SURFACE-CHEMISTRY

The branch of chemistry which deals with the study of phenomenons occuring at the surface is called surface chemistry.

★ **Adsorption**

The phenomenon of non-uniform distribution of a molecular species over other is called adsorption.

* **Adsorbent** : substance on the surface of which adsorbtion takes place.

* **Adsorbate** : substance which is adsorbed.

★ **Absorption**

The phenomenon of uniform distribution of a molecular species over other is called absorption.

* **Sorption** : The phenomenon in which absorption and adsorption takes place simultaneously are called sorption.

* **Disorption** : The process of seperating adsorbate and adsorbent is called disorption.

phenominon of adsorption of gases on the surface of metal is known as **occlusion**.

ADSORPTION

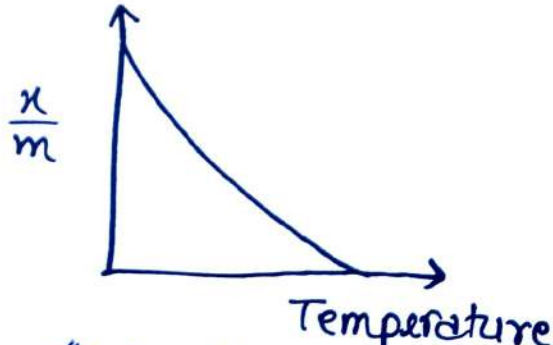
Physical adsorption.	Chemical adsorption.
* weak force.	• strong forces.
* low enthalpy of adsorption.	• high enthalpy of adsorption.
* reversible	• irreversible.
* forms multimolecular layers.	• forms mono-molecular layers.
* not very specific.	• highly specific.
* It takes place on surface.	• It takes place on whole body.

Adsorption isotherm

It is the curve that shows graph between extent of adsorption and temperature.

⇒ x = mass of gas adsorbed on mass m.

m = mass of adsorbent.



Freundlich adsorption Isobar// isotherm. (Effect of pressure)

Freundlich gave the following relationship b/w. x/m and p (pressure) at particular temperature.

mathematically,

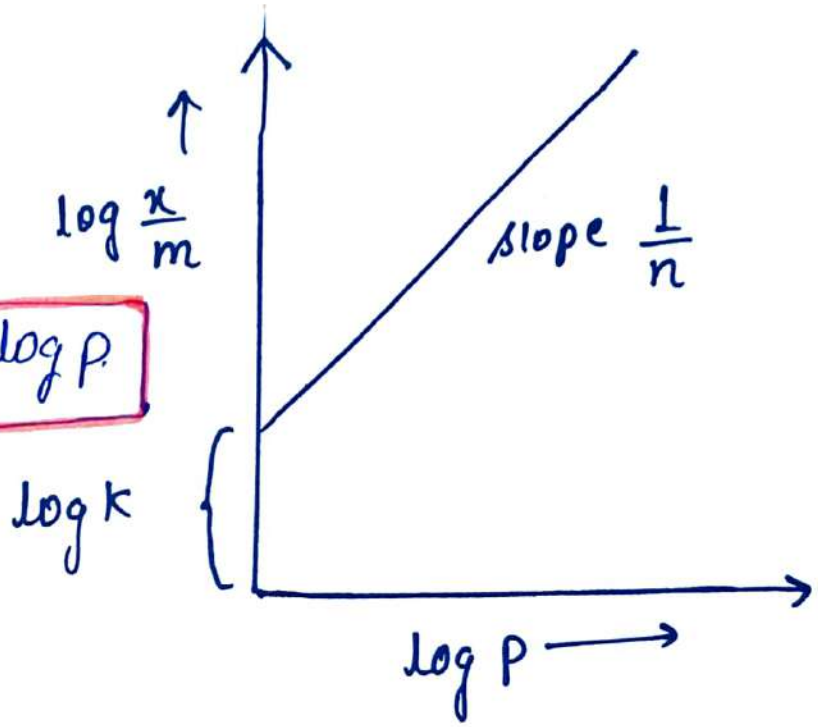
$$\frac{x}{m} = k p^{1/n} \quad (\text{where } 0 < 1/n < 1)$$

where, p = pressure

k and n = constant.

n = integer.

or $$\log \frac{x}{m} = \log k + \frac{1}{n} \log p$$



★ Adsorption from solution Phase.

★ Extent of adsorption decreases with increase in temperature and increases with an increase of surface area of the adsorbent.

