B.Sc. (Honours) Part-I

Paper-IA

Topic: Purification of Colloids

UG

Subject-Chemistry

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Purification of colloids

When a colloidal solution is prepared it contains certain impurities. These impurities are mainly electrolytic in nature and they tend to destabilise the colloidal solutions. Therefore colloidal solutions are purified by the following methods:

(a) Dialysis

(b) Electrodialysis

(c) Ultra – filtration

(d) Ultra – centrifugation

(a) Dialysis: The process of dialysis is based on the fact that colloidal particles cannot pass through parchment or celloplane membrane while the ions of the electrolyte can. The colloidal solution is taken in a bag of cellophane which is suspended in a tub full of fresh water. The impurities diffuse out leaving pure coloidal solution in the bag. This process of separating the particles of colloids from impurities by means of diffusion through a suitable membrane is called dialysis.

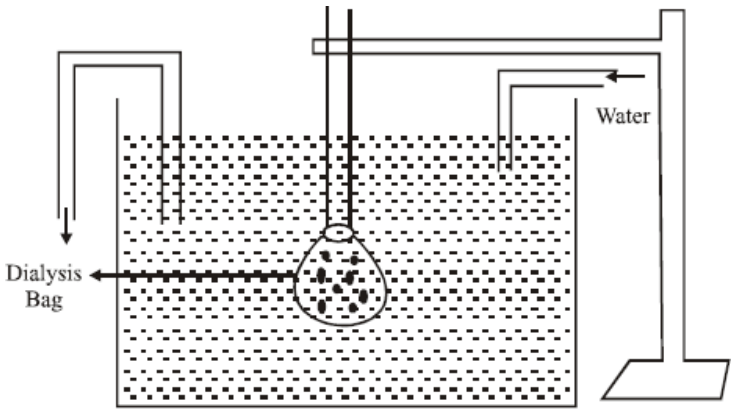

Figure: dialysis

(b) Electro-dialysis: The dialysis process is slow and to speed up its rate, it is carried out in the presence of an electrical field. When the electric field is applied through the electrodes, the ions of the electrolyte present as impurity diffuse towards oppositely charged electrodes at a fast rate. The dialysis carried out in the presence of electric field is known as electro-dialysis.

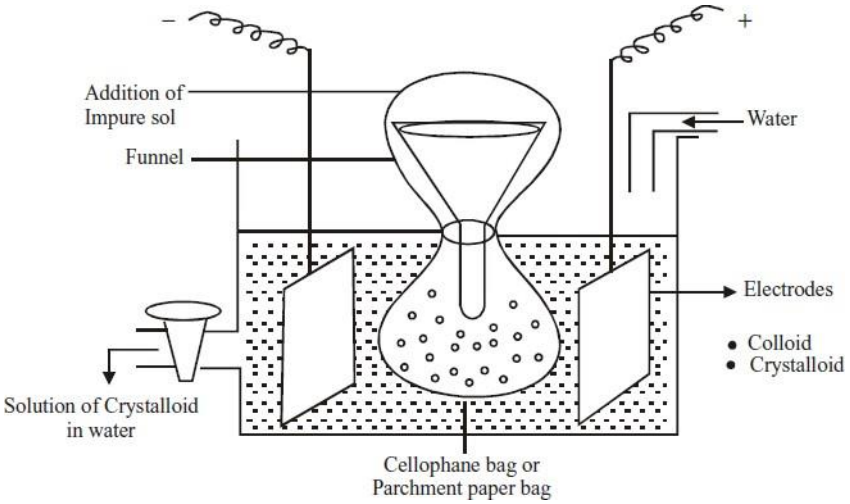

Figure: Electro-dialysis

(c) Ultra – filtration:

The pores of an ordinary filter paper are large enough to allow the passage of both impurity particles as well as colloidal particles. Therefore an ordinary filter paper cannot be used for removing the impurities of electrolytes from an impure sol. However, if the pore size of ordinary filter paper is reduced, it can be used for separating the impurities from impure sols.

This is achieved by treating an ordinary filter paper with collodion or gelatin followed by its hardening by dipping it in formaldehyde solution. This treatment reduces the pore size and enables it to check the passage of colloidal particles through it. Filter papers thus obtained are called ultrafilters. Filtration through ultrafilters is called ultrafiltration.

(i) Sol particles directly pass through ordinary filter paper because their pores are larger (more than $^{1}\mu$ or $^{1000}m\mu$) than the size of sol particles (less than $^{200}m\mu$).

(ii) If the pores of the ordinary filter paper are made smaller by soaking the filter paper in a solution of gelatin of colloidion and subsequently hardened by soaking in formaldehyde, the treated filter paper may retain colloidal particles and allow the true solution particles to escape. Such filter paper is known as ultra - filter and the process of separating colloids by using ultra – filters is known as ultra – filtration**.**

(d) Ultra – centrifugation

Ultracentrifugation involves the separation of colloidal particles from the impurities by centrifugal force. The impure sol is taken in a tube and the tube is placed in an ultra-centrifuge. The tube is rotated at high speeds. On account of this, the colloidal particles settle down at the bottom of the tube and the impurities remain in the solution. This solution is termed as centrifugate. The settled colloidal particles are removed from the tube and are mixed with an appropriate dispersing medium. Thus, the pure sol is obtained.

(i) The sol particles are prevented from setting out under the action of gravity by kinetic impacts of the molecules of the medium.

(ii) The setting force can be enhanced by using high speed centrifugal machines having 15,000 or more revolutions per minute. Such machines are known as **ultra–centrifuges**.