Quadrant II – Transcript and Related Materials

Programme: Bachelor of Science (First Year)

Subject: Chemistry

Paper Code: CHC-152

Paper Title: General Industrial Chemistry

Unit: III

Module Name: Colloids. Preparations, Properties and Applications of Sols and Gels

Module No: 6

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Notes

COLLOIDS AND THEIR CLASSIFICATIONS

- ***Definition:*** Colloidal solutions are those in which the solute particles are larger than the molecules or ions which are found in true solution.
- ***dispersed phase* and *(b) dispersion phase.***
- Dispersed phase or inner phase: Substance whose particles are distributed in a medium is known as dispersed phase. It is also known as discontinuous phase.
- Dispersion medium or outer phase: The medium in which the particles are distributed in a medium is known as dispersion medium. It is also known as continuous phase.

S.No.	Dispersed phase	Dispersion medium	Name of the colloidal systems	Examples
1.	Solid	Solid	Solid sol	Gems, precious stones , etc.

2.	Liquid	Solid	Gel or Jelly	Jelly
3.	Gas	Solid	Solid foam	Pumice stone
4.	Solid	Liquid	Colloidal solution	Sols of metals, sulphur, etc.
5.	Liquid	Liquid	Emulsion	Milk
6.	Gas	Liquid	Foam	Soap lather
7.	Solid	Gas	Aerosol	Smoke
8.	Liquid	Gas	Liquid aerosol, Cloud, mist, fog	Fog, cloud, mist

SOLS

There are two types of Sols:

- **Lyophilic Sols**
- **Lyophobic Sols**

PREPARATIONS OF SOLS

❖ **Preparation of Lyophilic Sols:** Substances having high molecular weights such as gelatin gum, starch etc, form lyophilic sols very easily, when they warmed with suitable liquid.

The sols of this type are of reversible nature and are thermodynamically stable.

❖ **Preparation of Lyophobic Sols:** Lyophobic sols cannot be prepared by simple contact or slight shaking of the substance with the solvent. Svedberg (1908-12) suggested that there are two ways for obtaining lyophobic sols.

- ***Dispersion Method:*** In these methods, larger lumps of the insoluble substances are pulverised by mechanical or by other means till particles of colloidal dimensions are obtained
- ***Condensation method:*** In these methods, a molecular or ionic distribution is first prepared which then by suitable coarsening gives rise to particles of colloidal dimensions.

PROPERTIES OF SOLS

1) Electrophoresis

- Electrophoresis was first observed by Linder and Picton (1892) and is used to indicate the migration of colloidal particles in an electric field.
- When the particles move towards the cathode, the phenomenon of migration of particles is known as ***cataphoresis*** and migration towards the anode is known as ***anaphoresis.*** But in practice a more general term ***electrophoresis*** is used.
- Electrophoresis can be studied by a simple apparatus which consists of a U-tube fitted with a funnel shaped reservoir and a stop cock.
- A small amount of water is placed in the U-tube and then some quantity of the sol is taken, so as to form a layer under the pure dispersion medium.
- An electric current is then applied by connecting the two electrodes dipped in the solution.
- If the sol is coloured, then the movement of the particles can be observed directly by naked eyes.
- When the colloidal particles reach the electrode, they lose their charge and are generally coagulated into coarse particles.

2) Electro-osmosis

- It is defined as *'the movement of a liquid (dispersion medium) with respect to solid (dispersed phase) as a result of an electric field'.*
- The colloidal system is put in a central chamber A, which is separated from the side chambers B and C filled with water, by the dialysing membranes M and M'.
- The water in the chambers B and C extends to the side tubes T and T' respectively.
- The membranes does not allow the colloidal particles to pass through it. So, when a potential difference is applied across the electrodes held close to the membranes in chambers B and C, the water starts to move.
- If the particles carry negative charge, the water will carry positive charge. So, it would start moving towards the cathode and so the level of water inside tube T' would be observed to rise.

- If on the contrary, the particles carry positive charge the water will carry a negative charge. The level of water will now start moving towards the anode and its level in the side tube T would start rising.

APPLICATIONS OF SOLS

1) Electrophoresis

- In the determination of the charge
- In electro-deposition of rubber

2) Electro-osmosis

- In the preparation of pure colloids
- In the tanning of hides and impregnation of similar materials

GELS

Gels may be subdivided into two kinds:

a) **Elastic**

b) **Non-elastic**

- ***Elastic Gels:*** Reversible, i.e. dehydrated gel can be brought back into the original form by heating with water.
- ***Non-elastic Gels:*** Irreversible, i.e. dehydrated and cannot be converted into the original form by heating with water.

PREPARATION OF GELS

Gels may be easily prepared by any of the following methods:

- **By Double Decomposition**: On adding water to sodium silicate we get a gel of silicic acid. During the reaction, silicic acid is prepared in the free state which rapidly sets to a gel.
- **By Exchange of solvents:** When pure alcohol is added to the aqueous solution of calcium acetate, the whole of the salt goes into alcohol, which then sets into a gel containing the liquid.

PROPERTIES OF GELS

1. **Optical properties*:*** Gels show the phenomenon of double refraction. It may be present in the gel from the start or it may be produced by pressure or tension.
2. **Electrical properties:** It has been seen that the electrical conductivity does not change during the transition from the sol to the gel state, as verified by kistler.

APPLICATION OF GELS

1. Gelatin and agar-agar gels are employed in laboratories for making liquid junction.
2. Silica gel is used in laboratory as a dehydrating agent and in desiccator.
3. Silica gel is employed in industry and also used as a catalyst.