Laboratory Safety Bulletin

Phone: 519-253-3000 Ext. 3523 • E-mail: ccc@uwindsor.ca • Web: www.uwindsor.ca/ccc
Location: Essex Hall / B-37 • Hours: 8:30 am to 4:30 pm (M-F)

Potentially Explosive Compounds

Potentially explosive compounds are chemicals that are generally safe to use when hydrated. Storing them in the lab for long periods of time can cause them to dry out and become unstable. Hence, these chemicals should be inspected regularly and discarded before they become a significant safety hazard. Chemical inventories need to be reviewed to identify any potentially explosive compounds in the laboratory. The list of potentially explosive compounds below is not complete; therefore attention should be given to any explosive potential warnings on the chemical's labels and SDS.

Chemicals of concern include:

PICRIC ACID: Solid picric acid (trinitrophenol) is shipped from the manufacturer with 30% water added to minimize its potential to detonate. Over time, picric acid becomes dehydrated, and it becomes an explosive hazard. Solid picric acid forms shock-sensitive explosives on contact with metals, therefore a container with a metal lid may pose a greater explosive hazard if the container is old.

SODIUM AZIDE: Similar to old picric acid, sodium azide also forms shock-sensitive explosives over time. They become highly sensitive to metals, to which a container with a metal lid may pose an even greater explosive hazard.

Additional Examples of Potentially Explosive Compounds[1]:

Potentially Explosive Solid Chemicals

These chemicals are among the most hazardous substances encountered in the chemical laboratory. They are hazardous because they are sensitive to shock, sparks, heat, friction and other accidental ignition. Most are far more sensitive to shock than common primary explosives such as trinitrotoluene (TNT).

- Benzoyl peroxide (dry)
- 2,4-dinitrophenol
- 2,4-dinitrophenyl hydrazine
- Hexanitrodiphenylamine (dipicrylamine)
- 1-methyl-3-nitro-1-nitrosoguanidine
- Nitrogen trichloride
- Nitrocellulose
- Pyroxylin
- Picric acid or trinitrophenol (solid and dry)
- Picramide
- Picryl chloride (trinitrochlorobenzene)
- Picrylsulfonic acid (trinitrobenzenesulfonic acid)
- Trinitrobenzene
- Sodium amide
- Potassium, Rubidium, Caesium metals (old)

Potentially Explosive Organic Chemicals

These commonly used organic chemicals have the potential to generate peroxides and can pose significant hazards similar to those of explosive solid chemicals if not properly stored or handled. Please consult Peroxides in the Laboratory LSB for more details.

- Acetaldehyde
- Cyclohexane
- Cyclooctene
- Decahydronaphthalene (Decalin)
- Diazald
- Dioxane ether
- Ethyl ether
- Furan
- Isopropryl ether
- N-methyl-N-nitroso-p-toluenesulfonamide
- Tetrahydronaphthalene (Tetralin)
- Tetrahydrofuran (THF)
- Vinyl ethers

Recommended work practices:

- Update chemical inventory periodically. Do not keep very old chemicals in your laboratory and do not inherit old chemicals from other research groups, especially if they are listed as one of the potentially explosive compounds! Old bottles that are way past their expiration date should be discarded. Those with metal caps are especially problematic and are more dangerous than those with plastic caps[2]. Contact CCC for instructions on disposal procedures.

- Follow individual chemical's SDS for the recommendations of the appropriate PPE. Additional PPE such as face shields, chemical aprons, disposable coveralls, chemically resistant gloves and respiratory protection shall be worn as appropriate.

- Label the containers of potentially explosive chemicals with the date the chemical was received and opened. Inspect chemical bottles containing potentially explosive compounds regularly to see signs of dryness – usually by crystal formation around the cap or in the bottle is a good telltale sign.

- For peroxide-forming compounds, periodically test them for peroxide concentration and note the date when the bottles are tested. If the test shows peroxide concentration greater than 100 ppm, the chemical should be disposed of as hazardous waste. Contact CCC for instructions on disposal procedures.

- If you find a reactive or explosive chemical container that is damaged, bulging, past expiration, leaking, shows solid crystals around the cap or inside the bottle, or is otherwise compromised in any way, DO NOT DISTURB OR HANDLE THE CONTAINER. MOVE AWAY FROM THE AREA AND PREVENT OTHERS FROM ENTERING. CONTACT THE CHEMICAL CONTROL CENTRE IMMEDIATELY.

For more information on peroxides and other potentially explosive chemicals, please visit the Chemical Control Centre's Laboratory Safety, Assurance, and Compliance website at www.uwindsor.ca/ccc or by phone (ext. 3523)

References:

1. https://research.cuanschutz.edu/docs/librariesprovider174/guidance-and-manuals/potentially-explosive-compounds.pdf?sfvrsn=315620b9_2
2. https://oag.ca.gov/sites/all/files/agweb/pdfs/cci/safety/picric.pdf