



Environmental Health &amp; Safety

Owner <b>C.H.O</b>	DOC. NO. SOP	REV. 2	DATE <b>12/9/2019</b>
DOC. TITLE <b>SOP FOR PEROXIDE FORMING CHEMICALS</b>			

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## STANDARD OPERATING PROCEDURES (SOP) FOR WORKING WITH PEROXIDE FORMING CHEMICALS AT AMHERST COLLEGE

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### General Information

Peroxide Forming Chemicals are a group of compounds that have the ability to form peroxides overtime. They have the ability to form shock sensitive and explosive peroxide crystals. The crystals are usually formed in the headspace of the container, around the cap, after the chemical has been opened and exposed to air; however, they may form anywhere inside the container. These peroxides can explode upon being subjected to shock or friction, leading to serious injury or even death.

Common examples of Peroxide Forming Chemicals used in Amherst College Laboratories include: ethers, benzaldehyde, benzyl alcohol, vinyl chloride, tetrahydrofuran, and common secondary alcohols such as 2-butanol, 2-pentanol, and 2-propanol.

Peroxide Forming Chemicals may also be characterized by other hazards, hence, users of these chemicals may also need to refer to other SOP's.

Note that since this SOP covers Peroxide Forming Chemicals, as a whole, each individual chemical's Safety Data Sheet must be reviewed before use.

See the "Appendix" page below for a full list of Peroxide Forming Chemicals.

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### Personal Protective Equipment

When working with Peroxide Forming Chemicals, the following personal protective equipment (PPE) **must** be worn, at a minimum. Depending on the specific chemical, other forms of protection might be required. Consult the SDS for each chemical before use:

Splash goggles

Lab coat

Long pants

Close toed shoes

Gloves – The type of gloves required depends on the specific chemical (consult the SDS)

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Environmental Health & Safety

### Safety Devices

Fume hood – always work with Peroxide Forming Chemicals in a fume hood, except for those that require the use of a glove box

Identify the location of all the safety devices in the room before starting your procedure. Also, familiarize yourself with all the possible means of egress.

### Specific Health Hazards

The Permissible Exposure Limits (PEL) for Peroxide Forming Chemicals are specific to each individual chemical. Review the SDS before using each chemical.



Pictogram:

All Peroxide Forming Chemicals are flammable. However, some of these chemicals might also be characterized by additional hazards.

Consult the SDS for more information about a specific chemical

### Possible Routes of Entry

Inhalation, eye/skin contact, ingestion

**If *any part of your body* comes in contact with Peroxide Forming Chemicals, call the Amherst College Emergency phone number 413-542-2111. Also call this number if you begin to feel ill after working with or in the vicinity of Peroxide Forming Chemicals**

#### *Inhalation*

If inhaled, move to fresh air, and get help. if you begin to feel ill during / after working with Peroxide Forming Chemicals, Call the Amherst College Police Department (ACDP) at x2111 to report it

#### *Eye contact*

Use eyewash to flush eyes with water for at least 15 minutes

#### *Skin Contact*

Wash skin with plenty of water for 15 minutes. Use safety shower, if needed.



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Environmental Health & Safety

### *Ingestion*

Do not induce vomiting

### **Storage and Special Handling**

Store Peroxide Forming Chemicals in a tightly closed container, in a vented flammable cabinet

Store away from oxidizers, heat sources, open flames, strong acids, strong bases

Do not store on shelf

Storage of Diethyl Ether in the refrigerator is not recommended

Label new containers with the Date Received, Date Opened, Date Last Tested

If you have Peroxide Forming Chemicals that have expired or that you no longer need, please contact Jason Williams (x2736) for disposal

### *Special Handling*

Do not open/handle if:

Crystals are present around cap; there is a precipitate in the bottle; there is an oily layer in the bottle

Test Peroxide Forming Chemicals for peroxides before concentration, distillation, or purification

Never distill Peroxide Forming Chemicals to dryness

Test for peroxides in opened containers every 3 months while unopened containers shall be tested once per year

### **Spill clean up**

Do not attempt to clean up any chemical unless you are comfortable doing so.

If a spill of less than 100ml of a Peroxide Forming Chemical occurs, consult the SDS for clean-up methods

Wear all personal protective equipment, mentioned in the "Personal Protective Equipment" section of this SOP, while cleaning up the spill.

Call Jason Williams (Chemical Hygiene Officer) or The Amherst College emergency number (x2111) to report it.



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Environmental Health & Safety

If the spill is more than 100ml:

Alert everyone in the area

Leave the room and close the door behind you

Call Jason Williams (Chemical Hygiene Officer) or The Amherst College emergency number (x2111) to report it

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### Disposal

Disposable pipets, pipet tips, and any other disposable devices that come into contact with Peroxide Forming Chemicals may be disposed of in the regular trash, provided that they are dry and not grossly contaminated

Waste containing Peroxide Forming Chemicals shall only be mixed with other compatible waste (see "storage" section above). If unsure, dispose of waste containing these compounds by themselves.

Half-full containers of waste containing Peroxide Forming Chemicals shall only be kept in the Satellite Accumulation Area for 3 months (full containers are still subject to the 3-day rule)

If you have Peroxide Forming Chemicals that you no longer need, contact the Chemical Hygiene officer

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### Questions

Contact Jason Williams or Environmental Health and Safety if you have any questions about this SOP or this compound.

