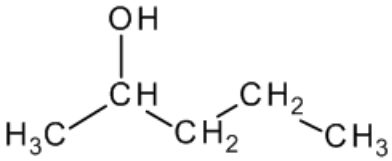

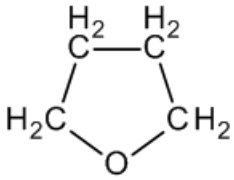

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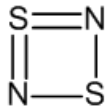
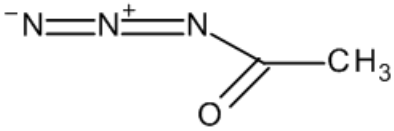
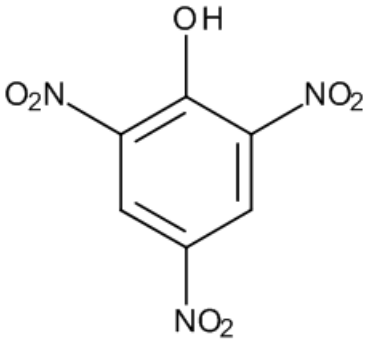
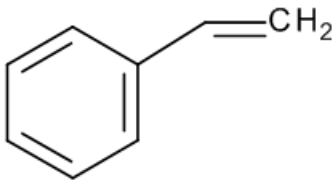
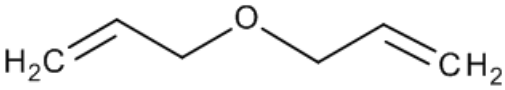


Inventory Control, Safe Storage, Disposal and Handling of Explosive and Potentially Explosive Chemicals









Lakehead UNIVERSITY

Table of Contents

1. Introduction

Explosive chemicals can release tremendous amounts of destructive energy rapidly. If not handled properly, these chemicals can pose a serious threat to the health and safety of laboratory personnel, emergency responders, building occupants, chemical waste handlers, and disposal companies. For example, an explosion of old isopropyl ether killed a laboratory worker when he attempted to remove a glass stopper from the container[1]. In another instance, tetrazole exploded inside a hazardous waste incinerator, causing major damage and costly repairs[2].

There are two classes of explosive chemicals. The first is known explosive chemicals that are designed and produced for use as an explosive (e.g. TNT, explosive bolts, bullets, blasting caps, and fireworks). The other class is potentially explosive chemicals (PECs), which include peroxidizable organic chemicals. Most chemicals that are used in research and teaching laboratories are stable and non-explosive at the time of purchase. Over time, some chemicals can oxidize, become contaminated, dry out, or otherwise destabilize to become PECs (e.g. isopropyl ether, sodium amide, and picric acid). See Appendix I and II for examples of each.

Unlike known explosives, which are designed to be stable under normal conditions, PECs are particularly dangerous because they may explode if they are subjected to heat, light, friction, or mechanical shock. To handle and dispose of PECs properly, Lakehead University employs and works with a hazardous waste contractor to transport these to an off campus site, where they are dealt with appropriately, usually for a substantial fee.

Note: There is a great deal of uncertainty regarding the hazards and safe handling of PECs. For example, with peroxide forming chemicals, there are no definite data available about the concentration and specific conditions at which these peroxides will detonate. This policy outlines standard best practices to handle and store these types of chemicals.

2. Common Laboratory PECs

There are many PECs used in academic research and teaching laboratories (see Appendices). The following are some commonly used chemicals that can become an explosion hazard under certain conditions:

- Organic chemicals that form peroxides through exposure to air or light
- Hydrated picric acid that becomes dry or becomes contaminated with metals that form metal picrate salts
- Sodium amide that reacts with air or moisture to form superoxides, as evidenced by yellow or brown discolouration
- Certain alkyl nitrates (e.g. butyl nitrate or propyl nitrate) that become contaminated with nitrogen oxides
- Certain normally stable perchlorates (e.g. pyridium perchlorate or tetraethylammonium perchlorate) that become unstable at elevated temperatures

There is an additional group of chemicals that should be considered although they are not necessarily heat-, light-, friction-, or shock-sensitive. These chemicals give off gaseous degradation by-products that may cause over-pressurization of the container and explode. They can degrade over time and should be incorporated into a safety and handling system that will prevent them from becoming explosion hazards (see Appendix III).

