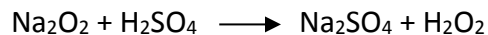


Hydrogen Peroxide (H₂O₂): -

Hydrogen peroxide was discovered by J. L. Thenard in 1818. It is also called as oxygenated water. It is prepared by: -

(i) Merck's Method: -

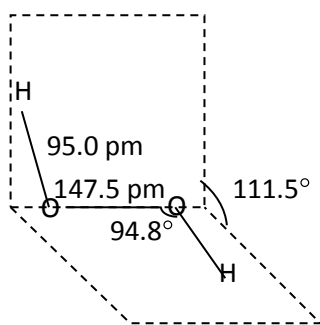


(ii) Lab. Method: -

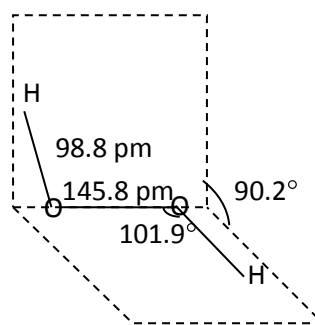


Structure of H₂O₂: -

It has a non-planar open book (skew) structure. The O – H bond length is 95.0 pm and O – O bond length is 147.5 pm. The H – O – O bond angle is 94.8° and the dihedral angle is 111.5° in gas phase. The bond lengths and angles are slightly changed in liquid and solid phases due to hydrogen bonding. The bond angle between the two phases reduces to 90.2° in the crystalline state.



(a) Gas phase



(b) Solid phase

Properties of H₂O₂: -

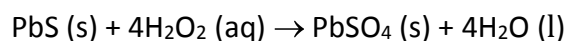
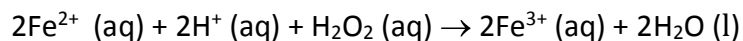
Physical Properties:-

- (i) H₂O₂ is syrupy liquid due to H – bonding. It is odourless.
- (ii) It is soluble in water, alcohol and ether.
- (iii) It has bitter taste and injurious to skin.
- (iv) It boils at 152°C and freezes at –89°C.

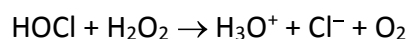
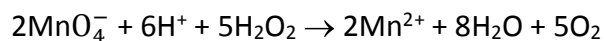
Chemical Properties: -

It acts as an oxidizing as well as reducing agent in both acidic and alkaline media. Some important reactions are given below:

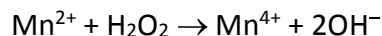
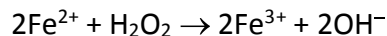
(i) Oxidizing action in acidic medium



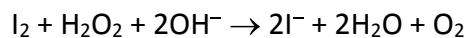
(ii) Reducing action in acidic medium



(iii) Oxidizing action in basic medium



(iv) Reducing action in basic medium



Storage of H₂O₂: -

H₂O₂ is not stored in glass bottles since the alkali oxides present in glass catalyse its decomposition. It is, therefore, stored in paraffin wax coated plastic or Teflon bottles. Small amounts of acid, glycerol, alcohol, acetanilide and H₃PO₄ are often used as stabilizers to check its decomposition.

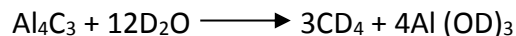
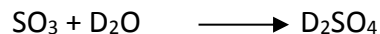
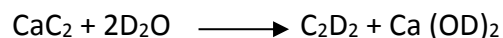
Uses of H₂O₂: -

- (i) In daily life it is used as hair bleach and as a mild disinfectant. As an antiseptic it is sold in the market as perhydrol.
- (ii) It is employed in the industries as a bleaching agent for textiles, paper pulp, lather, oils, fats etc.
- (iii) It is also used in Environmental chemistry.

Heavy water, D₂O: -

Heavy water is produced by repeated electrolysis of ordinary water. It is used as a moderator in nuclear reactors.

Heavy water reacts with many compounds to form deuterium compounds. For example:



Hydrogen Economy: -

The production, transportation and storage of energy in the form of liquid hydrogen in bulk quantities and then use of liquid hydrogen as an alternate source of energy as a fuel in industry, power plants, in homes and motor vehicles is referred to as hydrogen economy.

Hydrogen economy has many advantages such as the products of combustion in just water, there is absence of polluting emissions like CO, CO₂, NO_x, SO₂, hydrocarbons, lead compounds etc. there is release of greater energy per unit weight of fuel and very high efficiency (70 – 85%) fuel cells using H₂ and O₂.

Advantages of hydrogen as an automobile fuel:-

- (i) It produces greater energy per unit mass of fuel due to high calorific value.
- (ii) It is pollution free.
- (iii) Internal combustion engines can be easily modified for use of hydrogen as a fuel.