Colloids,Adsorption and Ion-exchange resin

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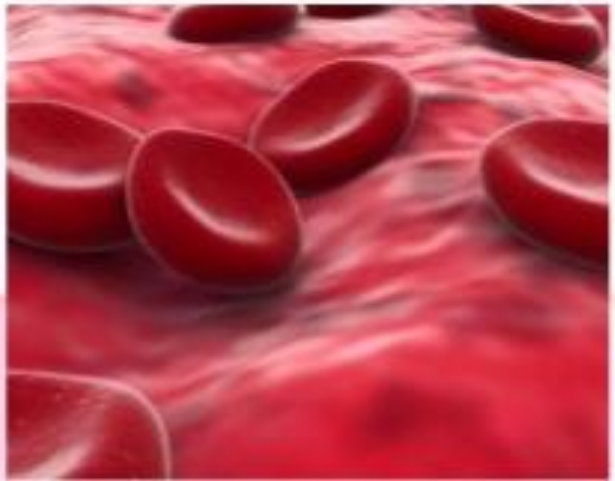
Learning objectives

- Colloids; definition ,its phases ,examples
- Classification of colloids, its properties
- Biological application of colloids
- Adsorption
- Ion exchange resin

Colloids ; definition

- A colloid is a substance microscopically dispersed evenly throughout another substance.
- The particles in a mixture ranges between 1 to 100nm in diameter, still they are able to maintain even distribution throughout the solution.
- Example;milk is a colloid,in which both parties are liquid.

- Examples of colloids are milk, synthetic polymers, fog,
  blood, jam, shoe polish, smoke, etc.



Solutions:

*A solution is a homogeneous mixture when 2 or more substances are dissolved together.

Colloids:

*A colloid contains particles that are in-between in size. They do not seperate into layers. Fog is a colloid. A property of a colloid is a scattering of light.

Suspensions:

*A suspension is a heterogeneous mixture, it separates over time. A great example is oil and vineger or sand and water.

