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Dartmouth College Guidelines for Safe Use of

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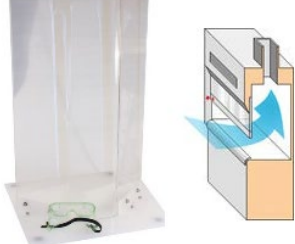

GHS!

# Organic Peroxide-Forming Materials

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Laboratories should create their own specific SOP's for the use of Organic Peroxide-Forming Materials

See classes & examples of common peroxide formers on page 3.

Hazards	Potential Hazards	<ul style="list-style-type: none"> <li>Some organic peroxide-forming materials can form <b>explosive peroxide crystals</b> during storage; these may be <b>sensitive to shock, friction, heat and/or light</b>. Other compounds in this class can form peroxides capable of initiating <b>violent polymerization reactions</b>.</li> <li>Many organic peroxide-forming materials are flammable.</li> <li>See Safety Data Sheet (SDS) for specific hazard information. Note that the ability to form peroxides is a hazard category that is NOT classified under GHS. Some SDSs may include the</li> <li>European hazard classification "May Form Organic Peroxides" under "hazards not otherwise classified" at the bottom of Section 2 of the SDS.</li> </ul>	
	Selection & Purchase	<ul style="list-style-type: none"> <li>If possible, use a chemical that does not form peroxides.</li> <li>If possible, purchase peroxide formers with an <b>inhibitor</b>.</li> <li>Purchase the <b>smallest practical containers</b>; plan to use <b>peroxide-formers</b> within safe timeframe. (See SDS and page 2 for more information.)</li> <li>Purchase peroxide test strips.</li> <li><i>Write date received &amp; date opened on the container.</i></li> </ul>	
Hazard Controls	Storage & Transport	<ul style="list-style-type: none"> <li>Store in a cool location away from heat &amp; light in sealed <b>airtight</b> containers with tight-fitting nonmetal lids.</li> <li>If in <b>class A or B</b> (or if indicated on the SDS), it is recommended to store under <b>nitrogen or argon</b>.</li> </ul>	
	Engineering Controls	<ul style="list-style-type: none"> <li>Use a <b>blast shield</b> if there is a possibility of <b>vigorous chemical reaction or explosion</b>.</li> <li>Use under a <b>fume hood</b> when an <b>inhalation hazard</b> is anticipated.</li> </ul>	
	Work Practice Controls	<ul style="list-style-type: none"> <li><b>Never</b> force open a rusted or stuck cap. <b>Never</b> open a dented container.</li> <li>Use the <b>smallest practical quantities</b> for the work being performed.</li> <li>Follow instructions on page 2 for <b>evaluating peroxide formers</b>.</li> <li><b>Do not distill</b> unless absence of peroxides has been shown.</li> <li><b>Do not allow</b> to evaporate to dry residue; <b>leave 10 – 20% residual</b> in container.</li> </ul>	
	Personal Protective Equipment (PPE)	<ul style="list-style-type: none"> <li>Dartmouth College has a <a href="#">Policy on PPE for Chemistry</a></li> <li>Wear closed-toed shoes and clothing covering the legs.</li> <li><b>Minimum PPE:</b> <ul style="list-style-type: none"> <li>Buttoned lab coat, safety glasses, and nitrile gloves</li> </ul> </li> <li><b>For risk of explosion or vigorous reaction:</b> <ul style="list-style-type: none"> <li>Chemical splash goggles and face shield</li> <li>Flame-resistant lab coat</li> <li>Heavy gloves (consider flame-resistant gloves)</li> </ul> </li> </ul> <p><i>Check the manufacturer's glove guide for glove effectiveness with the chemical you are using.</i></p> <ul style="list-style-type: none"> <li>Dartmouth College Stockrooms provide <a href="#">Purple Nitrile Gloves</a> which have a thickness of 0.09-0.15 mm from Cuff to Middle Finger.</li> </ul>	

<b>Other</b>	<b>Emergencies &amp; Spills</b>	<ul style="list-style-type: none"> <li>For fire or potential for a fire – Pull nearest fire alarm pull station, evacuate the building and go to a safe location to dial 911. (In Borwell, Rubin and Williamson, dial 5555)</li> <li>Serious injury or exposure to a hazardous material -- dial 911. <ul style="list-style-type: none"> <li>Find the nearest eyewash station or safety shower</li> <li>Flush the contaminated area with large volumes of water</li> <li>While flushing, remove any clothing which may have been contaminated (including shoes)</li> <li>If the injury is to the eyes, hold the eyes open to ensure irrigation under the eyelids (15 minutes minimum)</li> <li>Continue flushing until EMS arrives</li> </ul> </li> <li>Spill is beyond your ability to control contact EHS 603-646-1762 or after hours contact Dartmouth Safety and Security at 603-646-3333.</li> </ul>
	<b>Waste</b>	<p>Contact Dartmouth EHS by calling 603-646-1762 immediately to arrange for pick-up for the following:</p> <ul style="list-style-type: none"> <li>If crystals are found around the lid of the container. (Do NOT open the container!) OR</li> <li>If the container tests positive for peroxides.</li> </ul> <p>If after hours do not touch the container and notify your PI and other lab member then e-mailing Dartmouth EHS at <a href="mailto:ehs@dartmouth.edu">ehs@dartmouth.edu</a> for waste pick up the next day.</p> <ul style="list-style-type: none"> <li>Label any waste containers with the appropriate <a href="#">waste labels</a>.</li> <li>Store in secondary containers.</li> <li>For waste pick up and disposal contact Dartmouth EHS by e-mailing <a href="mailto:ehs@dartmouth.edu">ehs@dartmouth.edu</a></li> </ul>
	<b>Training</b>	Dartmouth College requires certain <a href="#">training</a> for employees. For this chemical Laboratory Safety/ Hazardous Waste Management is required. This training is mandatory for all personnel working in a teaching or research wet laboratory. It is an introductory program on laboratory safety and waste management in a biomedical, engineering, chemistry, earth science or physics lab at Dartmouth College. The course takes approximately 45 minutes to complete. Completion is required every three years.
	<b>Medical Surveillance</b>	
	<b>Monitoring Requirements</b>	
	<b>Questions</b>	Contact Dartmouth Environmental Health and Safety by e-mailing us a <a href="mailto:ehs@dartmouth.edu">ehs@dartmouth.edu</a> calling 603-646-1762 or visting our <a href="#">website</a> .

