

B.Sc. (Honours) Part-I
Paper-I

Topic: Application of Colloid
UG

Subject-Chemistry

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Application of colloids

Colloids play an important role in our daily life and industry. A good knowledge of colloid chemistry is essential to understand some of the various natural phenomena around us. Colloids make up some of our modern products. A few of the important applications of colloids are listed below.

(1) Purification of Municipal water:

The municipal water obtained from natural sources often contains colloidal particles. The process of coagulation is used to remove these. The sol particles carry a negative charge. When aluminium sulphate (alum) is added to water, a gelatinous precipitate of hydrated aluminium hydroxide (floc) is formed,



The positively charged floc attracts to it negative sol particles which are coagulated. The floc along with the suspended matter comes down, leaving the water clear.

(2) **In rubber and tanning industry** (coagulation and mutual coagulation) : Several industrial processes such as rubber plating, chrome tanning, dyeing, lubrication etc are of colloidal nature

(i) In rubber plating, the negatively charged particles of rubber (latex) are made to deposit on the wires or handle of various tools by means of electrophoresis. The article on which rubber is to be deposited is made anode.

(ii) In tanning the positively charged colloidal particles of hides and leather are coagulated by impregnating, them in negatively charged tanning materials (present in the barks of trees). Among the tanning agent chromium salts are most commonly used for the coagulation of the

hide material and the process is called *chrome tanning*.

(3) **Artificial rains:** It is possible to cause artificial rain by throwing the electrified sand or silver iodide from an aeroplane and thus coagulating the mist hanging in air.

(4) **Smoke precipitation (Coagulation):** Smoke is a *negative* sol consisting of carbon particles dispersed in air. Thus, these particles are removed by passing through a chamber provided with highly positively charged metallic knob.

(5) **Formation of deltas (coagulation):** River water consists of negatively charged clay particles of colloidal dimension.

When the river falls into the sea, the clay particles are Na^+ , K^+ , ions etc. present coagulated by the positive water and new lands called deltas Mg^{2+} in sea are formed.

(6) **Clot formation:** Blood consists of negatively charged colloidal particles (albuminoid substance). The colloidal nature of blood explains why bleeding stops by applying a ferric chloride solution to the wound. Actually ferric chloride solution causes coagulation of blood to form a clot which stops further bleeding.

(7) **Colloidal medicine:** Argyrol and protargyrol are colloidal solution of silver and are used as eye lotions colloidal sulphur is used as disinfectant colloidal gold, calcium and iron are used as tonics.

(8) **Coating of Photographic plates:** These are thin glass plates coated with gelatin containing a fine suspension of silver bromide. The particles of silver bromide are colloidal in nature.

(9) **Artificial Kidney machine:** The human kidneys purify the blood by dialysis through natural membranes. The toxic waste products such as urea and uric acid pass through the membranes,

while colloidal-sized particles of blood proteins (haemoglobin) are retained. Kidney failure, therefore, leads to death due to accumulation of poisonous waste products in the blood. Now-a-days, the patient's blood can be cleansed by shunting it into an 'artificial kidney machine'. Here the impure blood is made to pass through a series of cellophane tubes surrounded by a washing solution in water. The toxic waste chemicals (urea, uric acid) diffuse across the tube walls into the washing solution. The purified blood is returned to the patient. The use of artificial kidney machine saves the life of thousands of persons each year.

- (10) **Sewage disposal:** Sewage usually contains considerable amounts of deflocculating substances such as soap, organic matter and the like which tend to keep it full of colloiddally dispersed particles. The successful treatment of sewage, backwaters and trade effluents involves the separation from them these colloids by coagulation, absorption, filtration or destruction (usually by bacteria in septic tank).
- (11) **Leather tanning:** Leather tanning is a process which utilizes colloidal properties. Raw hides contain giant molecules arranged in long tangled fibres. Tanning materials which include tannin and compounds of chromium and aluminium are in colloidal state and the positively charged protein fibres adsorb negative charges from these metallic ingredients.
- (12) **Blue colour of the sky:** This is an application of Tyndall effect. The upper atmosphere contains colloidal dust or ice particles dispersed in air. As the sun rays enter the atmosphere these strike the colloidal particles. The particles absorb sunlight and scatter light of blue colour (4600–5100Å). The light that is incident at earth's surface is considerably reddened

(13) **Smoke precipitation:** Smoke is also a colloidal system which mainly consists of charged particles of carbon deposited in air. Smoke is a big problem for environment as it is the major source for air pollution. Removal of the dispersed colloidal particles from the air will solve the problem. For this again the process of electrophoresis is used. This is done in Cottrell precipitator. Smoke is passed through a chamber which contains a number of metal plates attached to a metal wire connected to high potential source. The electrically charged colloidal particles of carbon present in air get discharged when they come in contact with the oppositely charged plates and fall down to the bottom. The clean hot air leaves the precipitator from an exit near the top.