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**APPENDIX**

<b>List of Peroxide Forming Chemicals</b>		
<b>Class A – Severe Peroxide Hazard</b>		
Butadiene	Isopropyl Ether	Sodium Amide
Chloroprene	Potassium Amide	Tetrafluorotethylene
Divinyl Ether	Potassium metal	Vinylidene chloride
<b>Class B – Concentration Hazard</b>		
1-phenylethanol	Acetaldehyde	Diethyl ether
2-butanol	All secondary alcohols	dioxanes
2-cyclohexen-1-ol	Benzyl alcohol	Furan
2-hexanol	Cumene	Methyl cyclopentane
2-pentanol	Cyclohexanol	Methyl isobutyl ketone
2-phenylethanol	cyclohexene	tetrahydrofuran
3-methyl-1-butanol	Decalin	Tetrahydronaphthalene
4-heptanol	Diacetylene	Vinyl ethers
4-methyl-2-pentanol	Dicyclopentadiene	
<b>Class C – Potential Peroxide Forming Chemicals</b>		
Acrolein	p-Chlorophenetole	4,5-Hexadien-2-yn-1-ol
Allyl ether	Cyclooctene	n-Hexyl ether
Allyl ethyl ether	Cyclopropyl methyl ether	o,p-Iodophenetole
Allyl phenyl ether	Diallyl ether	Isoamyl benzyl ether
p-(n-Amyloxy)benzoyl chloride	p-Di-n-butoxybenzene	Isoamyl ether
n-Amyl ether	1,2-Dibenzoyloxyethane	Isobutyl vinyl ether
Benzyl n-butyl ether	p-Dibenzoyloxybenzene	Isophorone
Benzyl ether	1,2-Dichloroethyl ethyl ether	b-Isopropoxypropionitrile
Benzyl ethyl ether	2,4-Dichlorophenetole	Isopropyl-2,4,5-trichlorophenoxy acetate
Benzyl methyl ether	Diethoxymethane	n-Methylphenetole
Benzyl-1-naphthyl ether	2,2-Diethoxypropane	2-Methyltetrahydrofuran
1,2-Bis(2-chloroethoxy)ethane	Diethyl ethoxymethylenemalonate	3-Methoxy-1-butyl acetate
Bis(2-ethoxyethyl)ether	Diethyl fumarate	2-Methoxyethanol
Bis(2-(methoxyethoxy)ethyl) ether	Diethyl acetal	2-Methoxyethyl acetate
Bis(2-chloroethyl) ether	Diethylketene	3-Methoxybutyl acetate
Bis(2-ethoxyethyl) adipate	Diethoxybenzene (m-,o-,p-)	2-Methoxyethyl vinyl ether



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Environmental Health &amp; Safety

Bis(2-methoxyethyl) carbonate	1,2-Diethoxyethane	Methoxy-1,3,5,7-cyclooctatetraene
Bis(2-methoxyethyl) ether	Dimethoxymethane	b-Methoxypropionitrile
Bis(2-methoxyethyl) phthalate	1,1-Dimethoxyethane	m-Nitrophenetole
Bis(2-methoxymethyl) adipate	Di(1-propynyl) ether	1-Octene
Bis(2-n-butoxyethyl) phthalate	Di(2-propynyl) ether	Oxybis(2-ethyl acetate)
Bis(2-phenoxyethyl) ether	Di-n-propoxymethane	Oxybis(2-ethyl benzoate)
Bis(4-chlorobutyl) ether	1,2-Epoxy-3-isopropoxypropane	b,b-Oxydipropionitrile
Bis(chloromethyl) ether	1,2-Epoxy-3-phenoxypropane	1-Pentene
2-Bromomethyl ethyl ether	p-Ethoxyacetophenone	Phenoxyacetyl chloride
beta-Bromophenetole	1-(2-Ethoxyethoxy)ethyl acetate	a-Phenoxypropionyl chloride
o-Bromophenetole	2-Ethoxyethyl acetate	Phenyl-o-propyl ether
p-Bromophenetole	(2-Ethoxyethyl)-a-benzoyl benzoate	p-Phenylphenetone
3-Bromopropyl phenyl ether	1-Ethoxynaphthalene	n-Propyl ether
tert-Butyl methyl ether	o,p-Ethoxyphenyl isocyanate	n-Propyl isopropyl ether
n-Butyl phenyl ether	1-Ethoxy-2-propyne	Sodium 8-11-14-eicosatetraenoate
n-Butyl vinyl ether	3-Ethoxypropionitrile	Sodium ethoxyacetylde
Chloroacetaldehyde diethylacetal	2-Ethylacrylaldehyde oxime	Tetrahydropyran
2-Chlorobutadiene	2-Ethylbutanol	Triethylene glycol diacetate
1-(2-Chloroethoxy)-2-phenoxyethane	Ethyl-b-ethoxypropionate	Triethylene glycol dipropionate
Chloroethylene	Ethylene glycol monomethyl ether	1,3,3-Trimethoxypropene
Chloromethyl methyl ether	2-Ethylhexanal	1,1,2,3-Tetrachloro-1,3-butadiene
beta-Chlorophenetole	Ethyl vinyl ether	4-Vinyl cyclohexene
o-Chlorophenol	2,5-Hexadiyn-1-ol	Vinylene carbonate
3-Bromopropyl phenyl ether	1-Ethoxynaphthalene	n-Propyl ether
tert-Butyl methyl ether	o,p-Ethoxyphenyl isocyanate	n-Propyl isopropyl ether
n-Butyl phenyl ether	1-Ethoxy-2-propyne	Sodium 8-11-14-eicosatetraenoate
n-Butyl vinyl ether	3-Ethoxypropionitrile	Sodium ethoxyacetylde
Chloroacetaldehyde diethylacetal	2-Ethylacrylaldehyde oxime	Tetrahydropyran

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