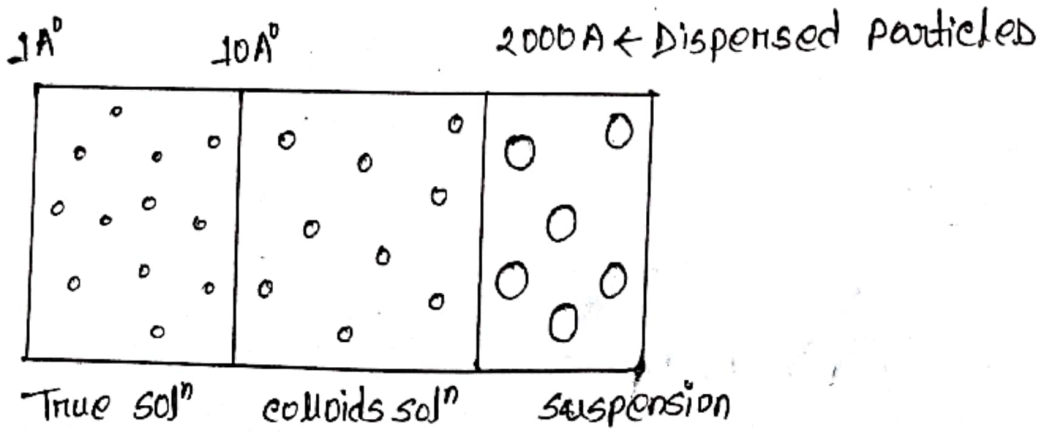
Surface chemistry and colloids

① Definition of colloids
② Dispersion, Dispersed medium and dispersed phase
③ Types of colloids
④ Application of colloids
⑤ Properties of sol
⑥ Lyophillic sol, Lyophobic sol (Defn, difference)
⑦ Gel and emulsion.

Colloids: When the diameter of the particles of a substance dispersed in a solvent ranges from about $10A^0$ to $2000A^0$. the system is termed as colloids.

Sol: Sol is a colloidal suspension with solid particles is as,

True solutions: Salt / sugar in water $(1-10)A^0$
Suspension: Sand stirred into water



A colloidal system made of two phases:

① Dispersed phase
② Dispersed medium

Dispersed phase: The substance distributed as colloidal particle is called dispersed phase.

Dispersed ~~phase~~ Medium: The second continuous phase in which the colloidal particles are dispersed it called the dispersed medium.

Types of colloids: Classification of colloids based on dispersed medium and dispersed phase:

Type name	Dispersed phase	Dispersed medium	Example
Foam	Gas	liquid	Soda water, whipped cream, shaving cream
Solid foam	gas	solid	foam rubber
Aerosol	liquid	gas	mist, clouds
Emulsion	liquid	liquid	milk, hair cream
Solid emulsion (gel)	liquid	~~gel~~ solid	butter, cheese
Smoke	solid	gas	dust, soot in air
Sol	solid	liquid	paint, ink, colloidal gold
Solid sol	solid	solid	ruby glass, alloys

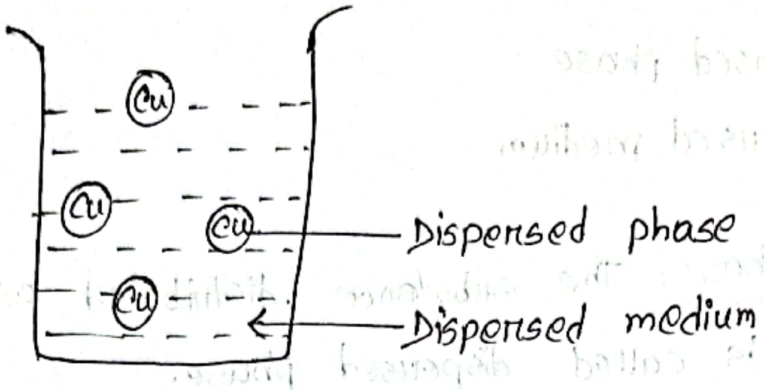


Fig: A colloidal system of copper in water.

Application of colloids:

① A colloid is used as thickening agents in industrial products such as lubricants, lotions, toothpaste etc.

② In the manufacture of paints and inks, colloids are useful.

③ In ball point pens the ink is a gel (liquid - solid colloid)

④ Most of the medicines are colloidal

⇒ colloidal gold and calcium (↑ vitality of muscles)

⇒ Argyrol is used as an eyelotion.

⇒ Albumin, Hetastrach, Dextran.

⑤ colloids are used in water purification.

⑥ Rubber is obtained by a colloidal solution.

⑦ Micelles formed in the cleaning action of soaps are colloids.

⑧ Many nanomaterials are prepared by colloids.

⑨ Silver colloid is used as a germicidal agent.

⑩ It is used in plastic surgery of human body.

⑪ These are used in wound dressing materials.

Lyophilic sols (solvent loving):

Lyophilic sols are those in which the dispersed phase exhibits a definite affinity for the medium or solvent.

Example: Starch / protein – in H_2O.

Lyophobic sols (solvent hating): Lyophobic sols are those in which the dispersed phase has no attraction for the medium or the solvent.

Example: Gold / sulphur, $Fe(OH)_3$ in H_2O

Difference between Lyophilic sols and Lyophobic sols:

Lyophilic sols	Lyophobic sols
① Prepared by direct mixing with dispersion medium.	① Cannot be prepared by direct mixing with dispersion medium, its required special method.
② No/ little charge in particles.	② Particles carry positive or negative charge.
③ It does not exhibit tyndall effect.	③ It exhibits tyndall effects.
④ Reversible	④ Irreversible
⑤ More hydrated	⑤ less hydrated
⑥ More stable	⑥ less stable
⑦ Ex: Starch or protein dissolved in water.	⑦ Ex: Ferric hydroxide / Aluminum hydroxide dissolve in water.

Properties of sol :

Optical: 1. Tyndall effects
2. Ultramicroscope shows up the presence of individual particles.
3. Sol particle can be shown with electron microscope.

Kinetic properties:

Brownian movement / continuous rapid zig zag movement.

Electrical properties: 1. It's carry electrical charge
2. Electrophoresis

Emulsion: It is a liquid - liquid colloidal system.
It can be defined as a dispersion of finely divided liquid droplets in another liquid.

Types: 1. Oil in water (O/W type)
→ Milk
2. Water in oil type (W/O type)
→ Grease

Gel: A gel is a jelly like colloidal system in which a liquid is dispersed in a solid medium.

Types: 1. Elastic gel
→ shape is changed while electric force
2. Non-elastic gel
→ Rigid - silica gel