

Hydrogen Sulphide

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Hydrogen Sulphide

Hydrogen sulphide is the hydride of sulphur, just as water is the hydride of oxygen.

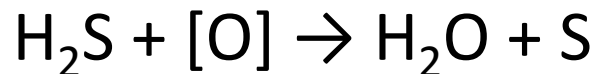
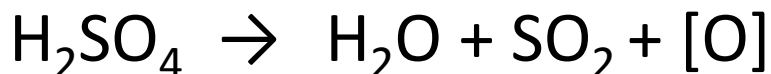
Lab Preparation

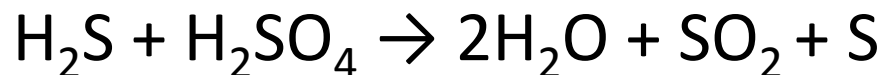
Principle:

Hydrogen sulphide is prepared by the action of dilute sulphuric acid on iron sulphide.



Conc. sulphuric acid cannot be used for the preparation of hydrogen sulphide because this acid behaves as an oxidising agent and oxidizes H_2S to sulphur.





Lab preparation...contd.

A woulf bottle is fitted with a thistle funnel and a delivery tube as shown in figure. Pieces of ferrous sulphide are place in the bottle and dil. H_2SO_4 is run down through the funnel. The H_2S gas is run down through the funnel. The H_2S gas is formed and collected in a gas jar by upward displacement of air.

Lab preparation contd..

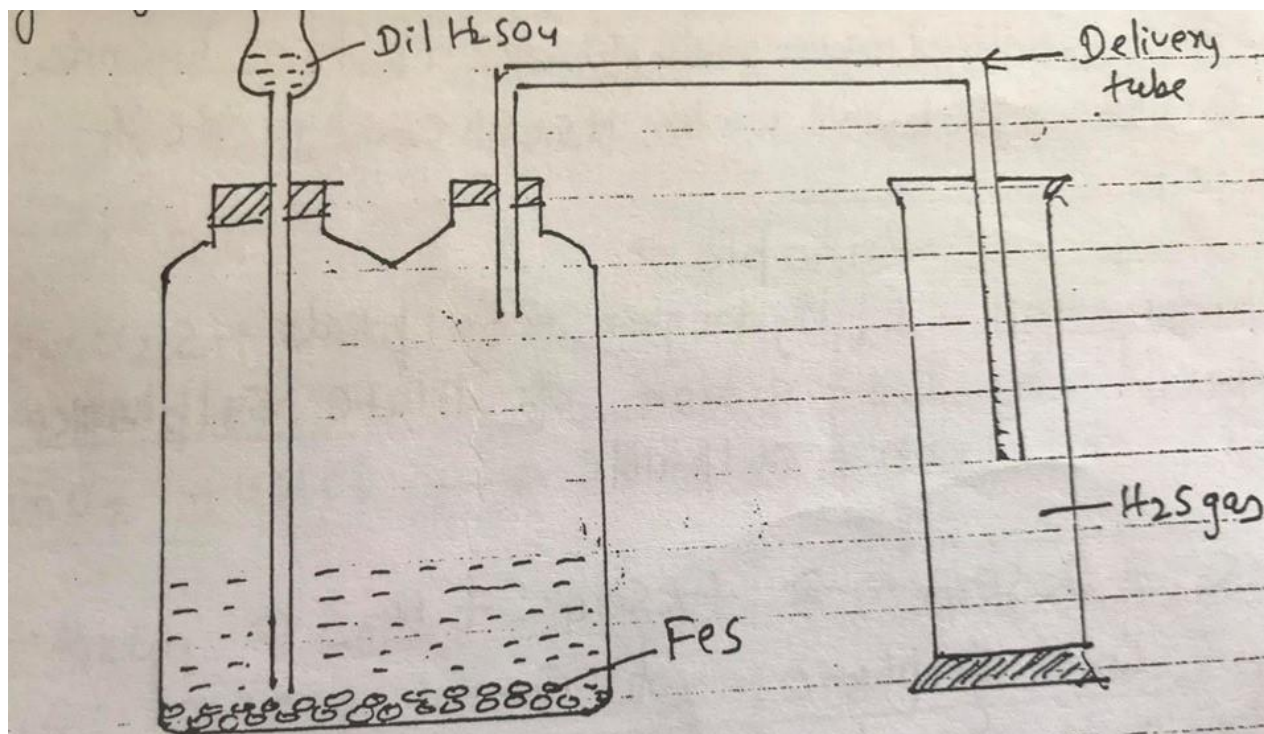


Fig - Lab prepⁿ of H_2S gas.

Kipp's Apparatus

For analytical purposes H_2S gas is required intermittently in the lab in small quantities. Kipp's apparatus consists of two parts.

