

**General Guide to Incompatible Chemicals**

The chemicals listed below may undergo a chemical reaction when mixed, these reactions may be violent in nature (producing heat, gas or may even lead to spontaneous ignition) or may produce hazardous, reactive or toxic by-products. Incompatible chemicals should be segregated wherever possible to prevent them from coming into contact and undergoing a chemical reaction either by mixing or in the event of a leak or spillage. This list is generic and non-exhaustive and does not cover all possible interactions, **for more detailed information always refer to the safety data sheet and other resources**.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Chemical / Class | Incompatible with: | Reason | | | | | |
| **Violent Reaction** | **Flammable Gas** | **Fire** | **Unstable** | **Toxic Product** | **Toxic Gas** |
| **Acetic acid** | Chromic acid, Chromium (VI) oxide |  |  |  |  |  |  |
| Nitric acid |  |  |  |  |  |  |
| Alcohols |  |  |  |  |  |  |
| Ethylene glycol |  |  |  |  |  |  |
| Perchloric acid |  |  |  |  |  |  |
| Oxidising agents |  |  |  |  |  |  |
| **Acetone** | Concentrated nitric / sulphuric acid mixtures |  |  |  |  |  |  |
| Strong bases |  |  |  |  |  |  |
| Chloroform (in the presence of a base) |  |  |  |  |  |  |
| **Acetylene** | Copper (including pipes / tubing) |  |  |  |  |  |  |
| Chlorine, bromine, fluorine |  |  |  |  |  |  |
| Silver, mercury |  |  |  |  |  |  |
| **Acids** | Inorganic cyanide salts |  |  |  |  |  |  |
| Alkali / base |  |  |  |  |  |  |
| **Activated Charcoal / Carbon** | Calcium hypochlorite |  |  |  |  |  |  |
| Oxidising agents |  |  |  |  |  |  |
| **Alkali metals (Li, Na, K, Rb, Cs)** | Water / Acids |  |  |  |  |  |  |
| Carbon tetrachloride / Halogenated alkanes |  |  |  |  |  |  |
| Carbon Dioxide (solid)1 |  |  |  |  |  |  |
| Halogens |  |  |  |  |  |  |
| **Alkaline earth metals (Be, Mg, Ca, Sr, Ba, Ra)** | Water / Acids |  |  |  |  |  |  |
| Carbon tetrachloride / Halogenated alkanes |  |  |  |  |  |  |
| Carbon Dioxide (solid) |  |  |  |  |  |  |
| Halogens |  |  |  |  |  |  |
| **Ammonia (anhydrous)** | Mercury |  |  |  |  |  |  |
| Strong oxidisers (e.g. calcium hypochlorite) |  |  |  |  |  |  |
| Chlorine, Bromine, Iodine |  |  |  |  |  |  |
| Hydrogen fluoride / hydrofluoric acid |  |  |  |  |  |  |
| **Ammonia solution (aqueous)** | Chlorine, bromine, iodine |  |  |  |  |  |  |
| **Ammonium nitrate** | Acids |  |  |  |  |  |  |
| Metal powders |  |  |  |  |  |  |
| Flammable liquids / combustible materials |  |  |  |  |  |  |
| Chlorates |  |  |  |  |  |  |
| Nitrites |  |  |  |  |  |  |
| Sulphur |  |  |  |  |  |  |
| **Aniline** | Nitric acid |  |  |  |  |  |  |
| Hydrogen peroxide |  |  |  |  |  |  |
| **Arsenic compounds** | Reducing agents |  |  |  |  |  |  |
| **Azides (e.g. sodium azide)** | Acids |  |  |  |  |  |  |
| Lead, copper, heavy metals |  |  |  |  |  |  |
| Carbon disulphide |  |  |  |  |  |  |
| **Bromine** | Ammonia |  |  |  |  |  |  |
| Acetylene |  |  |  |  |  |  |