Contact Lab Safety Officer immediately if you suspect a material is a PEC. Post warning signs so others do not handle or disturb the material. Lab Safety Officer will inspect the chemical and coordinate a plan for the safe disposal of the chemical.

3. General Storage Precautions

It is important that chemical users track and dispose of chemicals before they become a problem. Proper inventory management systems can help mitigate risk to personnel and avert higher than normal disposal costs.

- Using Lakehead University's current chemical inventory software, eRPortal, you must keep your laboratory inventory up-to-date.
- Generate a list identifying all explosive and potentially explosive chemicals in your inventory.
- Use the expiry date field to track expiry dates for chemicals with defined shelf-lives.
- Refer to Lakehead University's Chemical Storage Procedure for the proper storage of chemicals in your laboratory. In addition, keep explosive chemicals away from all ignition sources such as open flames, hot surfaces, spark sources, and direct sunlight.
- When planning any new purchases of explosive or potentially explosive chemicals that fall into the families listed in Appendix I, you are required to notify the Lab Safety. Along with this notification, include a description of the proposed storage location, and the assessment plan to regularly determine the condition of the chemical.
- Record the received date, the opening date, and the last date tested or opened on the label of chemicals that may degrade to become potentially explosive. Labels are available from Chemistry Stores to facilitate this.
- All PECs must be visually inspected annually by the lab supervisor or a qualified designate. This inspection is to assess the age and condition of the chemicals, including but not limited to the condition of the container, crystallization (either around the cap or in the liquid), discolouration, precipitation, stratification, surface crust on solids or other irregularities.
- As part of your Laboratory Safety Protocol, make sure everyone who uses chemicals that are explosive or could become potentially explosive are thoroughly trained in the safe storage methods, conditions to avoid (e.g. contamination), the hazards of the chemical, and disposal procedures.

4. Specific Storage and Testing Guidelines for Peroxide Forming Chemicals

4.1 About Peroxide Forming Chemicals

Many oxygenated organic compounds become more and more dangerous upon prolonged storage because they tend to form explosive peroxides with age. Organic peroxides are carbon-based chemicals that contain the characteristic peroxide O-O bond. Peroxides may form in freshly distilled, undistilled, and unstabilized ethers within less than two weeks. Exposure to light and air enhances the formation of the peroxides. Many ethers tend to absorb and react with oxygen from the air to form unstable peroxides which may detonate with extreme violence when they become concentrated by evaporation or distillation. These ethers may also explode when combined with other compounds that produce a detonable mixture or when disturbed by heat, shock, or friction.

Peroxides formed in compounds by auto-oxidation have caused many accidents, including the unexpected explosions of the residue of solvents after distillation. While ethers present one of the most commonly known peroxidizable compound risks, other common solvents such as isopropanol have exploded upon distillation due to peroxide concentration.

While the peroxide formation potential in ethers is the primary hazard, ethers also pose inhalation hazards. Lower molecular weight ethers are powerful narcotics that can cause death in large doses.

With all peroxide forming chemicals, it is preferable to use small containers that can be completely emptied, rather than take small amounts from a large container over time. Ethers should be stored in amber bottles or other opaque containers under a blanket of inert gas, such as nitrogen or argon, or over a reducing agent to inhibit formation of peroxides.

4.2 Storage of Peroxide Forming Chemicals

- When purchasing peroxide forming chemicals, buy the smallest container size available for your needs.
- Peroxide forming chemicals must be stored away from heat and light, in addition to being protected from physical damage. They should be stored in sealed amber bottles with tight-fitting lids.
- To minimize peroxide formation under the cap, carefully clean the neck, cap and threads of the container after use.
- Peroxide forming chemicals should not be stored below the temperature at which the peroxide freezes or precipitates. The result is compounds that are extremely shock sensitive. It is also important to note that refrigeration does not prevent or inhibit peroxide formation.
- Class A peroxide forming chemicals (see Appendix II) more than two years old, and Class B, C & D peroxide forming chemicals (see Appendix II) more than ten years old must be

tested for peroxide content using peroxide test strips arranged through Lab Safety Officer. Those containing >100ppm peroxide concentration must be disposed of in accordance with University protocol.