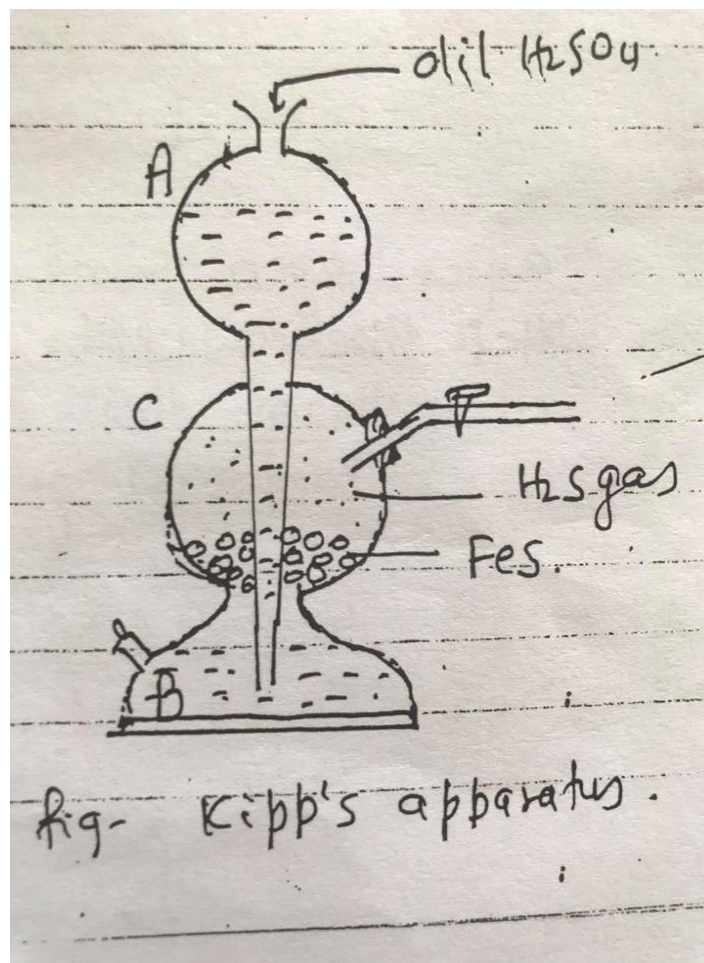
- i) Bulb A with a long stem and
- ii) the base with two communicating bulb B and C.

The stem of the bulb A reaches the bottom of C and is placed air tight into neck of B. pieces of iron sulphide (FeS) are introduced poured into the central bulb 'B' and dilute H_2SO_4 poured into the upper bulb A till the pieces of FeS are just covered by the acid with the tap open. The acid reacts with FeS producing H_2S gas.

Kipp's Apparatus ...contd

When the tap is closed the gas evolves for a while and very soon the pressure developed in the central bulb forces the acid up into the upper bulb A, resulting breaking of the contact between the acid and FeS. The gas ceases to evolve until the tap is opened again.

Kipp's Apparatus...



Properties

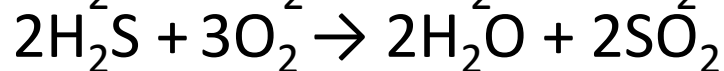
Physical Properties

- i) It is colourless gas having an unpleasant smell resembling that of rotten eggs.
- ii) It is fairly soluble in water.
It is heavier than air.
- iii) Boiling point $\rightarrow -60.7^{\circ}\text{C}$
Freezing point $\rightarrow -85.6^{\circ}\text{C}$
- iv) The gas is poisonous in nature, it produces headache when inhale in small quantities but may cause death when breathed for a long time.

Chemical properties

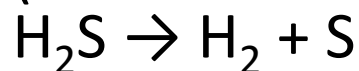
i) Combustibility

It is combustible but not a supporter of combustion. It burns with a blue flame depositing sulphur in a limited supply of air.



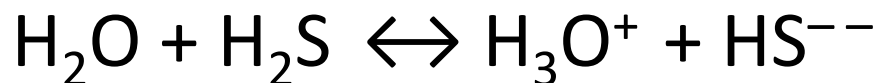
ii) Thermal dissociation

It is stable at room temperature. When heated strongly (310°C to 1700°C), it decomposes to hydrogen and sulphur.

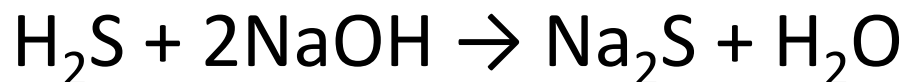


iii) Acidic Character

- a) It turns moist blue litmus to red
- b) H_2S behaves as a diprotic acid and ionizes in two stages.