| Butadiene |  |  |  |  |  |  |
| Flammable / combustible materials |  |  |  |  |  |  |
| Sodium carbide |  |  |  |  |  |  |
| Turpentine |  |  |  |  |  |  |
| Finely divided metals |  |  |  |  |  |  |
| **Calcium oxide** | Water |  |  |  |  |  |  |
| **Chlorate Compounds** | Ammonium salts |  |  |  |  |  |  |
|  | Acids2 |  |  |  |  |  |  |
|  | Metal powders |  |  |  |  |  |  |
|  | Sulphur |  |  |  |  |  |  |
|  | Combustible materials |  |  |  |  |  |  |
| **Chlorinated solvents (e.g. chloroform)** | Alkali metals |  |  |  |  |  |  |
| Non-halogenated flammable solvents |  |  |  |  |  |  |
| Powdered aluminium or magnesium |  |  |  |  |  |  |
| **Chromic acid and chromium (VI) oxide** | Acetic acid, acetic anhydride |  |  |  |  |  |  |
| Flammable liquids |  |  |  |  |  |  |
| **Chlorine** | Ammonia |  |  |  |  |  |  |
| Hydrogen |  |  |  |  |  |  |
| Acetylene |  |  |  |  |  |  |
| Methane, ethane, propane, butane |  |  |  |  |  |  |
| Alcohols |  |  |  |  |  |  |
| Sodium carbide |  |  |  |  |  |  |
| Finely divided metals, combustible materials3 |  |  |  |  |  |  |
| **Chlorine dioxide** | Ammonia |  |  |  |  |  |  |
| Methane, ethane, propane, butadiene |  |  |  |  |  |  |
| Phosphine |  |  |  |  |  |  |
| Hydrogen sulphide |  |  |  |  |  |  |
| **Copper** | Acetylene |  |  |  |  |  |  |
| Hydrogen peroxide |  |  |  |  |  |  |
| **Cumene hydroperoxide** | Acids |  |  |  |  |  |  |
| Combustible materials |  |  |  |  |  |  |
| **Cyanide salts** | Acids |  |  |  |  |  |  |
| **Diethyl ether** | Chlorine |  |  |  |  |  |  |
| **Dimethyl sulphoxide (DMSO)** | Chromium trioxide |  |  |  |  |  |  |
| **Ethanol** | Silver nitrate |  |  |  |  |  |  |
| Calcium hypochlorite |  |  |  |  |  |  |
| **Flammable solvents** | Oxidising agents |  |  |  |  |  |  |
| Reducing agents4 |  |  |  |  |  |  |
| Concentrated acids |  |  |  |  |  |  |
| **Fluorine** | All other chemicals |  |  |  |  |  |  |
| **Hydride compounds (e.g. sodium hydride)** | Waste chemicals |  |  |  |  |  |  |
| **Hydrocarbons (e.g. propane)** | Oxidisers (e.g. chlorine, sodium peroxide) |  |  |  |  |  |  |
| **Hydrogen cyanide (hydrocyanic acid)** | Acids |  |  |  |  |  |  |
| Bases / alkalis |  |  |  |  |  |  |
| **Hydrofluoric acid** | Ammonia |  |  |  |  |  |  |
| Bases |  |  |  |  |  |  |
| Silica |  |  |  |  |  |  |
| **Hydrogen sulphide** | Fuming nitric acid |  |  |  |  |  |  |
| Acids |  |  |  |  |  |  |
| Oxidising gases (e.g. chlorine, oxygen) |  |  |  |  |  |  |
| **Hypochlorite compounds** | Acids |  |  |  |  |  |  |
| Activated carbon |  |  |  |  |  |  |
| **Iodine** | Acetylene |  |  |  |  |  |  |
| Ammonia |  |  |  |  |  |  |
| **Mercury** | Acetylene |  |  |  |  |  |  |
| Fulminic acid |  |  |  |  |  |  |
| Ammonia |  |  |  |  |  |  |
| **Nitrate compounds** | Acids (sulphuric acid) |  |  |  |  |  |  |
| **Nitric acid (concentrated)** | Acetic acid, acetic anhydride |  |  |  |  |  |  |
| Inorganic acids |  |  |  |  |  |  |
| Hydrogen sulphide |  |  |  |  |  |  |
| Flammable liquids |  |  |  |  |  |  |
| Copper, brass |  |  |  |  |  |  |