COMPARISON OF THE PROPERTIES OF SOLUTION, COLLOID AND SUSPENSION

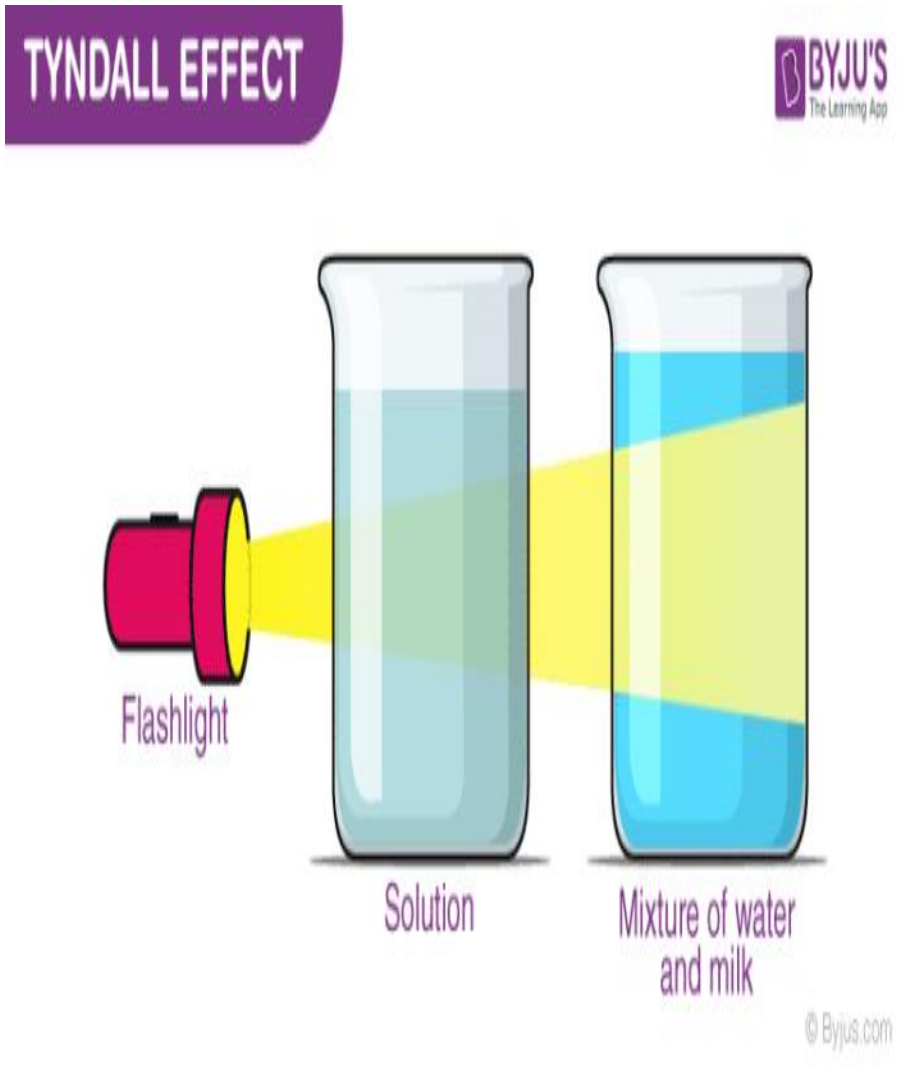
PROPERTY	SOLUTION	COLLOID	SUSPENSION
Particle size	Less than 1 nm	1 to 100 nm	More than 100 nm
Appearance	clear	cloudy	Cloudy
Separation	Does not separate	Does not separate	Separates or settles
Filterability	Passes through the filter paper	Passes through the filter paper	Particles do not pass through filter paper
Effect of beam of light	Light can pass through	Scatters light	Light cannot pass through
Example	Salt solution	mayonnaise	Muddy water

Tyndall effect

Particles in a colloid can scatter light,

This is why colloidal mixture appear cloudy and opaque.

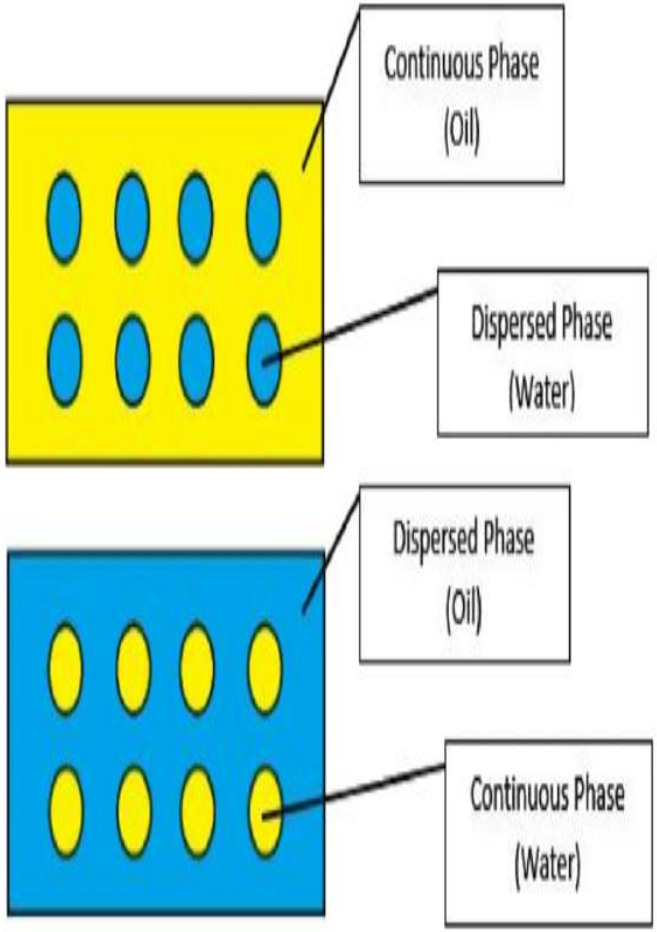
These colloidal solution make the beam bright because of the scattering ability.