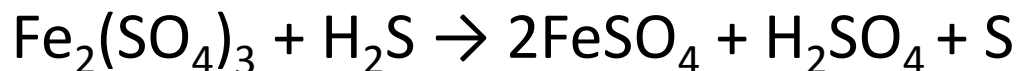
- c) It forms salts with alkalies.



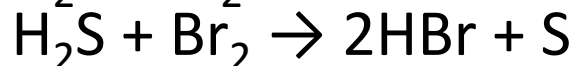
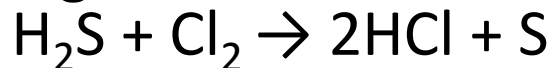
iv) Reducing Character

H₂S is a good reducing agent. This is because the S⁻² ion loses 2 electrons to another species thus reducing it and is itself oxidised to free sulphur.

a) Ferric salts reduced to ferrous salts.



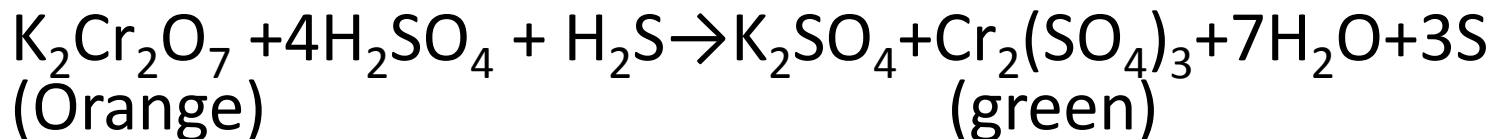
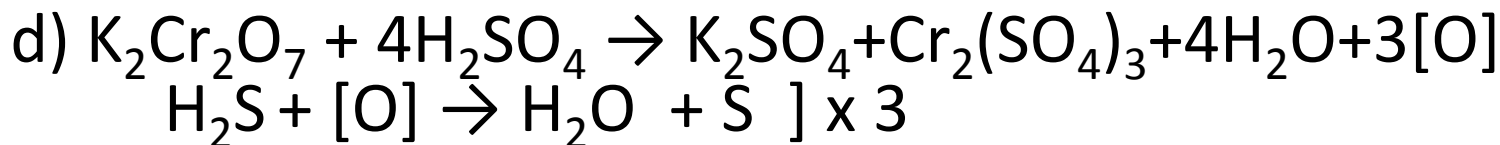
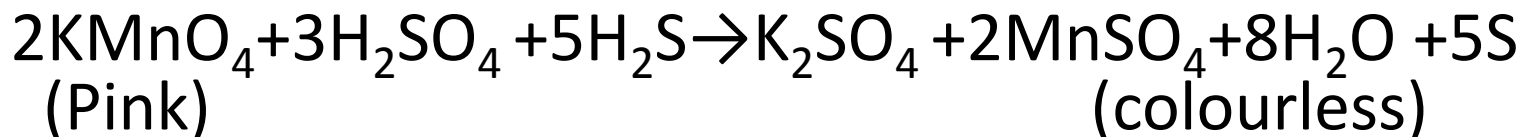
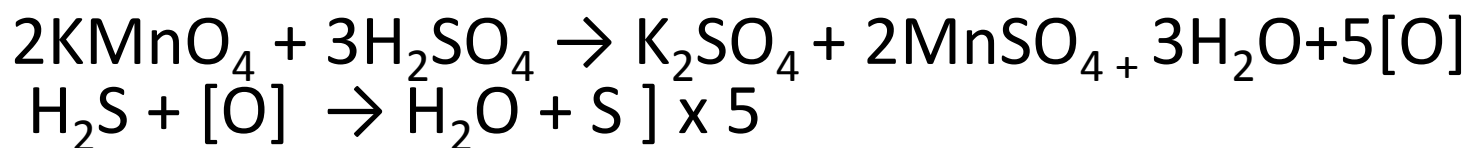
b) Halogens are reduced to their corresponding halogen acids.



Reducing properties of H₂S

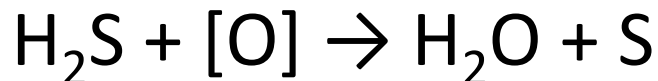
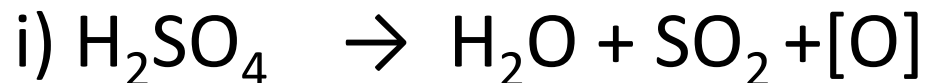
contd..(Very Important)

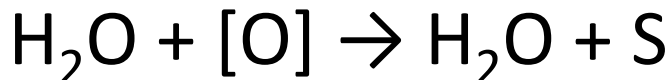
c) It reduces acidified solutions of Pot. permanganate and pot. dichromate.



Reducing properties of H_2S contd..

f) It reduces H_2SO_4 to SO_2 and HNO_3 to NO_2 .