| Heavy metals |  |  |  |  |  |  |
| Reducing agents |  |  |  |  |  |  |
| **Nitrite compounds** | Acids |  |  |  |  |  |  |
| **Nitroparaffins (e.g. nitromethane)** | Inorganic bases |  |  |  |  |  |  |
| Amines |  |  |  |  |  |  |
| Silver Nitrate |  |  |  |  |  |  |
| **Oxalic acid** | Silver, mercury |  |  |  |  |  |  |
| **Oxidising agents** | Organic materials (e.g. wood, paper) |  |  |  |  |  |  |
| Flammable solvents |  |  |  |  |  |  |
| Reducing agents |  |  |  |  |  |  |
| Dehydrating agents (e.g. sulphuric acid) |  |  |  |  |  |  |
| **Oxygen** | Oils, grease, flammable liquids, solids or gases |  |  |  |  |  |  |
| **Perchloric acid** | Acetic acid, acetic anhydride |  |  |  |  |  |  |
| Bismuth (and its alloys) |  |  |  |  |  |  |
| Combustible materials |  |  |  |  |  |  |
| Dehydrating agents (e.g. sulphuric acid) |  |  |  |  |  |  |
| **Peroxide compounds (organic)** | Acids (organic and mineral)5 |  |  |  |  |  |  |
| **Phosphorus (white)** | Oxygen / Air |  |  |  |  |  |  |
| Oxygen containing compounds (e.g. chlorates) |  |  |  |  |  |  |
| Alkalis |  |  |  |  |  |  |
| Reducing agents |  |  |  |  |  |  |
| Sulphur |  |  |  |  |  |  |
| **Phosphorus pentoxide** | Water |  |  |  |  |  |  |
| **Picric acid** | Heavy metal salts (lead, mercury, silver) |  |  |  |  |  |  |
| Ammonia |  |  |  |  |  |  |
| Alkalis / bases |  |  |  |  |  |  |
| **Potassium chlorate / perchlorate** | Acids |  |  |  |  |  |  |
| Alkali metals |  |  |  |  |  |  |
| Magnesium, calcium |  |  |  |  |  |  |
| **Potassium permanganate** | Glycerol, ethylene, benzaldehyde |  |  |  |  |  |  |
| Sulphuric acid |  |  |  |  |  |  |
| **Silver** | Acetylene |  |  |  |  |  |  |
| Oxalic acid, tartaric acid, fulminic acid |  |  |  |  |  |  |
| Ammonium compounds |  |  |  |  |  |  |
| **Sodium nitrite** | Ammonium nitrate |  |  |  |  |  |  |
| Acids |  |  |  |  |  |  |
| **Sodium peroxide** | Alcohols |  |  |  |  |  |  |
| Glacial acetic acid, acetic anhydride |  |  |  |  |  |  |
| Benzaldehyde |  |  |  |  |  |  |
| Carbon disulphide |  |  |  |  |  |  |
| Organic compounds (e.g. ethylene glycol) |  |  |  |  |  |  |
| **Sulphide compounds** | Acids |  |  |  |  |  |  |
| **Sulphuric acid** | Potassium chlorate / perchlorate |  |  |  |  |  |  |
| Potassium permanganate (or similar) |  |  |  |  |  |  |
| Metals |  |  |  |  |  |  |
| Hypochlorite compounds |  |  |  |  |  |  |

**Colour Key:**

**Violent / Exothermic Reaction**

**Flammable gas generated**

**Fire / Spontaneous ignition**

**Unstable / Explosive Compound Formed**

**Toxic substance produced**

**Toxic gas generated**

**Notes:**

1. Carbon dioxide fire extinguishers should not be used on alkali metal fires as they will tend to increase the severity of the fire.
2. Chlorine dioxide (an explosive gas) is a by-product of this reaction
3. Explosive mixtures formed with turpentine, diethylether and many other organic liquids
4. For example lithium aluminium hydride will react vigorously with protic solvents such as alcohols
5. Avoid friction and store at reduced temperature