

Oxidising Agents

Certain chemicals, which do not burn themselves, can support combustion because they contain a relatively high proportion of oxygen.

These chemicals are called **oxidising agents**. They decompose on heating to liberate oxygen or readily react with combustible materials providing oxygen.

In a fire, at high temperatures, they are extremely hazardous, because they may cause combustible materials to ignite, and burning may continue without an external source of oxygen such as air.

Concentrated nitric acid, HNO_3 is a powerful oxidising agent and reacts vigorously with many organic (carbon-containing) compounds such as wood, paper, and alcohol. Sawdust or wood chips should not be used to soak up this acid. Nitric acid attacks metals such as brass steel and copper (aluminium-lined tankers are used for transport).

Nitric acid is used in the manufacture of explosives such as nitroglycerine, nitrocellulose, T.N.T. (trinitrotoluene). In each of these, the nitro-group provides the oxidising part of the molecule.

At high temperatures (such as in a fire) nitric acid decomposes to give oxygen O_2 (which supports combustion) and nitrogen dioxide NO_2 (which is highly toxic).

The nitrates are also good oxidising agents. Sodium nitrate, NaNO_3 in the molten state is used for heat treatment of metals. The liquid nitrate salt is extremely hazardous at this temperature if it comes in contact with combustible materials. NaNO_3 is also hygroscopic, that is, it absorbs water from materials such as wood, leaving it in a state which is readily combustible.

Ammonium nitrate, NH_4NO_3 is used widely as an agricultural fertiliser and is found in large quantities as such.

All nitrates break down on heating to give O_2 and/or NO_2 (or N_2O)

Ammonium nitrate breaks down explosively at high temperatures to form N_2O .

Other examples of oxidising agents are:

- Chlorates e.g. NaClO_3 KClO_3 (used as weed killers)
- Permanganate's e.g. KMnO_4 (condies crystals)
- Chromates and dichromate's. e.g K_2CrO_4 K_2CrO_7
- Concentrated sulphuric acid H_2SO_4
- Hypochlorites e.g. NaOCl (bleach) and CaOCl_2 (H.T.H. or granulated 'chlorine' used for swimming pools)
- Peroxides e.g. H_2O_2 hydrogen peroxide.
 Na_2O_2 sodium peroxide
 $(\text{CH}_3)_2\text{O}_2$ dimethyl peroxide (an -organic- peroxide)

The peroxides all contain the -O-O- group,

e.g. H-O-O-H
 Na-O-O-H
 $\text{CH}_3\text{-O-O-CH}_3$

This oxygen is easily liberated, making these compounds good oxidising agents

Summary:

- Oxidising agents are substances which are able to support combustion.
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- Many of these give off oxygen when they are heated.
- They are hazardous in a fire because they cause burning to take place much more rapidly.
- Contact with a combustible material may be explosive.
- Nitric acid and the- nitrate salts are strong oxidisers commonly found in industry-
- They are hazardous because they liberate oxygen and toxic oxides of nitrogen on heating-
- Other strong oxidising agents are:
 - Chlorates
 - Permanganate's
 - Chromates
 - Chlorine
 - Concentrated sulphuric acid
 - Hypochlorites (H.T.H.)
 - Peroxides

