

B.Sc. (Honours) Part-I
Paper-IB

Topic: H_2O_2 : preparation, properties, structure and uses

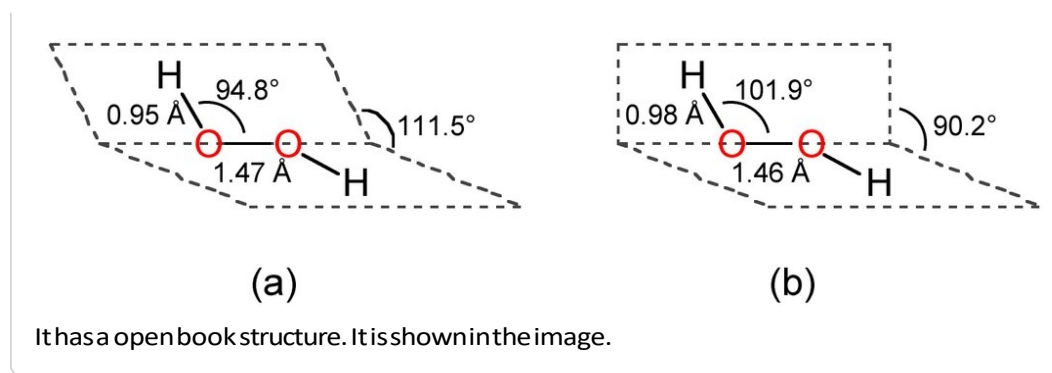
UG
Subject-Chemistry

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H₂O₂: preparation, properties, structure and uses

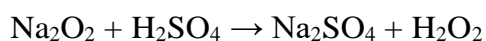
Hydrogen peroxide is the simplest kind of peroxide available (oxygen-oxygen single bond). It is a colorless liquid and is used in aqueous solution for safety reasons. It acts as a bleaching agent and is also used as a disinfectant. Concentrated hydrogen peroxide is a very reactive oxygen species and is used as a propellant in rocketry. The chemical formula for hydrogen peroxide is H₂O₂.

STRUCTURE OF HYDROGEN PER OXIDE:



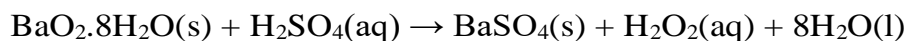
PREPARATION OF HYDROGEN PER OXIDE -

From sodium peroxide:



From Barium peroxide:

(a) By the action of dilute sulphuric acid:



(b) By the action of carbon dioxide: $\text{BaO}_2 + \text{H}_2\text{O} + \text{CO}_2 \rightarrow \text{BaCO}_3 + \text{H}_2\text{O}_2$

(c) By the action of phosphoric acid: $3\text{BaO}_2 + 2\text{H}_3\text{PO}_4 \rightarrow \text{Ba}_3(\text{PO}_4)_2 + 3\text{H}_2\text{O}_2$

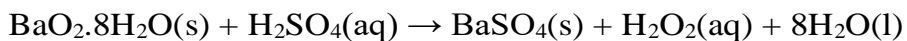
MERCK'S METHOD

Sodium peroxide is gradually added to an ice-cold solution of 20% H_2SO_4 .
$$\text{Na}_2\text{O}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + \text{H}_2\text{O}_2$$

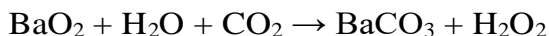
Upon cooling, crystals of $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ separates out and the resulting solution contains 30% H_2O_2 .

PREPARATION OF HYDROGEN PEROXIDE FROM BARIUM PEROXIDE

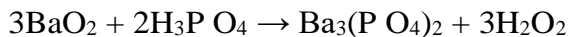
By the action of dilute sulphuric acid:



By the action of carbon dioxide:



By the action of sulphuric acid:



LIMITATION OF PREPARATION OF HYDROGEN PEROXIDE

H_2O_2 prepared from barium peroxide (laboratory method of preparation) contains appreciable amount of Ba^{2+} ions which catalyse the decomposition of H_2O_2 . Therefore, hydrogen peroxide cannot be stored for a long time. It is unstable and also explosive, so it is usually preserved in water solution.

PHYSICAL PROPERTIES OF HYDROGEN PEROXIDE

- 1) Hydrogen peroxide is colorless and odorless liquid.
- 2) It is bitter in taste.
- 3) Pure H_2O_2 is thick syrupy liquid with pale blue colour.
- 4) It is completely miscible with water, alcohol and ether in all proportion.

CHEMICAL PROPERTIES OF HYDROGEN PEROXIDE

1. **Decomposition:** Pure H_2O_2 is unstable in nature, hence it decomposes into water and oxygen.



2. **Acidic nature:** It turns blue litmus red but its dil. solution is neutral to litmus. The acidic nature of H_2O_2 is shown by its neutralization reactions with hydroxides.

3. **Oxidising and reducing nature:**

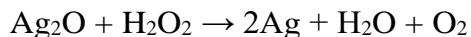
It oxidises lead sulphide to lead sulphate (in neutral solution)

It oxidizes acidified ferrous sulphate to ferric sulphate (in acidic medium)



4. In the presence of other oxidizing agents, hydrogen peroxide acts as a reducing agent.

This is because it can take up an atom of oxygen to give water and oxygen gas.



Uses of Hydrogen Peroxide

Hydrogen peroxide is used as an antiseptic.

It is used in the preservation of wine and milk.

Our white blood cells produce hydrogen peroxide to kill bacteria.

It is used to clean stains from sensitive fabrics and clothes.

Soaking feet in water mixed with H_2O_2 for 15 min every day for a week will help to get rid of fungus

Plant growth can be sustained by sprinkling mixture of hydrogen peroxide and water in equal amounts

The textile and paper industry use it as a bleaching agent.

It is used for the synthesis of tartaric acid, food products, and many pharmaceuticals.

It is used in the manufacture of chemicals which in turn are used in making of high-quality detergents.

The most significant use of H_2O_2 is in environmental chemistry where it is used in pollution control treatment of domestic waste and industrial effluents.

Highly concentrated Hydrogen Peroxide is used as rocket propellant.