- Never force open a stuck cap on a container of peroxide forming chemicals.
- When attempting to test a peroxide forming chemical for peroxides, only open containers in which the identity of the compound is known, the age is known, and evaporation is deemed to be less than 10%. For all others, contact Lab Safety Officer for immediate assistance.

4.3 Hazardous Waste Disposal

To dispose of waste chemicals, follow these instructions.

- Generate a chemical Waste Pickup Request in eRPortal.
- Label each container with the Waste Pickup Request number and the name or description of the waste.
- Print off a copy of the Waste Pickup Request.

Appendix I: Explosive and Potentially Explosive Chemical Families

Note: This list is not all inclusive.

Family	Examples	CAS
Acetylene or acetylide compounds		
	N-chloro-3-aminopropyne	103698-31-3
	propiolic acid	471-25-0
	propynethiol	27846-30-6
Acyl azides		
	acetyl azide	24156-53-4
	cyanodiazoacetyl azide	115057-40-4
	phenylphosphoric azide chloride	
Acyl hypohalites		
	acetyl hypobromite	4254-22-2
	hexafluoroglutaryl dihypochlorite	71359-64-3
Alkyl nitrates		
	ethylidene dinitrate	55044-04-7
	glyceryl trinitrate	55-63-0
	propyl nitrate	627-13-4
Alkyl perchlorates		
	hexyl perchlorate	52936-24-0
	ethyl perchlorate	22750-93-2

	1-chloro-2-propenyl perchlorate	58426-27-0
Allyl trifluoromethansulphonates		
	2-chloro-2-propenyl trifluoromethanesulphonate	62861-56-7
Amminemetal oxosalts		
	ammonium hexanitrocobaltate	14652-46-1
	bis(1,2-diaminoethane) diaquacobalt (III) perchorlate	55870-36-5
	trihydrazine nickel (II) nitrate	
Aromatic nitrates		
	picric acid	88-89-1
	trinitrobenzene	99-35-4
	picryl sulphonic azide	2508-19-2
Azides		
	sodium azide	26628-22-8
	lead azide	13424-46-9
	hydrogen azide	7782-79-8
Aziridines		
	1-bromoaziridine	19816-89-8
Azocarbaboranes		
	1,1'-azo-1,2-dicarbadecaborane	
N-azolium nitroimidates		
	benzimidazolium 1-nitroimidate	52096-22-7
	4-nitroamino-1,2,4-triazole	52096-16-9
	2-(N-nitroamino)pyridine N-oxide	85060-25-9
Diazo compounds		
	2-buten-1-yl diazoacetate	14746-03-3
	diethyl diazomalonate	5256-74-6
	dinitrodiazomethane	25240-93-1
Diazonium carboxylates, perchlorates, salts, sulfates, tetrahaloborates and triiodates		
	benzenediazonium-2-carboxylate	17333-86-7
	4-aminobenzenediazonium perchlorate	
	6-chloro-2,4-dinitrobenzenediazonium sulphate	65036-47-7

	2-nitrobenzenediazonium tetrachloroborate	
	4-toluenediazonium triiodate	68596-94-1
Difluoroaminoalkanols		
	1,1-difluorourea	1510-31-2
	perfluoro-N-cyanodiaminomethane	16408-94-9
Fluoro - nitro compounds		
	1-fluoro-1,1-dinitrobutane	19273-47-3
	fluorodinitromethyl azide	17003-82-6
Fulminating metals		
	lead fulminate	
	gold fulminate	
	silver fulminate	5610-59-3
Furazan N-oxides		
	dicyanofurazan N-oxide	55644-07-0
	4-oximino-4,5,6,7-tetrahydrobenzofurazan N-oxide	
Hydroxooxodiperoxochromate salts		
	1-ammonium hydroxooxodiperoxochromate	
	potassium hydroxooxodiperoxochromate	
Iodine compounds		
	calcium 2-iodylbenzoate	59643-77-5
	iodobenzene	591-50-4
	2-iodylvinyl chloride	
Isoxazoles		
	3-aminoisoxazole	1750-42-1
	3,5-dimethylisoxazole	300-87-8
Metal azide halides		
	chromyl azide chloride	14259-67-7
	molybdenum diazide tetrachloride	14259-66-6
	tungsten azide pentachloride	88495-99-2
Metal azides		
	aluminum azide	39108-14-0
	bis(cyclopentadienyl)tungsten diazide oxide	53504-80-6
	mercury (I & II) azide	14215-33-9/38232-63-2
	sodium azide	26628-22-8

