

Surface Chemistry

EMULSIONS

These are colloidal solutions in which a liquid is dispersed in another liquid. Generally one of the two liquids is water. There are two types of emulsions: 1. Oil in water (O/W) type and 2. Water in oil (W/O) type

In oil in water type emulsion, oil is the dispersed phase and water is the dispersion medium. e.g. Milk. In milk, the liquid fat is dispersed in water

In water in oil type emulsion, water is the dispersed phase and oil is the dispersion medium. E.g. butter and cream

An emulsion obtained by mixing oil with water or water with oil is not stable. In order to prepare a stable emulsion, a third substance called *emulsifying agent* is added. The emulsifying agent forms an interfacial film between dispersed phase and the dispersion medium.

The common emulsifying agents for O/W emulsions are proteins, gums, natural and synthetic soaps, etc., and for W/O, heavy metal salts of fatty acids, long chain alcohols, lampblack, etc.

The two types of emulsions can be *distinguished by dilution with dispersion medium*.

The droplets in emulsions carry negative charge and they can be precipitated by electrolytes. They also show Brownian movement and Tyndall effect.

Applications of Colloids

1. **Formation of Delta:**

Deltas are formed at the river mouth. This is because river water is a negatively charged colloid of sand particles. When this water enters into sea, the positive ions present in sea water coagulate the colloidal solution of sand and so the particles settle down. This will result in the formation of delta.

2. **Electrical precipitation of smoke (Cottrell precipitation):**

Smoke is a colloidal solution of carbon, arsenic compounds, dust particles etc. in air. The smoke before coming out of the chimney is passed through a chamber (Cottrell precipitator) containing plates having a charge opposite to that of smoke particles. Thus neutralization of charges occurs and the particles settle down and pure air flows out of the chimney.

3. **Purification of drinking water:**

The water obtained from natural sources often contains suspended impurities. In order to coagulate these impurities, alum is added to water. The positive ions present in alum neutralize the suspended impurities and hence get purified.

4. **Medicines:**

Most of the medicines are colloidal in nature. This is because they have large surface area and are therefore easily assimilated. For example, argyrol is a silver sol used as an eye lotion. Colloidal antimony is used in curing kalaazar. Colloidal gold is used for intramuscular injection.

5. **Tanning:**

Animal hides are colloidal in nature. When a hide, which has positively charged particles, is soaked in tannin (which contains negatively charged colloidal particles) mutual coagulation takes place. This results in the hardening of leather. This process is termed as tanning.

6. **Photographic plates and films:**

Photographic plates or films are prepared by coating an emulsion of the light sensitive silver bromide in gelatin over glass plates or celluloid films.

7. **Rubber industry:**

Rubber latex is a colloidal solution of rubber particles which are negatively charged. Rubber is obtained by coagulation of the latex.

8. **Food articles:**

Milk, butter, halwa, ice creams, fruit juices, etc., are all colloids in nature.

9. **Blood:**

Blood is a colloidal solution of an albuminoid substance. When alum and ferric chloride (FeCl_3) solution are added to blood, then coagulation of particles take place which results in clotting of blood.

10. **Industrial products:**

Paints, inks, synthetic plastics, rubber, graphite lubricants, cement, etc., are all colloidal in nature.
