



Guidance Note

May 2007

Explosive Chemicals

HWG-011

This information is for your use and as a way of providing consistent information. There is no response required.

Potentially Explosive Chemicals

Researchers should be aware that some chemical compounds on their shelves might become potentially explosive as they age. Potentially explosive compounds should be inspected regularly for water content or age and discarded before they become a significant safety hazard. The UCDHSC Environmental Health and Safety (EH&S) Department recommends that you check your chemical inventory for any of the potentially explosive compounds listed below or compounds which have warnings regarding storage on the label. If the compound has exceeded its recommended shelf life, shows signs that it may be becoming hazardous (discoloration or layering visible), and is no longer needed, please call us to arrange for immediate disposal (x40345).

Picric acid (trinitrophenol) has been commonly used in laboratories as a fixative, however when dry it is also an explosive; its chemical structure is very similar to TNT (trinitrotoluene). Solid picric acid is shipped from the manufacturer with 20% water in order to minimize its potential to detonate. Picric acid as well as **sodium azide** also form shock sensitive explosives on contact with metals so a container with a metal lid may explode when disturbed.

Ethyl ether and other peroxidizable solvents may form shock sensitive explosive peroxide compounds on exposure to atmospheric oxygen and the process is further accelerated by exposure to light or heat. Organic peroxides are among the most hazardous substances handled in the laboratory due to their instability and shock sensitive nature. Manufacturers usually add small amounts of inhibitors (BHT) to peroxidizable solvents in order to minimize the formation of peroxide structures. The manufacturer usually marks ethyl ether containers with an expiration date. Peroxidizable solvents should be dated by laboratory personnel when received and when opened. Ethyl ether should be discarded within a year after being opened and **isopropyl ether** within three months. All unopened containers of peroxidizable chemicals should be discarded within 18 months of being purchased. A majority of peroxide explosions occur when the solvent is being distilled and the peroxide residue becomes concentrated in the distillation pot. Isopropyl ether readily forms peroxide compounds and outdated containers of this material have exploded when personnel were attempting to open them.

Laboratory personnel should use the following procedure when surveying their chemical inventory for potentially explosive compounds:

1. Do not touch an old chemical container that holds a peroxidizable solvent if there are any traces of solid crystals around the lid or if solid crystals are visible inside the container. Solid peroxide crystals are shock and friction sensitive and touching them may set off a violent explosion.
2. Handle every old or suspected peroxidizable solvent container (ethers, etc.) with extreme care and avoid unnecessary motion or bumping of the containers because peroxide crystals are very unstable. Ethyl ether is usually stored inside metal containers, so the liquid cannot be visibly inspected for the presence of peroxide crystals.
3. Do not attempt to open an old outdated container of peroxidizable solvents because they may explode if peroxide crystals are present in sufficient concentration (above 1%) especially in the treads.
4. Do not touch a container of picric acid (trinitrophenol) or sodium azide if they are stored inside a metal container or a container with a metal lid. Heavy metal salts of either picric acid or sodium azide are

extremely shock sensitive and disturbing a metal container may cause an explosion.

5. Contact EH&S immediately (303-724-0294) if you discover a peroxidizable solvent that has visible crystals present or if the container is over five years old.
6. For most potentially explosive chemicals which are not an immediate hazard and are no longer needed, follow the regular procedures for disposing of chemicals no longer needed in the lab.

Other Examples

Explosive Solid Compounds (partial listing)

2,4-dinitrophenyl hydrazine, hexanitrodiphenylamine (dipiclylamine), solid picric acid (trinitrophenol), picryl chloride, picrylsulfonic acid (trinitrobenzenesulfonic acid)

Peroxidizable Compounds, Explosive Hazard (partial listing)

Chemicals that form explosive levels of peroxides without concentration:

isopropyl ether, potassium metal, sodium amide (sodium amide and potassium metal are solids, however, they also form shock sensitive peroxide compounds on exposure to atmospheric oxygen)

Chemicals that form explosive levels of peroxides on concentration:

acetaldehyde, dioxane, ether (ethyl ether), tetrahydrofuran (THF), vinyl ethers