N-metal derivatives		
	cadmium nitride	12380-95-9
	dibutylthallium isocyanate	74637-34-6
	sodium amide	7882-92-5
Metal fulminates		
	mercury (II) fulminate	628-86-4
	sodium fulminate	15736-98-8
	tripropyllead fulminate	43135-83-7
Metal halogenates		
	lead bromate	34018-28-5
Metal hydrides		
	stibine (antimony hydride)	7803-52-3
Metal nitrophenoxides		
	lithium 4-nitrothiophenoxide	75350-94-4
	potassium 4-nitrophenoxide	1124-31-8
Metal oxides		
	bis(1-chloroethylthallium chloride) oxide	
	magnesium chloride trioxide	
Metal oxohalogenates		
	ammonium iodate	13446-09-8
	lead acetate - lead bromate	
Metal oxometallates		
	bis (benzene) chromium dichromate	
Metal perchlorates		
	chromyl perchlorate	62597-99-3
Metal peroxides		
	Many transition metal peroxides are dangerously explosive.	
Metal peroxomolybdates		
	2-potassium tetraperoxomolybdate	56094-15-6
	2-sodium tetraperoxomolybdate	42489-15-6
Metal picramates		
	palladium picramate	
	uranyl picramate	
Nitroaryl compounds		
	N-chloro-4-nitroaniline	59483-61-3
Nitrogenous base nitrite salts		
	methylammonium nitrite	68897-47-2

aci-Nitroquinonoid compounds		
	sodium 1,4-bis(aci-nitro)-2,5-cyclohexadienide	
aci-Nitro salts		
	ammonium aci-nitromethanide	
	dipotassium aci-dinitromethanide	
	thallium acid-phenylnitromethanide	53847-48-6
Nitroso compounds		
	dinitrosylnickel	
	ethyl N-methyl-N-nitrosocarbamate	615-53-2
	potassium nitrosodisulphate	14293-70-0
N-S compounds		
	disulphur dinitride	25474-92-4
	potassium sulphurdiimidate	79796-14-8
	tetrasulphur tetranitride	28950-34-7
	thiotrithiazyl nitrate	79796-40-0
Organic acids		
	picric acid	88-89-1
	trinitroresorcinol	82-71-3
Organic azides		
	diazidomethyleneazine	
	picryl azide	1600-31-3
	vinyl azide	7570-25-4
Organolithium reagents		
	o-trifluoromethylphenyllithium	49571-31-5
	m-bromophenyllithium	6592-86-1
Organomineral peroxides		
	bis(triethyltin) peroxide	4403-63-8
	diethylhydroxotin hydroperoxide	
Oximes		
	bromoacetone oxime	62116-25-0
	hydroxycopper glyoximate	63643-78-7
	potassium cyclohexanehexone-1,3,5-trioximate	
Oxosalts of nitrogenous bases		
	ammonium tetranitroplatinate (II)	22289-82-3
	diamminepalladium (II) nitrate	34090-17-0

	1,2-diammonioethane nitrate	20829-66-7
Ozonides		
	trans-2-butene ozonide	16187-15-8
	ethylene ozonide (1,2,4-trioxolane)	289-14-5
	trifluoroethylene ozonide	86013-87-8
Perchlorate salts of nitrogenous bases		
	pyridinium perchlorate	15598-34-2
	tetraethylammonium perchlorate	2567-83-1
Perchloramide salts		
	barium perchlorylamide	28815-10-3
	mercury (II) N-perchloryl benzylamide	89521-44-8
	silver perchlorylamide	25870-02-4
Perchloryl compounds		
	2.6-dinitro-4-perchlorylphenol	
	perchloryl fluoride	7616-94-6
	N-perchoryl piperidine	768-34-3
Peroxyacids salts		
	calcium peroxodisulphate	13235-16-0
	potassium tetraperoxomolybdate	56094-15-6
	tetramethylammonium pentaperoxodichromate	
Peroxyacids		
	benzeneperoxyselennic acid	
	peroxyacetic acid	79-21-0
	peroxyformic acid	107-32-4
Peroxycarbonate esters		
	O-O-tert-butyl isopropyl monoperoxycarbonate	2372-21-6
	diallyl peroxydicarbonate	34037-79-1
	dimethyl peroxydicarbonate	15411-45-7
Phosphorus esters		
	diethyl phosphite	762-04-9
	dibenzyl phosphorochloridate	538-37-4
Picrates		
	nickel picrate (anhydrous)	53085-06-3
	S-7-methylnonylthiouronium picrate	
	sodium picrate	73771-13-8

