




**DANGER**

# Pyrophoric Liquids & Solids

**DANGER**GHS Hazard Classification: **H250**GHS Hazard Classification: **H250**Pyrophorics are chemicals that, even small quantities, are **liable to ignite with 5 minutes** after coming into **contact with air**.

Laboratories should create their own specific SOP's for the use of Pyrophorics

**Examples:** Grignard reagents (**RMgX**), metal alkyls & aryls (**RLi, RNa, R<sub>3</sub>Al, R<sub>2</sub>Zn**), metal carbonyls (**Ni(CO)<sub>4</sub>, Fe(CO)<sub>5</sub>, Co<sub>2</sub>(CO)<sub>8</sub>**), alkali metals (**Na, K**), metal powders (**Al, Ca, Co, Fe, Mg, Mn, Pd, Pt, Ti, Sn, Zn, Zr**), metal hydrides (**NaH, LiAlH<sub>4</sub>**), nonmetal hydrides (**B<sub>2</sub>H<sub>6</sub> and other boranes, PH<sub>3</sub>, AsH<sub>3</sub>, SiH<sub>4</sub>**), nonmetal alkyls (**R<sub>3</sub>B, R<sub>3</sub>P, R<sub>3</sub>As**) and Phosphorus (white)

<b>Hazards</b>	<b>Potential Hazards</b>	<p><i>Check the Safety Data Sheet (SDS) to see if the material presents other hazards, such as corrosivity, teratogenicity, water reactivity, peroxide formation, or systemic effects.</i></p> <p><i>If other hazards are present, appropriate safety precautions should be addressed in the individual lab's SOP for each unique pyrophoric material.</i></p> <ul style="list-style-type: none"> <li><b>Primary hazard</b> is that they are pyrophoric: <b>will ignite spontaneously in air or oxygen</b> due to being <b>extremely</b> reactive toward oxygen and in most cases, <b>water</b>, and must never be exposed to the <b>atmosphere</b></li> <li><b>Possible</b> secondary hazards: Some are toxic, and many come dissolved or immersed in a flammable solvent.</li> <li><b>Other common</b> hazards include corrosivity, teratogenicity, water reactivity, or peroxide formation, and may damage to the liver, kidneys, and central nervous system.</li> </ul>	
	<b>Selection &amp; Purchase</b>	<ul style="list-style-type: none"> <li><b>Before</b> purchasing pyrophoric materials, consult with Dartmouth EHS by e-mailing <a href="mailto:ehs@dartmouth.edu">ehs@dartmouth.edu</a> or calling 603-646-1762 to select a compatible fire extinguisher. <ul style="list-style-type: none"> <li>The extinguisher must be on hand before any work with the pyrophoric material takes place (and preferably before the material is ordered).</li> </ul> </li> <li>Purchase <b>minimal</b> amounts of pyrophoric materials.</li> <li><b>Take note</b> of any printed <b>expiration dates</b> on the container label and dispose of them as required.</li> <li>Many pyrophoric reagents <b>become unstable</b> or more dangerous with <b>age</b>.</li> <li>Set up a <b>designated area</b> for work with pyrophoric materials – a chemical fume hood and/or a (dry) glove box (with inert atmosphere, if needed) <b>located within 10 seconds</b> of an eyewash/drench hose, safety shower, and an appropriate fire extinguisher, as determined in consultation with Fire Safety.</li> <li>Incompatible materials should be <b>removed</b> from the area (e.g. flammable solvents, acids, gas cylinders, oxidizers)</li> <li>A <b>container of sand</b> should be kept within arm's reach (for covering spills).</li> </ul>	
<b>Hazard Controls-1</b>	<b>Storage &amp; Transport</b>	<ul style="list-style-type: none"> <li>Store and use pyrophoric chemicals under an <b>inert atmosphere</b> as appropriate (e.g. nitrogen, argon)</li> <li>Store in secondary containers, away from flammables and oxidizers. (You may be able to reuse the secondary container provided by the manufacturer.)</li> <li>Avoid areas with heat, flames, and water.</li> <li><b>Some</b> of these materials may need to be kept <b>below threshold temperatures</b>.</li> </ul>	
	<b>Engineering Controls &amp; Safety Equipment</b>	<ul style="list-style-type: none"> <li>Liquid pyrophorics should be <b>stored in sealed containers with PTFE-lined septa</b> to prevent air exposure and manipulated via syringe or cannula in a chemical fume hood (over a spill tray if possible) with the sash as low as possible.</li> <li>Solid pyrophorics must be <b>handled only in an inert atmosphere</b>, glove box or glove bag.</li> <li>Mineral oil bubblers should be used to release pressure from reagent or reaction vessels.</li> <li>Use a blast shield if available.</li> </ul>	  