Phases/components of colloids

- In case of colloids we don't talk about solute or solvent instead we say
- Dispersed phase --- solute portion
- Continous phase /dispersion medium --- solvent portion

➡ These both can be of any phase



Dispersed Phase	Dispersing Medium	Name of Colloidal System	Common Examples
Liquid	Gas	*Liquid Aerosol*	*mist, clouds, fog*
Solid	Gas	*Aerosol*	*dust, smoke*
Gas	Liquid	*Foam*	*suds, whipped cream*
Liquid	Liquid	*Emulsion*	*cream, milk, mayo*
Solid	Liquid	*Sol*	*paints, jellies, sewage*
Gas	Solid	*Solid Foam*	*marshmallow*
Liquid	Solid	*Solid Emulsion*	*butter, cheese*
Solid	Solid	*Solid Sol*	*opals, some alloys*

Classification of colloids

- Based on the affinity of dispersion medium with dispersed phase,colloids are classified as 1)lyophobic and 2)lyophilic colloids.

1)Lyophobic : these colloids donot have any attraction towards dispersion medium.

if water is used as d.m,the colloids are reffered as hydrophobic.

2)Lyophilic : these colloids have distinct affinity towards dispersion medium.

if water is the d.m,the colloids are reffered as hydrophilic.

Gel and sol

- The terms gel and sol are, respectively, used to jelly like and solution like colloids.

Emulsions and miscelles

- Colloids formed by two immiscible liquids (e.g oil + water) are called emulsions.
- Emiulsions are stabilized by by using agents called emulsifiers.e.g protein casein acts as an emulsifier in milk.
- Miscelles are aggregatesof colloidal particles.
- E.g soap in water

Properties of colloids

- 1)Brownian movement : continous and haphazard motion of the colloidal particles is called brownian movement.
- 2)Optical properties : when light is passed through a colloidal solution ,it gets scattered called Tyndal effect.
- 3)Electrical properties : colloidal particles carry electrical charge either positive or negative charge which may be due to ionization of the colloidal particles.The stability of colloids is determined by the ionic charge they carry.

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- 4)Non-dialysable nature : the colloidal particles being larger in size,cannot pass through a membrane(cellophane or parchment).The membrane however,allows the disperdsion medium and smaller molecule to pass through its pores,this process is called dialysis and is useful for separation of colloids.

Biological importance of colloids

- 1)Biological fluids as colloids : these include milk,blood and cerebrospinal fluid.
- 2)Biological compounds as colloidal particles : high molecular weight proteins,lipids and polysaccharides exist as colloids.
- 3)Blood coagulation : when blood coagulation occurs,sol is converted into gel.
- 4)Fat digestion and absorption : formation of emulsions ,facilitated by emulsifying agents bile salts,promotes fat digestion,and absorption in intestinal tract.

Ion exchange resin

- Ion exchange resin or polymers are resins or polymers which acts as a medium for ion exchange.for example : sodium polystyrene sulfonate.
- Ion exchange is a reversible chemical reaction where the ions dissolve in a solution are removed and replaced by other ion of same electrical charge.
- Ion exchange resins are normally in the form of small microbeads,usually white or yellowish in colour.

Ion exchange resin

- The beads are typically porous.
- Most of these resins are made of polystyrene sulfonate.
- Ion –exchange resins are typically of two types::1)cation exchange resins

  2)anion exchange resin s

- Cation exchange resins exchange positively charged ions.
- Anion exchange resins exchange negatively charged ions.
- Ion exchange resins are used for removal of calcium,magnesium,iron and mangenese salts from water(water softening).

Source

- U.SATYANARAYANA
- Google images


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