Platinum compounds		
	amminedecahydroxydiplatinum	
	cis-diammineplatinum (II) nitrate ?nitrite?	
	trimethylplatinum hydroxide	14477-33-9
Poly(dimercuryimmonium) compounds		
	poly(dimercuryimmonium picrate)	
	poly(dimercuryimmonium permanganate)	
	poly(dimercuryimmonium trinitrobenzoate)	
Polymerization (violent)		
	acrylic acid	79-10-7
	ethylene oxide	75-21-8
	vinyl acetate	108-05-4
Polynitroaryl compounds		
	5,6-dinitro-2-dimethylaminopyrimidinone	
	4-nitro-1-picryl-1,2,3-triazole	31123-28-1
	2,4,6-trinitrotoluene	118-96-7
Silver compounds		
	silver nitride (fulminating silver)	20737-02-4
	disilver ketenide	27278-01-4
	phenylsilver	5274-48-6
	silver azide	13863-88-2
	silver osmate	
Strained-ring compounds		
	2-azatricyclo[2.2.1.0^{2,6}]hept-7-yl perchlorate	98566-27-9
	dicyclopropyldiazomethane	16102-24-2
	prismane	650-42-0
Tetrazoles		
	5-aminotetrazole	4418-61-5
	silver & mercury salts of 5-nitrotetrazole	
	tetrazole	288-94-8
Triazoles		
	3-diazo-5-phenyl-3H-1,2,4-triazole	80670-36-6
	4-hydroxy-3,5-dimethyl-1,2,4-triazole	35869-74-0

	1,2,3-triazole	27070-49-1

Appendix II: Common Peroxide Forming Chemicals

Note: This list may not be all inclusive.

Peroxide Hazard on Storage (Class A)	Peroxide Hazard on Concentration (Class B)	Hazardous Due to Peroxide Initiation of Polymerization (Class C)
butadiene (106-99-0) - liquid	2-butanol (78-92-2)	acrylic acid (79-10-7)
chlorobutadiene/chloroprene (126-99-8) - liquid	2-cyclohexen-1-ol (822-67-3)	acrylonitrile (107-13-1)
divinyl acetylene (821-08-9)	2-hexanol (626-93-7)	butadiene (106-99-0) - gas
divinyl ether (109-93-3)	2-pentanol (6032-29-7)	chlorobutadiene/chloroprene (126-99-8) - gas
isopropyl ether (108-20-3)	2-propanol (67-63-0)	chlorotrifluoroethylene (79-38-9) - gas
potassium amide (17242-52-3)	3-methyl-1-butanol (123-51-3)	methyl methacrylate (80-62-6)
potassium metal (7440-09-7)	4-heptanol (589-55-9)	styrene (100-42-5)
sodium amide (7782-92-5)	4-methyl-2-pentanol (108-11-2)	tetrafluoroethylene (116-14-3) - gas
tetrafluoroethylene (116-14-3) - liquid	4-penten-1-ol (821-09-0)	vinyl acetate (108-05-4)
vinylidene chloride (75-35-4) - liquid	acetal (105-57-7)	vinyl acetylene (689-97-4) - gas
	acetaldehyde (75-07-0)	vinyl chloride (75-01-4)
	benzyl alcohol (100-51-6)	vinyl pyridine (100-43-6, 100-69-6)
	cumene (98-82-8)	vinylidene chloride (75-35-4) - gas
	cyclohexanol (108-93-0)	
	cyclohexene (110-83-8)	
	decahydronaphthalene (91-17-8)	
	diacetylene (460-12-8)	
	dicyclopentadiene (77-73-6)	
	diethyl ether (60-29-7)	
	diethylene glycol dimethyl ether (111-96-6)	
	dioxane (123-91-1, 505-22-6)	
	ethylene glycol dimethyl ether (110-71-4)	
	furan (110-00-9)	
	methyl acetylene (74-99-7)	
	methyl isobutyl ketone (108-10-1)	

	methylcyclopentane (96-37-7)	
	phenylethanol (98-85-1, 60-12-8)	
	tetrahydrofuran (109-99-9)	
	tetrahydronaphthalene (119-64-2)	
	vinyl ethers (111-34-2, 764-47-6)	
	other secondary alcohols	

