

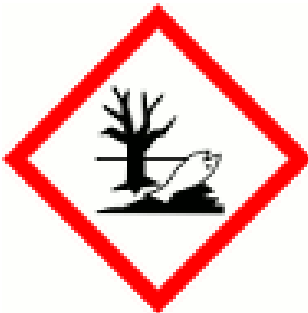
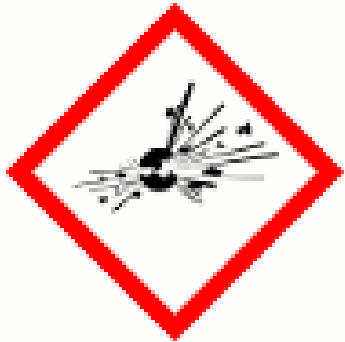
Chemical Incompatibility and Storage

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Hazard Classification

- Classification' of a chemical is a scientific assessment of whether it can cause harm – for example whether it has the potential to cause cancer, explode, irritate the eyes, etc
- Chemicals are classified so that people using them can understand any hazardous effects they could have on human health or the environment and to protect against that harm.

Classification Symbols



The Issues

- When certain hazardous chemicals are stored or mixed together, violent reactions may occur because the chemicals are unsuitable for mixing, or are incompatible.
- Classes of incompatible chemicals should be segregated from each other during storage, according to hazard classification.
- Is this the correct way to deal with incompatibilities?

No single method is perfect!


- Many chemicals belong to more than one hazard class. This can lead to confusion as to which class is appropriate for the chemical in question.
- Examples: Nitric acid is both an acid and an oxidizer; Benzoyl chloride is a combustible liquid, a corrosive, and a lachrymator.

- The hazard class that is most important can change depending on factors such as quantity of material, and other chemicals in the storage area.
- For example: acid/base mixing of dilute nitric acid and dilute ammonium hydroxide would likely not cause a reaction but concentrated solutions would.

- Not all chemicals in a given class are compatible.
- For example, sodium dichloroisocyanurate and calcium hypochlorite are both oxidizers and belong to no other class of chemical, yet the mixing of these two materials can lead to the formation of nitrogen trichloride, a shock sensitive explosive.

- Therefor the sheer number of exceptions to any classification scheme prevents listing all of them in a convenient reference table.
- Relying solely on compatibility classification schemes might provide a false sense of security and it is important that you are familiar with the limitations of the classification system and the properties of the materials they are working with.

What should we do?

- Check SECTION 10: Stability and reactivity on MSDS for list of incompatibilities
 - Store/dispose of chemicals correctly to eliminate the risk of mixing occurring
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SECTION 10: Stability and reactivity

- **10.1 Reactivity**
- no data available
- **10.2 Chemical stability**
- Stable under recommended storage conditions.
- **10.3 Possibility of hazardous reactions**
- no data available
- **10.4 Conditions to avoid**
- Exposure to moisture may affect product quality.
- **10.5 Incompatible materials**
- Strong acids, Borane/boron oxides, Zinc, Calcium oxide, Methyl vinyl ether, Calcium chloride is attacked by bromine trifluoride
- **10.6 Hazardous decomposition products**
- Other decomposition products - no data available, In the event of fire: see section 5