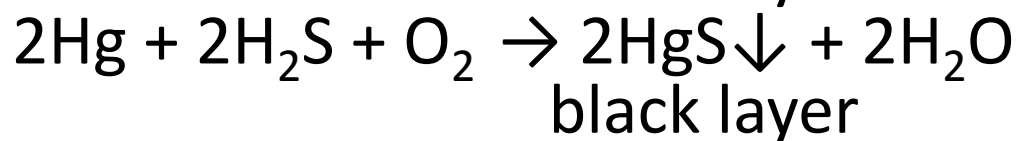
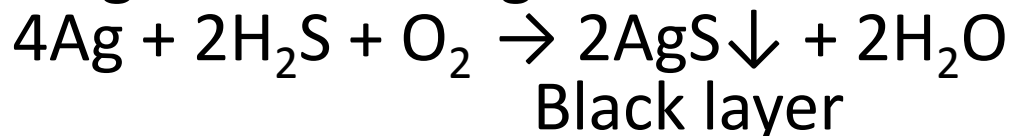




Test of H₂S

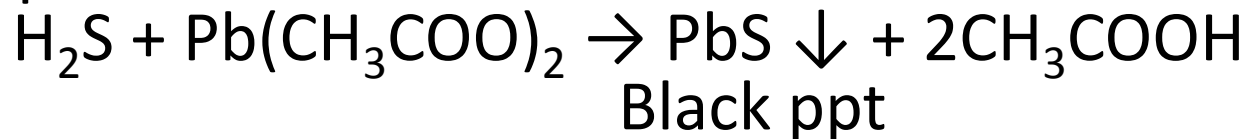
v)

a) Ag and Hg loss their luster with H₂S giving with H₂S giving black coating.



b)Action on lead Acetate

H₂S gas when pass to solution of lead acetate, black ppt formed.

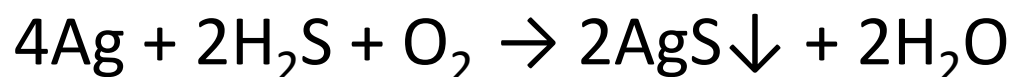


vi) Action on Metals

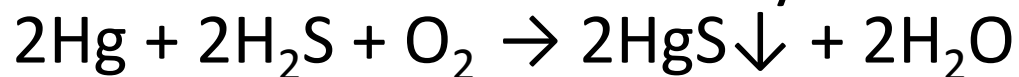
H₂S reacts with alkali metal, alkaline earth metals, Sn, Pb and Zn forming their sulphides and H₂.



Ag and Hg loss their luster with H₂S giving with H₂S giving black coating.



Black layer



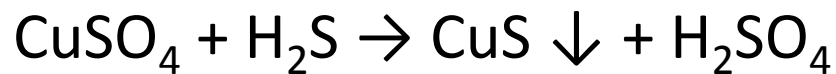
black layer

vii) Precipitation of metal sulphides or Uses in qualitative analysis

The gas precipitates many metals from their sulphides from their salt solutions as their sulphides under different conditions. From the colours of their precipitates, very useful is obtained towards the identification of metal ions. The metal ions of group (ii) and group (iii)B in the group separation table of the qualitative analysis are separated as their sulphides.

a) Group 'II' Cations (In Acidic Medium)

When H_2S gas is passed through salt solutions acidified with dil. hydrochloric acid, certain metals are precipitated as their sulphides.



$\text{CuS}, \text{HgS}, \text{PbS} \rightarrow \text{Black}$

$\text{Bi}_2\text{S}_3 \rightarrow \text{Brown}$

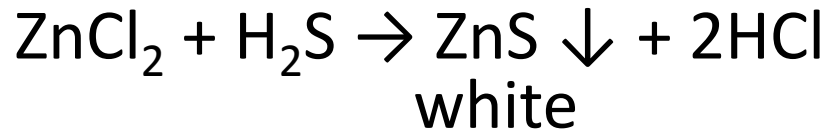
$\text{As}_2\text{S}_3, \text{CdS} \rightarrow \text{Yellow}$

$\text{Sn}_2\text{S}_2 \rightarrow \text{Dirty yellow}$

$\text{Sb}_2\text{S}_3 \rightarrow \text{Orange}$

$\text{Sn}_3\text{S} \rightarrow \text{Chocolate brown}$

b) Group 'III'B Cations (In alkaline medium or ammoniacal solution)



$\text{MnS} \rightarrow$ Flesh coloured (pink)

$\text{CoS} \rightarrow$ Black

$\text{NiS} \rightarrow$ Black

Uses

- i) It is extensively used as a lab reagent in qualitative analysis.
- ii) It is used in the preparation of metallic sulphides which in turn are used as pigments
- iv) It is used for reduction purposes.