May Form Peroxides but not of Class A, B or C (Class D)		
(2-ethoxyethyl)-alpha-benzoyl benzoate (?604-63-7?)	2-bromoethyl methyl ether (6482-24-2)	2-(butoxyethoxy)ethyl acetate (124-17-4)
1-(2-chloroethoxy)-2-phenoxyethane (2243-44-9)	2-bromomethy ethyl ether (13057-17-5)	2,5-hexadiyn-1-ol (28255-99-4)
1-(2-ethoxyethoxy)ethyl acetate (?)	2-butenal (4170-30-3)	2,5-norbornadiene (121-46-0)
1-butene (106-98-9)	2-butoxyethanol (111-76-2)	2.4-dichlorophenoxyacetic acid (94-75-7)
1-ethoxy-2-propyne (628-33-1)	2-chloro-2,3-butadiene (126-99-8)	3-bromopropyl phenyl ether (588-63-6)
1-ethoxynaphthalene (5328-01-8)	2-ethoxybenzoic acid (134-11-2)	3-ethoxypropionitrile (2141-62-0)
1-heptene (592-76-7)	2-ethoxyethyl acetate (111-15-9)	3-methoxy-1-butyl acetate (4435-53-4)
1-hexene (592-41-6)	2-ethylacrylaldehyde oxime (?922-63-4?)	3-methoxyphenol (150-19-6)
1-methoxynaphthalene (2216-69-5)	2-ethylbutanol (97-75-0)	3-methoxypropionitrile (110-67-8)
1-octene (111-66-0)	2-ethylhexanal (123-05-7)	3,3-dimethoxypropene (6044-68-4)
1-pentene (109-67-1)	2-hexanone (591-78-6)	3,3'-dimethoxy benzidine (119-93-7)
1,1-dimethoxyethane (534-15-6)	2-methoxyethanol (109-86-4)	3,3'-oxydipropionitrile (1656-48-0)
1,1,2,3-tetrachloro-1,3-butadiene (921-09-5)	2-methoxyethyl acetate (110-49-6)	3.4-dimethoxybenzaldehyde (120-14-9)
1,2-bis(2-chloroethoxyl)ethane (112-26-5)	2-methoxyethyl vinyl ether (1663-35-0)	4-ethoxybenzaldehyde (10031-82-0)
1,2-dibenzyloxyethane (622-22-0)	2-methoxyethylamine (109-85-3)	4-ethoxyphenol (622-62-8)
1,2-dichloroethyl ethyl ether (623-46-1)	2-methoxyphenyl isocyanate (700-87-8)	4-formylphenoxyacetic acid (20042-71-3)
1,2-diethoxyethane (629-14-1)	2-methyltetrahydrofuran (96-47-9)	4-hexyloxybenzaldehyde (5136-94-7)
1,2-epoxy-3-isopropoxypropane (4016-14-2)	2-nitrophenyl phenyl ether (620-88-2)	4-hydroxyphenoxyacetic acid (1878-84-8)
1,2-epoxy-3-phenoxypropane (122-60-1)	2,2-diethoxypropane (126-84-1)	4-methoxy-2-nitroaniline (96-96-8)
1,3-dioxepane (505-65-7)	2,2-dimethoxypropane (77-76-9)	4-methoxybenzylamine (104-84-7)
1,3-dioxolane (646-06-0)	2,3-dihydro-2,5-dimethoxyfuran (332-77-4)	4-methylphenetole (622-60-6)

