To Prepare Ferric Hydroxide, [$Fe(OH)_3$] Sol

Theory

Ferric hydroxide forms a lyophobic sol. The substances such as metal hydroxides or sulphides which are insoluble and do not readily give colloidal solutions on treatment with water are called lyophobic colloids.
Ferric hydroxide sol is prepared by the hydrolysis of ferric chloride with boiling distilled water. The reaction that takes place can be represented as

$$\underset{\text{Ferric chloride}}{FeCl_3(aq)} + 3H_2O(l) \xrightarrow{\text{Boil}} \underset{\text{Red sol}}{Fe(OH)_3(s)} + 3HCl(aq)$$

The hydrolysis reaction produces insoluble ferric hydroxide particles which undergo agglomerisation to yield bigger particles of colloidal dimensions. These particles adsorb Fe^{3+} ions preferentially from the solution to give positive charge to the sol particles. Stability of the sol is due to the charge on the sol particles. Hydrochloric acid which is produced during hydrolysis tries to destabilize the sol and hence it must be removed from the sol by dialysis process otherwise sol will not be stable.

Apparatus

Conical flask (250 ml), beaker (250 ml), a boiling-tube, glass-rod, funnel, round-bottom flask, iron stand with a clamp, wire-gauze, tripod-stand, burner and a burette or a dropper.

Materials Required

2% solution of ferric chloride (prepared by dissolving 2 g of pure $FeCl_3$ in 100 ml distilled water) and distilled water.

Procedure

1. Take a 250 ml conical flask and clean it by steaming-out process as shown in Fig.

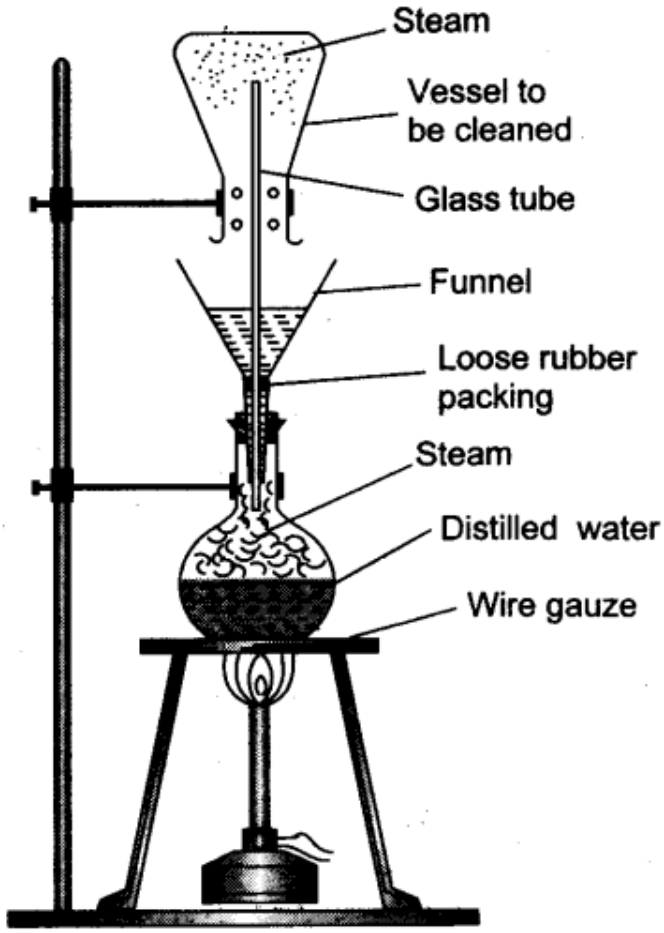

Fig. Steaming-out process for cleaning conical flask.

2. To this cleaned flask, add 100 ml of distilled water and heat it to boil by placing the flask on a wire-gauze.
3. Add ferric chloride solution drop wise (by the use of a burette or a dropper) to the boiling water.
4. Continue heating until deep red or brown solution of ferric hydroxide is obtained. Replace the water lost by evaporation during boiling at regular intervals.
5. Keep the contents of conical flask undisturbed for sometime at room temperature. Label the solution as “ferric hydroxide sol”.

Precautions

1. Since ferric hydroxide sol is affected by impurities, the apparatus required for the preparation of sol should be thoroughly cleaned by steaming-out process.
2. Add ferric chloride solution drop wise.
3. Heating is continued till the desired sol is obtained.
4. Hydrochloric acid formed as a result of hydrolysis of ferric chloride is removed by dialysis process otherwise it would destablise the sol.