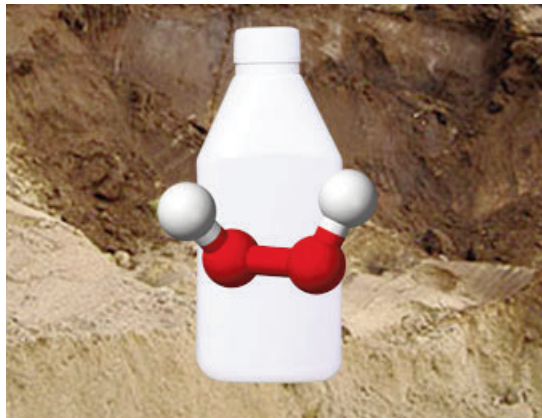


## Hydrogen peroxide



**ENVIRO**perox

**Hydrogen peroxide or peroxide is a strong oxidant used in in situ chemical oxidation (ISCO) processes for the treatment of contaminated soil and groundwater. Hydrogen peroxide produces hydroxyl radicals (OH •) that rapidly acts to destroy oil pollutants through an exothermic reaction.**

### Features

Hydrogen peroxide is an oxidant widely used in ISCO projects at hydrocarbon contaminated sites. When injected into groundwater, hydrogen peroxide is unstable and reacts with organic pollutants and subsurface materials. It decomposes into oxygen and water a few hours of its introduction into groundwater that generates heat in the process. The reagent is typically shipped to a remediation site in liquid form at concentrations ranging from 5% to 30%.

The high reactivity of hydrogen peroxide can limit its distribution in the subsoil, acting locally with a reduced radius of action. Hydrogen peroxide is particularly effective when it reacts with ferrous iron ( $Fe^{2+}$ ) producing a Fenton reaction.

Ferrous iron can be naturally present in subsurface soils and / or groundwater, or it can be added as a catalyst along with hydrogen peroxide to produce this aggressive chemical reaction.

Fenton's reagent requires soluble  $Fe^{2+}$  to form  $OH \bullet$ . This optimal reaction occurs under relatively low pH conditions (e.g., pH 2 to 4). adjusting the pH in the treatment area is often necessary to allow the oxidation process to proceed efficiently. This can be accomplished by acidifying the hydrogen peroxide or adding a chelating acid.

### Advantages

- Potential to complete remediation processes in short times.
- Ability to oxidize benzene and methyl tert-butyl ether (MTBE).
- Increases the level of dissolved oxygen in water allowing subsequent aerobic biodegradation.

Likewise, the use of hydrogen peroxide can cause uncontrollable exothermic reactions, can generate undesirable by-products and requires special attention in the handling and storage of the oxidant.



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# Hydrogen peroxide

## Applications

Hydrogen peroxide in contact with organic compounds produces hydroxyl ions which are very powerful oxidants. Hydroxyl radicals break the petroleum hydrocarbon bonds of common petroleum components such as benzene, toluene, ethylbenzene, and xylene.

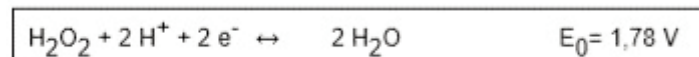
## Operation

The chemical reactions associated with the application of hydrogen peroxide in the subsoil are complex and take place both through the direct transfer of electrons and through the formation of radicals, giving rise to different chain reactions. Some examples:

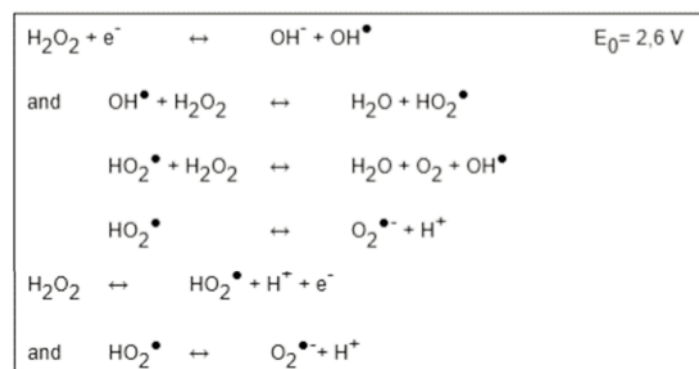
### Radical formation

The theoretical degradation products with complete oxidation (H<sub>2</sub>O, O<sub>2</sub> and CO<sub>2</sub>) are harmless and are naturally present in the soil. Under less than ideal conditions, chemical oxidation can generate intermediate degradation products or by-products that can be toxic.

### Direct oxidation



### Radical formation



PARAMETER	TYPICAL VALUE	UNITS
Formula	H <sub>2</sub> O <sub>2</sub>	-
Appearance	Colourless solution	-
Molecular weight	34	g/mol
Density	1,45	g/mL
Vapour pressure	23 (35%)	mmHg
pH	11,3 – 12,1	-
Water solubility	100 mg/100 ml	-
Viscosity	1,06	mm <sup>2</sup> /s

## Warnings and recommendations

The reagent must be handled with care. Protective equipment during handling should include face shields and / or goggles, rubber or plastic gloves, and rubber or plastic apron. If clothes look stained, wash immediately; spontaneous ignition can occur with cloth or paper. In cases of significant exposure, use the appropriate NIOSH-MSHA dust or mist respirator. For more details do not hesitate to consult our SDS.

## Storage

Avoid contact with acids, peroxides, and all combustible or easily oxidizable organic materials, including inorganic oxidizable materials and metal powders. With hydrochloric acid, chlorine gas is released. Hydrogen peroxide is neither explosive nor oxidizing. It can decompose if exposed to heat. For more details do not hesitate to consult our SDS.

## Delivery format

20 L drum (30%).



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