<b>Hazard Controls-2</b>	<b>Work Practice Controls</b>	<ul style="list-style-type: none"> <li>• Before working with these compounds, read the SDS and other reference material carefully; good examples are: <a href="#">UCSD training videos</a>, <a href="#">Lab Safety Workplace – Handling Pyrophoric Materials training course</a>, Sigma Aldrich Technical Bulletins <a href="#">AL-164</a> (Handling Pyrophoric Reagents) and <a href="#">AL-134</a> (Handling Air-Sensitive Reagents). Other <a href="#">Aldrich Technical Bulletins</a> describe specific laboratory equipment designed for use with air- and moisture-sensitive reagents.), <i>Prudent Practices in the Laboratory</i> (National Academies Press) Sections <a href="#">4.D</a> and <a href="#">6.G</a> and Laboratory Chemical Safety Summaries for, <a href="#">Butyllithiums</a>, <a href="#">Sodium (reactive metal)</a>, and <a href="#">Lithium aluminum hydride</a>.</li> <li>• Employees should be aware of the <b>location of all emergency equipment</b> and should know how to use it if needed.</li> <li>• Store and use pyrophoric chemicals under an <b>inert atmosphere</b>.</li> <li>• Know the <b>location</b> of the <b>nearest compatible fire extinguisher</b> and how to use it.</li> <li>• <b>See</b> the above-referenced Aldrich technical bulletins for recommendations on <b>safe transfer</b> of liquid pyrophorics.</li> <li>• Before conducting the actual procedure, always perform a dry run (without the pyrophoric material) to identify and resolve possible safety hazards.</li> <li>• <b>Work within sight and/or hearing</b> of at least one <b>other person</b> who is familiar with the hazards and written procedures.</li> </ul>
	<b>Personal Protective Equipment (PPE)</b>	<ul style="list-style-type: none"> <li>• Dartmouth College has a <a href="#">Policy on PPE for Chemistry</a></li> <li>• <b>Note</b> that personal clothing should not be of a type that may ignite (<b>NO polyester or nylon</b>).</li> <li>• Wear closed-toed shoes and clothing covering the legs.</li> <li>• Wear a fully buttoned, <b>flame-resistant lab coat</b> (Nomex material or equivalent) with sleeves extended to the wrist</li> <li>• Safety glass (recommended) safety goggles and</li> <li>• Nitrile laboratory gloves. Leather or Kevlar gloves are recommended beneath nitrile gloves (for fire protection).</li> <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> <li>• If large quantities will be used, a chemical-resistant apron is also required.</li> </ul>
<b>Other-1</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>	<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> <li>• <b>Empty or almost empty</b> pyrophoric bottles should be considered waste. <b>Quenching</b> these bottles are <b>not required</b> at Dartmouth. DO NOT left these bottles accumulate in the laboratory.</li> </ul>

<b>Other-2</b>	<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. For these chemicals <b>Handling Pyrophoric Chemicals</b> training is required.
	<b>Medical Surveillance</b>	
	<b>Monitoring Reuriements</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 vising our <a href="#">website</a> .

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

<b>Last</b>	<b>First</b>	<b>Dartmouth ID</b>	<b>Signature</b>

**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](#)