

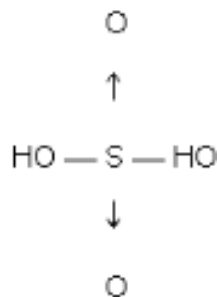
Study of Compounds – Sulphuric Acid

Sulphuric Acid

Molecular formula: H_2SO_4

Relative molecular mass: 98

Structure:



General Methods of Preparation

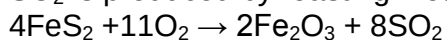
- By the action of heat on nitric acid and sulphur.
 $\text{S} + 6\text{HNO}_3 \rightarrow 6\text{NO}_2 + 2\text{H}_2\text{O} + \text{H}_2\text{SO}_4$
- By passing chlorine through an aqueous solution of sulphur trioxide.
 $\text{Cl}_2 + \text{SO}_2 + 2\text{H}_2\text{O} \rightarrow 2\text{HCl} + \text{H}_2\text{SO}_4$
- By dissolution of sulphur trioxide in water.
 $\text{SO}_3 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_4$
- By hydrolysis of sulphuryl chloride.
 $\text{SO}_2\text{Cl}_2 + 2\text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_4 + 2\text{HCl}$

Manufacture of Sulphuric Acid [Contact Process]

Steps involved in the contact process

(1) Production of sulphur dioxide

SO_2 is produced by roasting metallic sulphides in air.

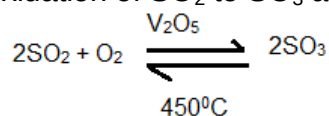


(2) Purification of gases

To enhance the efficiency of a catalyst, various impurities present in the mixture of sulphur dioxide and air are first removed.

(3) Catalytic oxidation of sulphur dioxide

Oxidation of SO_2 to SO_3 at 450°C in the presence of catalyst vanadium pentaoxide.



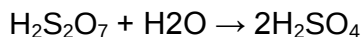
(4) Absorption of sulphur trioxide in sulphuric acid

Sulphur trioxide vapours are absorbed by a stream of conc. sulphuric acid.



(5) Dilution of oleum to obtain sulphuric acid

A calculated amount of water is added to obtain sulphuric acid of desired strength.



Properties of Sulphuric Acid

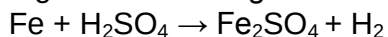
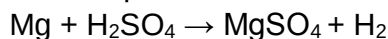
(A) Physical Properties

- Colourless, odourless with slight sour taste.
- It is highly corrosive in nature and chars the skin black.
- It is heavier than water and soluble in water.
- Boiling point is 338°C, and melting point is 10.4°C.

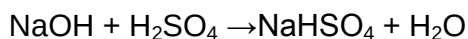
(B) Chemical Properties

Properties of Dilute Sulphuric Acid

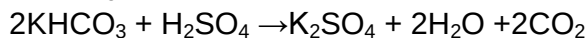
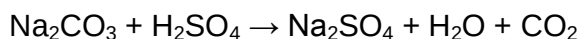
- Dilute sulphuric acid reacts with metals to form metallic sulphate and hydrogen.



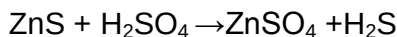
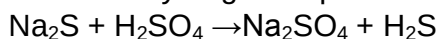
- It neutralises bases to form salts and water.



- It liberates carbon dioxide from metallic carbonates and bicarbonates.



- It evolves hydrogen sulphide from metal sulphides.



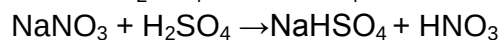
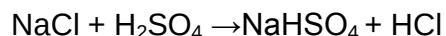
- It evolves sulphur dioxide from sulphites and hydrogen sulphites.



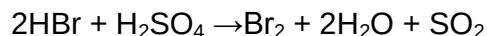
Properties of Conc. Sulphuric Acid

▪ Non-volatile nature

It has a high boiling point so it is used to prepare volatile acids such as HCl, HNO₃ and acetic acid from their salts.

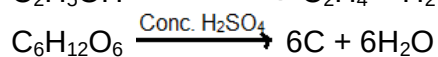
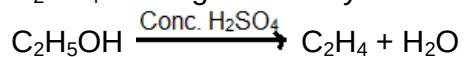


▪ As an oxidising agent



- **As a dehydrating agent**

H_2SO_4 has a great affinity for water, and therefore, it acts as a dehydrating agent.



Uses of Sulphuric Acid

- In the preparation of halogens, CO, CO_2 and SO_2 .
- Extraction of metals: Leaching of metallic compounds produces sulphates which give the metal in pure form on electrolysis.
- Pickling of metals: Removes metallic impurities from the surface of metals before galvanising.
- Industrial uses:
 - i. In the manufacture of fertilisers such as ammonium sulphate $[(\text{NH}_4)_2\text{SO}_4]$ and superphosphate of lime $[\text{Ca}(\text{H}_2\text{PO}_4)_2 + \text{CaSO}_4]$.
 - ii. In the manufacture of explosives such as trinitrotoluene and picric acid.