1,3,3-trimethoxypropene (29446-10-4)	2,4-dichlorophenetole (5392-86-9)	4-pentyloxyaniline (39905-50-5)
1,5-p-methadiene (5989-27-5)	2,4-dimethoxybenzoic acid (91-52-1)	4-pentyloxybenzaldehyde (5736-91-4)
2-(2-ethoxyethoxy)ethanol (111-90-0)	2,4-dinitrophenetole (610-54-8)	4-vinyl cyclohexene (100-40-3)
2-(2-ethoxyethoxy)ethyl acetate (112-15-2)	2,5-dimethoxyaniline (102-56-7)	4,4-dimethoxy-2-butanone (5436-21-5)
2-(2-methoxyethoxy)ethanol (111-77-3)	2,5-dimethoxytoluene (24599-58-4)	4,4'-oxydiphenol (1965-09-9)
4,5-hexadien-2-yn-1-ol (2749-79-3)	bis(2-methoxyethyl) adipate (106-06-3)	diethyl ethoxymethylene malonate (84-13-8)
4'-ethoxyacetophenone (1676-63-7)	bis(2-n-butoxyethyl) phthalate (117-83-9)	ethyl vinyl ether (109-92-2)
5,8,11,14-eicosatetraenoic acid, sodium salt (6610-25-9)	bis(2-phenoxyethyl) ether (622-87-7)	ethyl-beta-ethoxypropionate (763-69-9)
9,10-dihydroanthracene (613-31-0)	bis(4-chlorobutyl) ether (6334-96-9)	indene (95-13-6)
acrolein (107-02-8)	bis(chloromethyl) ether (542-88-1)	iodophenetole (699-08-1, 29052-00-4)
allyl ether (557-40-4)	bis(pentyloxy)azoxybenzene (19482-05-4)	isoamyl benzyl ether (122-73-6)
allyl ethyl ether (557-31-3)	bromophenetole (593-19-7, 588-96-5, 596-10-6)	isoamyl ether (544-01-4)
allyl gylcidyl ether (106-92-3)	chloroacetaldehyde diethyl acetal (621-62-5)	isobutyl vinyl ether (109-53-5)
allyl phenyl ether (1746-13-0)	chloroethylene (9002-86-2)	isoeugenol (97-54-1)
alpha-phenoxypropionyl chloride (122-35-0)	chlorofluoroethylene (2317-91-1)	isophorone (78-59-1)
anisaldehyde (123-11-5, 591-31-1)	chloromethyl ether (107-30-2, 3188-13-4)	isoprene (78-79-5)
anisole (100-66-3)	chlorophenetole (614-72-2, 2655-83-6, 622-61-7)	isopropyl-2,4,5-trichlorophenoxy acetate (93-78-2)
azoxydianisole (1562-94-3)	cyanamide (420-04-2)	ligroine (9072-35-9)
benzoin methyl ether (3524-62-7)	cyclobutyl methyl ether (18593-33-4)	limonene (138-86-3)
benzyl ether (103-50-4)	cyclohexyl methyl ether (931-56-6)	m-(m-phenoxyphenoxy)phenol (14200-84-1)
benzyl ethyl ether (593-30-0)	cyclooctene (931-88-4, 931-87-3)	m-anisyl alcohol (6971-51-3)
benzyl methyl ether (558-86-3)	cyclopentene (142-29-0)	m-nitrophenetole (621-52-3)

