



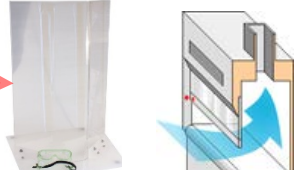

Not classified  
by GHS!

## Guidelines for Safe Use of

# Organic Peroxide-Forming Materials

Not classified  
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*See classes & examples of common peroxide formers on page 2.*

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 <b>flammable</b>. See <a href="#">Guidelines for Flammables</a>.</li><li>See <b>Safety Data Sheet (SDS)</b> for specific hazard information. <b>Note that the ability to form peroxides is a hazard category that is NOT classified under GHS</b>. Some SDSs may include the European hazard classification “May Form Organic Peroxides” under “hazards not otherwise classified” at the bottom of Section 2 of the SDS.</li><li>A <i>lab-specific SOP</i> is needed for <a href="#">particularly hazardous</a> Organic Peroxide-Forming materials.</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 <b>use peroxide-formers within safe timeframe</b>. (See SDS and page 2 for more information.)</li><li>Purchase <b>peroxide test strips</b>.</li><li><i>Write date received &amp; date opened on the container.</i></li></ul> 
Hazard Controls	Storage & Transportation	<ul style="list-style-type: none"><li>Store in a <b>cool</b> location <b>away from heat &amp; light</b> 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), 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 to evaporate</b> to dry residue; <b>leave 10 – 20% residual</b> in container.</li></ul>
	Personal Protective Equipment	<p><b>Minimum PPE:</b></p> <ul style="list-style-type: none"><li>Buttoned lab coat, safety glasses, and nitrile gloves</li></ul> <p><b>For risk of explosion or vigorous reaction:</b></p> <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>  <p><i>Check the manufacturer's glove guide for glove effectiveness with the chemical you are using.</i></p>
	Emergencies	See <b>Emergency Response Flip Chart</b> and/or lab specific chemical hygiene plan. Spills: 919-684-2444 (911 from campus phone) Exposures: 919-684-8115
Other	Waste	Contact <b>OESO Environmental Programs</b> at 919-684-2794 <b>immediately</b> to arrange for pick-up... <ul style="list-style-type: none"><li>If <b>crystals</b> are found around the lid of the container. (Do NOT open the container!) OR</li><li>If the container <b>tests positive</b> for peroxides.</li></ul> Submit prior to expiration date. Follow above storage guidelines for waste. See lab-specific chemical hygiene plan, <a href="#">Lab Chemical Waste Management Practice</a> , and <a href="#">Drain Disposal Practice</a> .
	Training	Sign signature page in lab-specific chemical hygiene plan to indicate review.
	Questions	Contact OESO Laboratory Safety at 919-684-8822.

## 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 <b>container</b> shows <b>no</b> discoloration, liquid stratification, or crystallization around cap or in solution.</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 call OESO Environmental Programs at 919-684-2794 for assistance with safe disposal.</p>		
	<b>Peroxide Test</b>	<p>Containers passing initial screening may be tested for peroxide content. We recommend using peroxide test strips, available from a number of suppliers. Follow the instructions provided.</p> <p>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.</p>	<b>Assessing Peroxide Levels:</b>
		< 25 ppm	Considered safe for general use.
		25 – 100 ppm	Not recommended for distilling or otherwise concentrating.
		> 100 ppm	Avoid handling. Contact OESO at 919-684-2794 for disposal.

## Common Peroxide Forming Chemicals\*

*These lists are not all-inclusive. See also [U Minnesota list of peroxide-forming chemicals with CAS and structures](#). 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>	<p><b>Chemicals that form explosive levels of peroxides without concentration</b></p> <p><i>Store under inert gas if possible. Submit as waste or evaluate for peroxides within 3 months of opening.</i></p>			
	Butadiene (inhibited liquid monomer)	Chlorobutadiene (Chloroprene) – inhibited liquid monomer Diisopropyl Ether	Divinyl acetylene Potassium Amide Potassium Metal Sodium Amide (sodamide)	Tetrafluoroethylene – inhibited liquid monomer Vinylidene Chloride
<b>Class B</b>	<p><b>Chemicals that form explosive levels of peroxides upon concentration</b></p> <p><i>Store under inert gas if possible. Submit as waste or evaluate for peroxides within 6 - 12 months of opening.</i></p>			
	Acetal	Decahydronaphthalene	Furan	1-Phenylethanol
	Acetaldehyde	Diacetylene	4-Heptanol	2-Phenylethanol
	Benzyl Alcohol	Dicyclopentadiene	2-Hexanol	<b>2-Propanol (isopropanol, IPA)</b>
	2-Butanol	<b>Diethyl Ether</b>	Methyl acetylene	<b>Tetrahydrofuran</b>
	Cumene	Diethylene glycol dimethyl ether (diglyme)	3-Methyl-1-butanol	Tetrahydronaphthalene
	Cyclohexanol	Dioxanes	Methyl isobutyl ketone	Vinyl Ethers
	2-Cylcohexen-1-ol	Ethylene glycol dimethyl ether (glyme)	4-Methyl-2-pentanol	Other secondary alcohols
	Cyclohexene		2-Pentanol	
		4-Penten-1-ol		
<b>Class C</b>	<p><b>Chemicals that may autopolymerize upon peroxide concentration</b></p> <p><i>Without inhibitor: Submit as waste within 24 hours after synthesizing or opening.</i></p> <p><i>With inhibitor: 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.</i></p>			
	Acrylic Acid	Chlorotrifluoroethylene	Tetrafluoroethylene	Vinyl Pyridine
	Acrylonitrile	Ethyl acrylate	Vinyl Acetate	Vinylidene chloride
	Butadiene	Methyl methacrylate	Vinyl Acetylene	
	Chloroprene	Styrene	Vinyl 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

2/24/2017; updated 9/4/2019. Online with links at [www.safety.duke.edu/laboratory-safety/chemical-hygiene/chemical-sops](http://www.safety.duke.edu/laboratory-safety/chemical-hygiene/chemical-sops)