GLOVEBOXES

- Gloveboxes can be used to provide an atmosphere free of moisture and oxygen, with that consideration, EHS provides the following guidance:
    - Only new or purified peroxide formers should be brought into the glovebox.
    - If there is a glovebox failure & oxygen is detected, all peroxide formers shall be disposed of.
    - Peroxide formers in the glove box should be replaced at regular intervals.

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PARTIAL PEROXIDE FORMER LIST

Class A Peroxide Formers: Disposed 3 months after opening	
Acetaldehyde diethyl acetal (often referred to as acetal)	Potassium amide
Butadiene (Liquid)	Potassium metal
Chloroprene (2-chloro-1,3-butadiene) (Liquid)	Sodium amide (sodamide)
Diisopropyl ether (isopropyl ether)	Tetrafluoroethylene (TFE) (Liquid)
Divinylacetylene (DVA)	Vinylidene chloride (1,1-dichloroethylene)
Class B Peroxide Formers: Disposed 6 months after opening	
Acetal (compounds)	Dioxane (compounds)
Acetaldehyde	Ethylene glycol dimethyl ether (glyme)
Benzaldehyde	Diethylene glycol dimethyl ether (diglyme)
Cumene	Furan (compounds)
Cyclohexene	Methylacetylene
Decahydronapthalene	Methylcyclopentane
Diacetylene	Methyl isobutyl ketone (MIBK)
Diethyl Ether (Ethyl Ether)	Tetrahydrofuran
Class B Peroxide Forming Alcohols: Disposed 6 months after distilling/concentrating	
2-propanol	2-heptanol
2-butanol	2-hexanol
2-cyclohexen-1-ol	2-pentanol
1-phenylethanol	4-penten-1-ol
2-phenylethanol	
Class C Peroxide Formers: Disposed 6 months after opening	
Acrylic acid	Tetrafluoroethylene (Solid)
Acrylonitrile	Vinyl acetate
Butadiene (Solid)	Vinyl acetylene
Chloroprene (Solid)	Vinyl chloride
Chlorotrifluoroethylene	Vinyl pyridine
Methyl Methacrylate	Vinyladiene chloride
Styrene (monomer) (Liquid)	
Anomalous potential peroxide formers:	
Triton X-100: 2-year shelf life	Methyl tert-butyl ether (MTBE): 10-year shelf life
Not Peroxide formers:	
Hydrogen peroxide	Petroleum Ether

SOURCES:

Clark, Donald E. (2000). Peroxides and Peroxide Forming Compounds. Retrieved April 10th, 2022 from https://safety.fsu.edu/safety_manual/supporting_docs/Peroxides%20in%20depth%20discussion.pdf

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