

CHEMISTRY STUDY MATERIALS FOR CLASS 12

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Surface Chemistry

Classification colloids

1. Based on the physical state of dispersed phase and the dispersion medium

Depending upon physical state of the dispersed phase and the dispersion medium, there are eight types of colloidal systems. A gas mixed with another gas forms a homogeneous mixture and hence is not a colloidal system. The different types colloidal dispersion are:

Dispersed Phase	Dispersion medium	Type of colloid	Examples
Solid	Solid	Solid Sol	Some coloured glasses and gem stones
Solid	Liquid	Sol	Paints, Cell fluids
Solid	Gas	Aerosol of solid	Smoke, dust
Liquid	Solid	Gel	Cheese, butter, jellies
Liquid	Liquid	Emulsion	Milk, hair cream, cod liver oil
Liquid	Gas	Aerosol of liquid	Fog, mist, cloud, insecticide sprays
Gas	Solid	Solid foam	Pumice stone, foam rubber
Gas	Liquid	Foam	Froth, whipped cream, soap lather

2. Based on the dispersion medium, colloids are classified as follows:

Dispersion medium	Name of colloid
Air	Aerosol
Water	Hydrosol
Alcohol	Alco sol
Benzene	benzosol

3. Based on the attraction between the dispersed phase and the dispersion medium, colloids are of two types: **lyophilic** (solvent loving) and **lyophobic** (solvent hating). If the force of attraction between dispersed phase and dispersion medium is strong, it is called lyophilic sol

e.g. gum, gelatin, starch, rubber etc in suitable dispersion medium.

If the force of attraction between dispersed phase and dispersion medium is weak, it is called lyophobic sol.

e.g. Arsenic sulphide (As_2S_3) sol, sulphur sol and metal sols like gold sol, silver sol etc.

Differences between lyophilic and lyophobic sols

Properties	Lyophilic sol	Lyophobic sol
Force of attraction	Strong	Weak
Preparation	Can be easily prepared by mixing the dispersed phase with the dispersion medium	Some special methods are used for the preparation
Reversibility	Reversible (i.e. they can be easily separated and remixed)	irreversible
Stability	Self stabilized	Less stable and requires some stabilizing agent
Coagulation	large amount of electrolyte is required for coagulation	Only small amount of electrolyte is required.

4. Based on the nature of particles:

Based on this, colloids are of three types – Multimolecular colloids, Macromolecular colloids and Associated colloids.

1. **Multimolecular colloids:** They contain an aggregate of atoms or molecules having dimension $< 1\text{ nm}$. These particles are bind together by weak van der Waal's force of attraction and form particles of colloidal dimension.

e.g. Arsenic sulphide (As_2S_3) sol, sulphur sol and metal sols like gold sol, silver sol etc.

2. **Macromolecular colloids:** Macromolecules (Polymers) in suitable solvents form solutions in which the size of the particle is in the colloidal range. Such systems are called macromolecular colloids. These colloids are quite stable and resemble true solutions in many properties.

Example: solutions of starch, cellulose, proteins, enzymes, polythene, nylon, polystyrene, synthetic rubber, etc. in suitable dispersion medium.

3. **Associated colloids:** These are substances which behave as normal strong electrolytes at low concentrations, but as colloids at higher concentrations. The colloidal behavior is because of the formation of aggregates. They are also called **micelles**.

The formation of micelles takes place only above a particular temperature called **Kraft temperature** (T_k) and above a particular concentration called **critical micelle concentration** (CMC).

Surface active agents such as soaps and synthetic detergents are examples for micelles. These colloids have both lyophobic and lyophilic parts.