## Evaluating Peroxide Formers\*

<b>Initial Screening</b>	<ul style="list-style-type: none"> <li>Verify <b>identity</b> of chemical.</li> <li>Check that <b>date</b> last opened (or, if unopened, date received) is known and is <b>within the recommended safe storage period</b> per guidance below.</li> <li>Make sure that <b>evaporation</b> of the chemical is known or estimated to be <b>less than 10%</b>.</li> <li>Make sure container shows no <u>discoloration, liquid stratification, or crystallization around cap or in solution</u>.</li> </ul> <p><b>CAUTION: Never try to force open a rusted or stuck cap on a container of a peroxide-forming chemical. Do not open a dented container.</b> If any points above cannot be verified, the container should be considered unsafe and should not be disturbed. Promptly contact Dartmouth EHS by calling 603-646-1762 for assistance with safe disposal.</p>		
<b>Per</b>	Containers passing initial screening may be tested for peroxide content. We recommend using peroxide test		
	<b>Assessing Peroxide Levels:</b>		
	<table border="1" style="width: 100%;"> <tr> <td style="width: 50%; text-align: center;">&lt;25 ppm</td> <td style="width: 50%; text-align: center;">Considered Safe for general use.</td> </tr> </table>	<25 ppm	Considered Safe for general use.
<25 ppm	Considered Safe for general use.		

strips, available from a number of suppliers. Follow the instructions provided. For ease of tracking, testing should be conducted on a specific schedule (determined by the lab). Labs should maintain a record of testing with other safety-related information.	25-100 ppm	Not recommended for distilling or otherwise concentrating
	>100 ppm	Avoid handling. Contact Dartmouth EHS at 603-646-1762 or emailing <a href="mailto:ehs@dartmouth.edu">ehs@dartmouth.edu</a> for disposal

## Common Peroxide Forming Chemicals\*

*These lists are not all-inclusive.*

**Any UNOPENED bottles of peroxide-formers should be submitted as waste within 18 months of receipt or by the expiration date noted on the container, whichever comes first.**

<b>Class A</b>	<b>Chemicals that form explosive levels of peroxides without concentration</b> <i>Store under inert gas if possible. Submit as waste or evaluate for peroxides within 3 months of opening.</i>
	Butadiene (inhibited liquid monomer), Chlorobutadiene (Chloroprene) – inhibited liquid monomer, Diisopropyl Ether, Divinylacetylene, Potassium Amide, Potassium Metal, Sodium Amide (sodamide), Tetrafluoroethylene – inhibited liquid monomer, Vinylidene Chloride
<b>Class B</b>	<b>Chemicals that form explosive levels of peroxides upon concentration</b> <i>Store under inert gas if possible. Submit as waste or evaluate for peroxides within 6 - 12 months of opening.</i>
	Acetal, Acetaldehyde, Benzyl Alcohol, 2-Butanol, Cumene, Cyclohexanol, 2-Cyclohexen-1-ol, Cyclohexene, Decahydronaphthalene, Diacetylene, Dicyclopentadiene, Diethyl Ether, Diethylene glycol dimethyl ether (diglyme), Dioxanes, Ethylene glycol dimethyl ether (glyme), Furan, 4-Heptanol, 2-Hexanol, Methyl acetylene, 3-Methyl-1-butanol, Methyl isobutyl ketone, 4-Methyl-2-pentanol, 2-Pentanol, 4-Penten-1-ol, 1-Phenylethanol, 2-Phenylethanol, 2-Propanol (isopropanol, IPA), Tetrahydrofuran, Tetrahydronaphthalene, Vinyl Ethers, Other secondary alcohols
<b>Class C</b>	<b>Chemicals that may autopolymerize upon peroxide concentration</b> <i>Without inhibitor:</i> Submit as waste within 24 hours after synthesizing or opening. <i>With inhibitor:</i> Do not store under inert atmosphere (O <sub>2</sub> is required for inhibitors to work). Submit as waste or evaluate for peroxides within 12 months of opening.
	Acrylic Acid, Acrylonitrile, Butadiene, Chloroprene, Chlorotrifluoroethylene, Ethyl acrylate, Methyl methacrylate, Styrene, Tetrafluoroethylene, Vinyl Acetate, Vinyl Acetylene, Vinyl Chloride, Vinyl Pyridine, Vinylidene chloride

\*Sources: *Prudent Practices in the Laboratory*, NAP 2011; Kelly, ACS 1996; Kelly, LLNL 1999; Mason, JCHS 2014; Clark, JCHS 2001; Jackson, JChemEd 1970; Stanford EHS Info Sheet on Peroxides

**“I have read and understand this Guidelines. I agree to fully adhere to its requirements.”**

Last	First	Dartmouth ID	Signature


**Acknowledgement:** Special thanks for Duke's Occupational & Environmental Safety Office for their permission to use this great design for our chemical guidelines. All Dartmouth High Hazard Guidelines are based on [Duke OESO Chemical SOP's and Guidelines](#)