benzyl n-butyl ether (3459-80-1)	cyclopentyl methyl ether (5614-37-9)	menthofuran (494-90-6)
benzyl-1-naphthyl ether (613-62-7)	cyclopropyl methyl ether (540-47-6)	methoxy-1,3,5,7-cyclooctatetraene (7176-89-8)
beta-isopropoxypropionitrile (110-47-4)	di-n-propoxymethane (505-84-0)	methoxyacetic acid (625-45-6)
bis(2-(methoxyethoxy)ethyl) ether (143-34-8)	di(1-propynl) ether (111-43-4)	methoxyphenylacetic acid (104-01-8, 93-25-4)
bis(2-chloroethyl) ether (111-44-4)	di(2-propynl) ether (6921-27-3)	methyl ether (115-10-6)
bis(2-ethoxyethyl) adipate (109-44-4)	diethoxybenzene (2050-46-6, 2049-73-2, 122-95-2)	methyl-p-(n-amyloxy)benzoate (?)
bis(2-ethoxyethyl) phthalate (605-54-9)	diethoxymethane (462-95-3)	methylcyclohexane (108-87-2)
bis(2-ethoxyethyl) sebacate (624-10-2)	diethyl fumarate (623-91-6)	n-amyl ether (693-65-2)
bis(2-ethoxyethyl)ether (112-36-7)	diethylketene (?)	n-butyl gylcidyl ether (2426-08-6)
bis(2-methoxyethoxy)ethane (112-49-2)	diisobutylene (25167-70-8)	n-butyl phenyl ether (126-79-0)
bis(2-methoxyethyl) carbonate (626-84-6)	dimethoxymethane (109-87-5)	n-butyl vinyl ether (111-34-2)
bis(2-methoxyethyl) ether (119-96-6)	dimethylketene (558-30-5)	n-hexyl ether (112-58-3)
bis(2-methoxyethyl) phthalate (117-82-8)	ethoxyphenyl isocyanate (5395-71-1, 32459-62-4)	n-propyl ether (111-43-7)
n-propyl isopropyl ether (627-08-7)	phenoxyacetic acid (122-59-8)	tetraethylene glycol (112-60-7)
oxybis(2-ethyl acetate) (628-68-2)	phenoxyacetyl chloride (701-99-5)	tetraethylene glycol monomethyl ether (23783-42-8)
oxybis(2-ethyl benzoate) (120-55-8)	phenyl ether (101-84-8)	tetrahydropyran (142-68-7)
p-(n-amyloxy)benzoyl chloride (36823-84-4)	phenyl n-propyl ether (622-85-5)	triethylene glycol diacetate (111-21-7)
p-bromoanisole (104-92-7)	propene (115-07-1)	triethylene glycol dipropionate (123-80-8)
p-di-n-butoxybenzene (75942-37-9)	propyne (74-99-7)	trimethoxybenzaldehyde (86-81-7, 4460-86-0, 2103-57-3)
p-dibenzyloxybenzene (621-91-0)	sodium ethoxyacetylide (73506-39-5)	vinylene carbonate (872-36-6)
p-phenylphenetole (613-40-1)	t-butyl ethyl ether (637-92-3)	

perfluoroethylene (9014-83-9)	t-butyl methyl ether (16634-04-0)	

Appendix III: Explosion Hazard Due to Container Over-pressurization

Note: This list may not be all inclusive.

aluminum chloride (7446-70-0)
aluminum lithium hydride (16853-85-3)
ammonia solution (8013-59-0)
ammonium hydroxide (1336-21-6)
ammonium persulfate (7727-54-0)
anisyl chloride (6707-01-3)
aqua regia (8007-56-3)
benzenesulphonyl chloride (98-09-9)
bleach (8007-59-8)
bleaching powder (8031-48-9)
calcium carbide (75-20-7)
calcium hydride (7789-78-8)
calcium hypochlorite (7778-54-3)
chloroform (67-66-3)
chromic acid (1333-82-0/7738-94-5)
cumene hydroperoxide (80-15-9)
cyclohexene (110-83-8)
diethyl pyrocarbonate (1609-47-8)
dimethylamine (124-40-3)
formic acid (64-18-6)
hydrogen peroxide (7722-84-1)
lauroyl peroxide (105-74-8)
lithium aluminum hydride (16853-85-3)
lithium hydride (7580-67-8)
nitric acid (7697-37-2)
1-methyl-3-nitro-1-nitrosoguanidine (70-25-7)
peracetic acid (79-21-0)
phenol (108-95-2)
phosphorus trichloride (7719-12-2)
potassium persulphate (7727-21-1)
silicon tetrachloride (10026-04-7)
sodium borohydride (16940-66-2)
sodium dithionite (7775-14-6)
sodium hydride (7646-69-7)
sodium hydrosulphite (7775-14-6)

sodium hypochlorite (7681-52-9)
sodium peroxide (1313-60-6)
sodium persulphate (7775-27-1)
thionyl chloride (7719-09-7)
urea peroxide (124-43-6)
zinc (7440-66-6)

[1] *J. Chem. Ed.* 1964, 41:(8) A575-A579.

[2] Illinois Env. Protection Agency, *News*, Feb. 22, 1991, 91-117.