Surface film:-

Surface film tension is the property of a liquid by which it acts as if its surface is a stretched elastic membrane.

This tension allows insects to stand on the water surface.

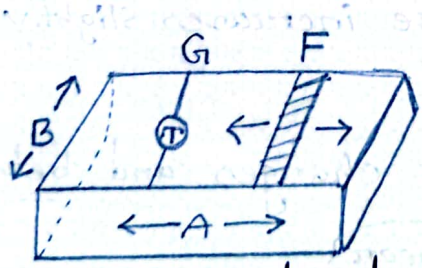
"The layer of the surface of a liquid of thickness equal to the range of molecular attraction."

"12-10-2023"

2nd Mid

Langmuir Experiment:-

When long chain of fatty acid added to the clean water surface due to their translational motion pressure was exerted on the side of the reaction vessel illustrates the film pressure.



Langmuir trough.

From Langmuir trough:- A trough containing clean water,

(i) where, F is moveable (right or left) barrier and G is a fixed barrier coupled with a torsion balance.

(ii) T = measure exerted pressure on G.

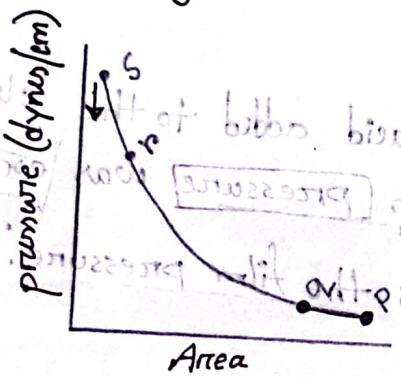
(iii) The trough has fixed width B and edge A.

(iv) At any position of F, a definite area enclosed by F and G.

(v) When small quantity of benzene solution of long chain fatty acid is added to the clean water confined within two barriers. বাষ্পীভূত আবদ্ধ

benzene evaporates leaving fatty acid behind. F is moved towards G in regular small successive steps and pressure exerted on G measured by T. প্রযুক্ত

Several readings are taken and pressure Vs area curve:—



① Pq region:- The pressure increases slightly on decreasing the area.

② Between qr the pressure changes and between rs, the curve is almost vertical and linear.

On compressing film beyond S, the film ruptures P-A curve no longer acceptable shown by downward arrow. বিচ্ছিন্ন

Pq qr rs

(i) The molecule forming the film on the surface with PQ area are almost lying on the surface and situated quite apart from each other.

(ii) The range rs, the film is said to be liquid film with low compressibility and no satisfactory relation between pressure and area is not known.

(iii) The range qr, due to decreased available area, the molecules are closed to each other is called liquid extended film.

Surface excess conc.:-

"The area-related concentration of a surfactant at the surface. When amount of solute on surface is more than the bulk surface.

Gibbs adsorption equation:-

The Gibbs adsorption equation enables us to establish the relationship between the concentration of surfactant at a surface and the change in surface tension it brings about.

- If the concentration of the solute is more on the surface layer than in bulk, the solute is said to be positively adsorbed on the surface.
- When the concentration of the solution is more in the bulk than in the surface, the solute is said to be negatively adsorbed on the surface.

The gas constant

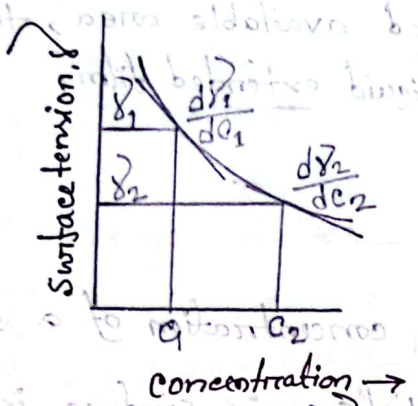
concentration of the solute in solution

Temparature in K

$$\Gamma = -\frac{d\gamma}{dc} \cdot \frac{c}{RT} \quad \text{---(i)}$$

γ = surface tension of the solution.

Γ = The excess concentration of the solute on the surface.



from a measurement of γ, surface tension of a series of solution of different concentration C. a plot γ vs C is drawn.

Solute adsorption:— two types:—

(i) surface active agent (positively adsorbed) → oil, soap

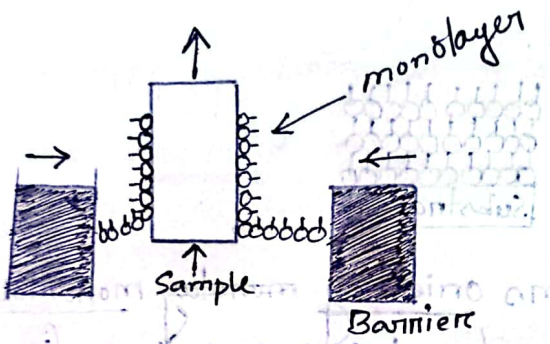
(ii) surface Inactive agent (negatively adsorbed) → solution (salt)

If oil on the liquid surface then form a surface film layer. for positive adsorbed, surface tension will be reduce.

In water and salt, Here no adsorption only solvation occur for that its a negative adsorbed. When a substance on a liquid surface solvation occur, its called negative adsorption. For that surface increases, not decreases.

Langmuir-Blodgett film:-

A Langmuir-Blodgett film (L.B film) can be defined as one or more monolayers of materials deposited from a liquid surface onto a solid substrate by dipping the substrate through a floating monolayer at a constant molecular density.



Application of Langmuir-Blodgett film:—

(i) For creating highly organized and controlled nano-particle coating on solid substrate.

(ii) The glucose biosensor can made of poly LB film.

(iii) LB films can be used as biological membrane.

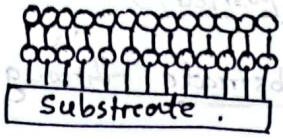
(iv) LB films can be used as passive layers in MIS (metal-insulator semiconductor).

