To Study the Dialysis Of Starch Sol Containing Sodium Chloride through a Cellophane Or Parchment Paper

Theory

The purification of sols by dialysis is based upon the fact that while the colloidal particles cannot pass through cellophane or parchment membrane, the ions of an electrolyte can readily do so.

Apparatus

A 400 ml beaker, a funnel with a long stem, cellophane or parchment membrane, dropper, test- tubes and iron-stand.

Materials Required

Starch sol containing sodium chloride, $AgN0_3$ solution, iodine solution.

Procedure

1. Take a parchment membrane and fold it into the shape of a bag. Then tie it to the end of the stem of a funnel by means of rubber band or a thread (Fig).

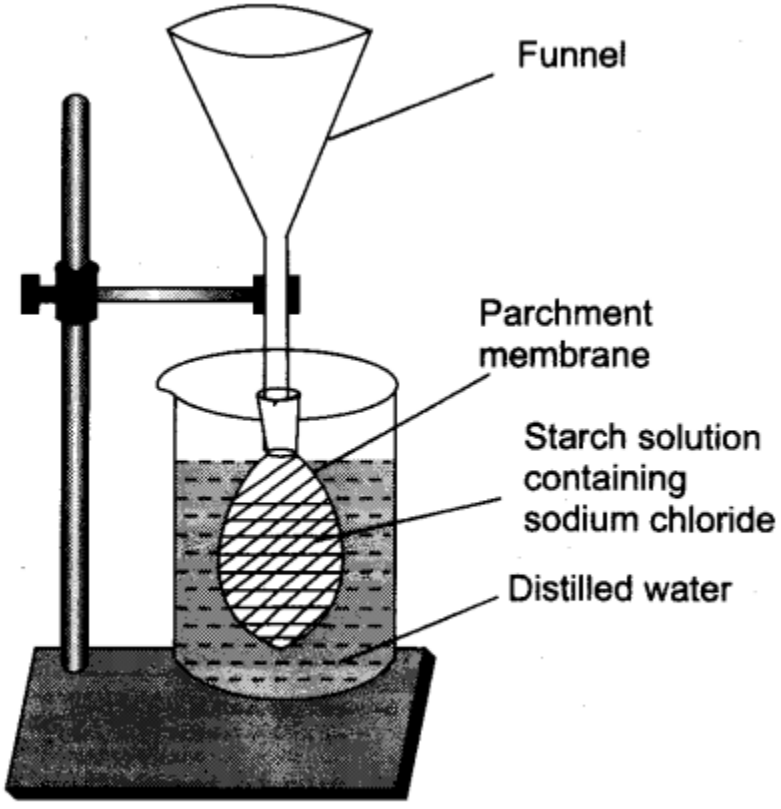

Fig. Purification of starch sol by dialysis.

2. Add the given starch sol containing sodium chloride into the parchment bag through the funnel till two-third of the bag is full.
3. Take a 400 ml beaker and fill it three-fourth with distilled water. Place it over an iron-stand, dip the parchment bag into distilled water and fix the funnel in position by means of a clamp.
4. Allow to it stand for about half an hour.
5. Then, withdraw about 1 ml of water from the beaker with the help of a dropper and transfer it to a test tube. Add to it a few drops of iodine solution. No blue colour appears. This indicates the absence of starch in water. Thus, it follows that starch molecules do not diffuse through parchment paper.
6. Now withdraw another 1 ml of water from the beaker and transfer it to another test tube. Add to it a few drops of $AgN0_3$ solution. A white ppt of AgCl is produced immediately. This shows presence of chloride ions and hence sodium chloride in water. It follows that Na^+ and Cl^- diffuse through the parchment paper. As Na^+ and Cl^- diffuse out of the starch sol, it gets free from the ions gradually.
7. In order to check whether sodium chloride is completely removed or not replace the water in the beaker by fresh distilled water and again place the parchment bag containing sol in it. After about 10 minutes, test for the presence of Cl^- ions. If the Cl^- ions are absent dialysis is complete, otherwise the sol still contains Cl^- ions and therefore the dialysis should be continued.

Precautions

1. Fill only two-third of the cellophane/parchment bag with sol.
2. There should be no leakage of sol from the bag into the beaker.
3. Use distilled water for dialysis.

Coagulation or Precipition of Colloidal Solutions

Presence of small concentrations of appropriate electrolytes is necessary to stabilize the colloidal solutions. However, if the electrolytes are present in higher concentration then the ions combine with charged colloidal particles and neutralize them. Now these colloidal particles may unite together to form bigger particles which are then precipitated. The precipitation of a colloid through induced aggregation by the addition of some suitable electrolyte is called coagulation or flocculation.
The coagulation of a colloidal solution by an electrolyte does not take place until the , added electrolyte has certain minimum concentration in the solution. The minimum concentration of an electrolyte in millimoles per litre of the mixed solution, required to cause coagulation of a particular sol is called the coagulation or precipitation value of the electrolyte for the sol.

Different electrolytes have different coagulation values. The coagulating behaviour of various electrolytes was studied in detail by Hardy and Schulze. They observed that:

1. The ions carrying charge opposite to that of sol particles are effective in causing the coagulation of the sol.

2. Coagulation power of an electrolyte is directly proportional to the valency of ion causing coagulation.
   Thus, for the coagulation of sols carrying negative charge (like As_2S_3 sol), Al^{3+} ions are more effective than Ba^{2+} or Na+ ions. Similarly, for the coagulation of sols carrying positive charge (such as $Fe(OH)_3$sol) PC_4^{3-} ions are more efficient than $S0_4^{2-}$ or Cl^- ions. The two observations given above are collectively called Hardy-Schulze rule.

Coagulation of colloidal solutions can also be achieved by the following methods:

1. By mutual precipitation. When two oppositely charged sols (such as of $Fe(OH)_3$ and AS_2S_3) are mixed in equi-molar proportions, they neutralize each other and get coagulated.
2. By electrophoresis. We know that during electrophoresis the sol particles move to wards the oppositely charged electrodes. If the process is carried for a long time, the particles will touch the electrode, lose their charge and get coagulated.
3. By repeated dialysis. The stability of colloidal sols is due to the presence of a small amount of electrolyte. If the electrolyte is completely removed by repeated dialysis, the sol will get coagulated.
4. By heating. The sol may be coagulated even by simple heating.