Separate and Isolate Your Most Serious Hazards

<p><u>Inorganic 10</u> Sulfur, Phosphorus, Arsenic, Phosphorus Pentoxide</p>	<p><u>Inorganic 7</u> Arsenates, Cyanides, Cyanates (Store away from water)</p>	<p><u>Organic 2</u> Alcohols, Glycols, Sugars, Amines, Amides, Imines, Imides (Store flammables in a dedicated cabinet)</p>	<p><u>Organic 8</u> Phenols, Cresols</p>
<p><u>Inorganic 2</u> Thiosulfates, Phosphates, Halogens, Oxalates, Phthalates, Oleates</p>	<p><u>Inorganic 5</u> Sulfides, Selenides, Phosphides, Carbides, Nitrides</p>	<p><u>Organic 3</u> Hydrocarbons, Esters, Aldehydes, Oils (Store flammables in a dedicated cabinet)</p>	<p><u>Organic 6</u> Peroxides, Hydroperoxides, Azides</p>
<p><u>Inorganic 3</u> Amides, Nitrates (except Ammonium Nitrate), Nitrites, Azides (Store ammonium nitrate away from all other substances)</p>	<p><u>Inorganic 8</u> Borates, Chromates, Manganates, Permanganates, Molybdates, Vanadates</p>	<p><u>Organic 4</u> Ethers, Ketones, Ketenes, Halogenated hydrocarbons, Ethyene oxide (Store flammables in a dedicated cabinet)</p>	<p><u>Organic 1</u> Acids, Amino acids, Anhydrides, Peracids (Store certain organic acids in an acid cabinet)</p>
<p><u>Inorganic 1</u> Metals, Hydrides (Store away from any water) (Store flammable solids in flammable cabinets)</p>	<p><u>Inorganic 6</u> Chlorates, Bromates, Iodates, Chlorites, Hypochlorites, Perchlorates, Perchloric Acid, Peroxides, Hydrogen Peroxide</p>	<p><u>Organic 5</u> Epoxy compounds, Isocyanates</p>	<p><u>Organic 9</u> Dyes, Stains, Indicators (Store alcohol-based solutions in flammable cabinets)</p>
<p><u>Inorganic 4</u> Hydroxides, Oxides, Silicates, Carbonates, Carbon</p>	<p><u>Miscellaneous</u></p>	<p><u>Organic 7</u> Sulfides, Polysulfides, Sulfoxides, Nitriles</p>	<p><u>Miscellaneous</u></p>

Secondary containment

- Secondary containment simply means that when a chemical spill develops the spill will be contained and controlled in a secondary area (i.e., specially designed safety storage cabinet) which will reduce the risk of chemical exposure, fire, explosion, etc.

Segregated Chemical Storage

- Storage of incompatible hazardous materials shall be separated. Separation shall be accomplished by ... Storing hazardous materials in storage cabinets ... Materials which are incompatible shall not be stored within the same cabinet.
- What are the issues?

Acids

- Segregate acids from reactive metals such as sodium, potassium, magnesium, etc.
- Segregate oxidizing acids (e.g., nitric acid) from organic acids, flammable and combustible materials.
- Segregate acids from chemicals which could generate toxic or flammable gases upon contact, such as sodium cyanide, iron sulfide, etc.
- Segregate acids from bases.
- <https://www.youtube.com/watch?v=UzjiaXQPyE>

Bases

- Segregate bases from acids, metals, organic peroxides and easily ignitable materials.
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Solvents

- Segregate from oxidizing acids and oxidizers.
- Keep away from any source of ignition (heat, sparks, or open flames).
- Store in a cool, dry place.
- Keep away from combustible and flammable materials.
- Keep away from reducing agents such as zinc, alkali metals, and formic acid.
- <https://www.youtube.com/watch?v=qQ4BlaqkikQ>

Water reactive chemicals

- Store in a cool, dry place away from any water source.
- Make certain that a Class D fire extinguisher is available in case of fire.
- https://www.youtube.com/watch?v=P7lv0_8WvVs

Pyrophoric Substances

- Materials which will react with the air to ignite when exposed, e.g., white phosphorus or tert-Butyl Lithium.
- Store in a cool, dry place making provisions for an airtight seal.
- <https://www.youtube.com/watch?v=Ele7mH9gHc8>

Peroxide Forming Chemicals

- Store in airtight containers in a dark, cool, and dry place.
 - Label containers with receiving, opening, and disposal dates.
 - Periodically test for the presence of peroxides.
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- https://web.stanford.edu/dept/EHS/prod/researchlab/lab/safety_sheets/07-207.pdf

Organic Peroxides

- Store in area such as a refrigerator where the temperature will remain below the self accelerating decomposition temperature.
- <https://www.youtube.com/watch?v=98jOeCr06Xs>

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