(v) LB films are used to transfer high quality molecular layers of a variety of materials in electronic industry.

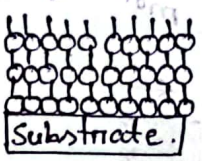
(vi) LB films is an effective tecnique to produce ultra thin films.

Types of LB films:-

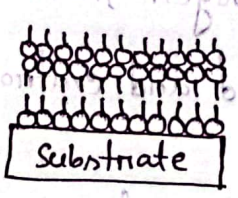
(i) **X-type:-** These films are with all heads facing away from the substrate



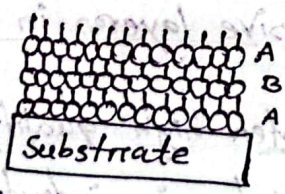
(ii) **Z-type:-** These films are with all heads pointing towards the substrate.



(iii) **Y-type:-** These films orienting ~~monolay~~ monomolecular layers in a head-to-head and tail-to-tail configuration.



(iv) **A-B-A type:-** These type of films are deposited when there is more than one amphiphile.



Characteristics of LB film:-

i) They are extremely thin films.

ii) They have high degree of structural order.

iii) The films have different optical, electrical and biological properties

iv) LB film may not be stable for long period.

(v) Specialized equipment is needed to create them.

(vi) Special care must be taken to ensure reproducible and well-ordered films.

"19-10-23"

Colloids:—

"Colloid is one type of solution. A colloid is a mixture of microscopic particles that are suspended in another medium Ex: milk, smoke".

Solution:—

"A solution is a homogeneous mixture of two or more components in which the particle size is smaller than 1 nm"

The solution consists of two parts-

(i) Solute (ii) solvent.

In other words, Solution means the mixture of solute and solvent.

Based on the particle size "solution" are three types

(i) True solution.

(ii) Colloidal solution.

(iii) Suspension.

True solution:—

"A true solution is a mixture of solute and solvent this homogeneous when the solute is totally dissolve in the solvent the the particle cannot see in microscope.

filteration cannot separate the solute from the solution. particle size less than <1 nm. Example: Sugar water. There is no tyndell effect.

Colloidal solution:-

Colloidal solution are mixture in which microscopically dispersed insoluble particles of one substance are suspended in one another substance.

Colloidal solutions are a type of mixture which consists of particle whose size varies between 1 to 100nm. separate by ultrafilter paper.

Ex: Milk

Suspensions:-

"Suspensions is defined as a heterogeneous mixture in which the solid particles are spread throughout the liquid without dissolving in it."

Suspension particle size varies between >100nm. Separate by normal filteration.

Ex: Mud milk.

Difference between True solution, Colbidal solution & suspension:—

property	True solution	Colloidal solution	suspension
Nature	Homogeneous Mixture	Heterogeneous Mixture	Heterogeneous Mixture
Size	<1nm	1-100 nm	>100nm
visibility	particles are not visible even under ultra-microsope	only visible under ultra-microscope.	visible in naked eyes
Tyndall effect	No	Yes	No
setting	Thin particle donot settle down under any condition	settle down only in centrifuge	settle down under gravity
Diffusibility	diffuse rapidly	diffuse slowly	diffuse.

Tyndell effect:—

" The tyndell effect is the effect of light scattering in colloidal dispersion, while showing no light in a true solution. It can be used to determine whether a mixture is true solution or a colloid".

When light pass in the fixed medium then the particle are scattering in light that time we can see the light or particle/ Beam of particle. This effect is called tyndell effect.

" Suspension has no tyndell effect because it is highly scattering "

colloidal state:—

A substance is said to be in the colloidal state, when it is dispersed in another medium in the form of very small Particles having diameter 1 to 100 nm.

Colloidal ~~state~~ solution consisting of two phases:—

(i) Dispersion medium (ii) Dispersion phase.

Dispersion medium:—

It is the medium in which disperse phase is present. It consists of continuous interlinked molecules. It is comparable to the solvent in a true solution.

Dispersion ~~medium~~phase:—

" It is comparable to the solute in a true solution. It consists of discrete particles significantly larger than ordinary molecules.

☐ Based on the nature of disperse phase and disperse medium :—

For solid

SL	Disperse phase	Disperse medium	Name	Example
1.	Solid	Solid	Solid sol	Glass, Alloy
2.	Solid	liquid	sol	paints, Ink
3.	Solid	gas.	Aerosol	Smoke Dust

From ~~For~~ liquid

4.	Liquid	Solid ~~liquid~~.	Gel	Pudding, curds
5.	Liquid	liquid	Emuision	Milk cream
6.	Liquid	Gas.	Liquid Aerosol.	Mist, Fog

From gas:-

7.	Gas	solid	Solid foam	Cake Bread
8.	Gas	liquid	Foam	whipped cream, Coffee foam.

~~☐ Based on electrical charge on the dispersed phase~~ :—

"Classification of colloids"

☐ Based on appearance :—

a) sol :—

"When colloidal solution appears as a fluid, it is termed as sol."

Disperse phase : solid ; Disperse Medium : Liquid.

If the disperse medium is water then they are called hydrosols.
If the disperse medium is alcohol then they are called alcosols.
Sols are named after the dispersion medium.

Gel:- "When a colloid has a solid-like appearance, it is termed as Gel"

Disperse phase = Liquid; Disperse medium = Solid.

The rigidity of gel varies from substance to substance.

- Some substances may occur both as sol as well gels. This depends upon the relative concentration of the disperse phase and medium.
- At high temperature, low concentration of gelatin it occurs as hydros in water. But if the low temperature and concentration of gelatin is hig the colloids takes the form of a gel.