VANDERBILT UNIVERSITY

Principal Investigator: Date Approved:

This document covers basic chemical safety protocols (CSP) for peroxide-forming particularly hazardous substances (PHS) and supplements the laboratory Chemical Hygiene Plan as appropriate. Additional lab-specific safety operating procedures for peroxide-forming PHSs may also be required. The use of any peroxide-forming PHSs is subject to pre-approval by the Principal Investigator (PI) and/or the designated Laboratory Responsible Safety Person. DO NOT USE ANY PEROXIDE-FORMING PHSs UNTIL YOU HAVE OBTAINED THE NECESSARY PRE-APPROVAL AND TRAINING.

Peroxide-forming Particularly Hazardous Substances

Peroxide-forming chemicals (PFCs) are flammable organic liquids which are capable of forming potentially explosive R-O-O-R' peroxide bonds (where R = organic group) upon exposure to air or oxidizing impurities. Peroxides formed in a chemical container are particularly likely to accumulate within the threads of the screw cap, and may explode when subjected to heat, light, friction or mechanical shock (e.g. unscrewing the cap). It is particularly dangerous to allow these materials to evaporate to dryness, such as during distillation, leaving the crystals of peroxide on the surfaces of the container.

Carcinogens, reproductive toxicants, and substances with a high degree of acute toxicity are considered particularly hazardous. This CSP covers particularly hazardous substances capable of forming organic peroxides (Peroxide-forming PHS).

Personal Protective Equipment

Lab Coat

Flame resistant lab coat

Gloves

Nitrile or chloroprene gloves typically provide adequate protection against minor splashes. Consult with your PI or supervisor to determine whether any materials involved in your process require alternative hand protection.

Eye Protection

ANSI Z87.1-compliant safety glasses or safety goggles if a splash hazard is present

Labeling & Storage

Peroxide-forming PHS should be stored in a flammable storage cabinet with self-closing hinges or in a refrigerator rated for flammable storage. Labels identifying the materials as Acute Toxicant, Reproductive Toxicant, and/or Carcinogen must appear on the bottles and secondary containers. Also, if not plainly visible (e.g. through a cabinet window), labelling must be applied to storage locations where these are stored. Containers greater than 1 gallon (4L) in size are not recommended but must be stored in a flammable storage cabinet if present. All Peroxide-forming PHS must be stored away from combustible materials and oxidizers.

Peroxide-forming PHS must be marked with receiving date and opening date and be disposed of within the recommended time frame based on the chemical's ability to form peroxides, or the expiration date as specified by the manufacturer if unopened.

Class A PFCs form explosive levels of peroxides without concentration. Store under inert gas if possible. Submit as waste or evaluate for peroxides within 3 months of opening.	• Vinylidene chloride	Carcinogen
Class B PFCs readily form explosive peroxides when they become concentrated (e.g., via evaporation or distillation). Stabilizers like hydroquinone and BHT inhibit peroxide formation. However, the concentration process defeats the action of most stabilizers. Store under inert gas if possible. Submit as waste or evaluate for peroxides within 6 - 12 months of opening	• Dicyclopentadiene • 1,4-Dioxane • Dimethoxyethane (glyme) • 4-Methyl-2-pentanone • Tetrahydrofuran • Tetrahydronaphthalene	Acute toxicant Carcinogen Reproductive Toxicant Carcinogen Carcinogen Carcinogen
Class C PFCs can auto polymerize upon peroxide concentration. These may explode when relatively small quantities of peroxides are formed. These items normally have an inhibitor added by the manufacturer to prevent peroxides from forming. This inhibitor can be removed if it interferes with the use of the chemical or the chemical is redistilled in the lab. If a procedure requires the use of an uninhibited item in this Class, please contact the Office of Environment, Health, Safety, and Sustainability (EHSS). ***Without inhibitor**: Submit as waste within 24 hours after synthesizing or opening.* ***With inhibitor**: Do not store under inert atmosphere (O2 is required for inhibitors to work). Submit as waste or evaluate for peroxides within 12 months of opening*	• Chlorobutadiene • Vinyl chloride • Styrene • Vinyl acetate	Carcinogen Carcinogen Carcinogen, Reproductive Tox Carcinogen

Engineering Controls, Equipment & Materials

Fume Hood

It is advisable to use a fume hood when working with these materials. If your protocol does not permit the handing of such materials in a fume hood, contact EHSS to determine whether additional respiratory protection is warranted.

Cautions & Considerations

Static Electricity

Large containers of PFCs are discouraged given the strict limits on prolonged storage. If required due to high demand, all large containers should always be grounded, and should be bonded to the receiving container during transfer. Always transfer flammable chemicals from glass containers to glassware or from glass container/glassware to plastic. Transferring these types of chemicals between plastic containers or unbonded metal containers may lead to a fire due to static discharge.

Housekeeping

Spills

Notify others in the area of the spill, including your PI/Responsible Safety Person. If it is a small spill that you can easily handle, use the contents of your lab spill kit to clean

	it up. If it is a large spill, then evacuate the area where the spill occurred. Call Vanderbilt University Public Safety (VUPS) at 615-421-1911 or use the Vandysafe app on your smart phone. Report any exposure through Risk and Insurance Management's Origami portal and mark that it occurred in research when prompted. Both VUPS and the Origami system will notify EHS of the incident. Remain on-site at a safe distance to provide detailed information to first responders.
Decontamination	Decontamination methods will vary based on the materials handled and equipment being used. Please review the chemical Safety Data Sheet for guidance on cleaning materials.
Waste	Note: Empty containers of PFC's can still pose a hazard. Containers should be triple-rinsed and the first rinse collected for disposal as hazardous waste. Refer to the laboratory *Chemical Hygiene Plan* (Section 6.7) for information on proper chemical waste disposal procedures.

First Aid & Emergencies

Skin or Eye Contact	Remove contaminated clothing and accessories; flush affected area with water. If symptoms persist, get medical attention.
Inhalation	Move person into fresh air. If symptoms persist, get medical attention.
Ingestion	Rinse mouth with water. If symptoms persist, get medical attention.

Name	Signature	Date