★ Extent of adsorption depends on the concentration of solute in the solution and on nature of the adsorbent and adsorbate.

★ Catalyst

The substance that changes the rate of a chemical reaction, without itself undergoing any chemical changes, is known as catalyst

and the process is known as catalysis.

✱ Types of catalysis.

i) Homogeneous catalysts.

ii) Hetero-geneous catalyst.

1) Homogeneous catalyst / catalysis

Those processes in which catalyst as well as reactant molecules are in same phase are called homogeneous catalyst. And the process is known as homogeneous catalysis.

2) Heterogeneous catalyst and catalysis.

When the reactant molecule and catalyst are in the different phase then such catalyst are known as heterogeneous catalyst and the process of increasing the rate of reaction is known as homogeneous catalysis.

Autocatalyst are those which on reaction acts as catalyst, and process is known as autoctalysis.

✱ Characteristic of catalysts.

- The catalyst remain unchanged in mass and chemical composition.
- In case of reversible rex^n, it do not change ΔH or ΔG.

Some process and catalyst used :

1. Haber process of NH_3 → finely divided Fe (Mo act as promoter)
2. Contact process for H_2SO_4 → V_2O_5
3. Lead chamber process for H_2SO_4 → Nitric oxide
4. Decon process → $CuCl_2$.

ENZYMES

Enzymes are biochemical catalysts that catalyse the reaction occuring in the living beings, these are highly specific in nature and work at a specific PH.

Colloids.

A colloid is a heterogeneous system in which one substance is dispersed (dispersed phase) as very fine particles in another substance called dispersed medium.

Colloids are classified on the basis of following criteria.

i) On the basis of physical state of dispersed phase and medium.

Table 5.4 (NCERT)

ii) on the basis of nature of interaction between dispersed phase and dispersed medium

a) Lyophilic (solvent attracting) sols.
b) Lyophobic (solvent repelling). sols.

1) Lyophilic sols

- Colloidal sols directly formed by mixing substance like gum, starch, rubber etc with a suitable dispersion medium are lyophilic sols.
- They are reversible sols.
- They protect to lyophobic sols from coagulation so also known as protective colloids.
- These are quite stable and cannot be coagulated.

2) Lyophobic sols.

- Substance like metals, their sulphides, etc when simply mixed with the dispersion medium do not form colloidal sol.
- Their ~~sols~~. colloidal sols are prepared only by special methods.
- They are irreversible.
- They need stabilising agent for preservation.

iii) Classification based on type of particle of dispersed phase.

a) Multimolecular colloids.
b) Macromolecular colloids.
c) Associated colloids. (Micelles)

1) Multimolecular colloids.

On dissolution, a large no. of atoms or smaller molecules of substance aggregate together to form species having size in range 1 - 1000 nm.

ex: Sols of gold, sulphur etc.

2) Macromolecular colloids

Macromolecules in suitable solvent form solutions in which the size of the macromolecules may be in the colloidal range i.e they are molecules of larger size of colloidal range.

3) Associated colloids

Those substance which behaves as normal strong electrolysis at low conc. but exibit colloidal behaviour at high conc. due to formation of aggregate known as micelle.

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

Preparation of colloid

1) By chemical method.

e.g. $FeCl_3 + 3H_2O \xrightarrow{\text{Hydrolysis}} Fe(OH)_3(sol) + 3HCl$.

2) Peptisation

The process of converting a precipitate into colloidal sol by shaking it with dispersion medium in the presence of small amount of electrolyte is called peptization and electrolyte used is known as peptizing agent.

3) Bredig's arc method.

It involves dispersion as well as condensation In this method electric arc is stuck between electrodes of the metal immersed in the dispersion medium. The intense heat produced vapourises the metal which then condenses to form particles of colloidal size.

Purification of colloidal solutions.

Purifications of colloidal solutions by diffusion through a suitable membrane is called dialysis

Apparatus used for this process is known as dialyser.

★ Properties of Colloidal Solutions.

- **Colligative properties.**

The value of colligative properties of colloids are of ~~same~~ small order as compared to the true solutions.

- **Tyndall Effect.**

When light falls on sol, it absorbs the light and scatter it. The phenomenon of scattering of light is called Tyndall effect.

- **Brownian movement.**

The colloidal particles appear to be in a state of continuous zig-zag motion. This motion is called brownian motion.

★ Coagulation or precipitation.

The process of settling of colloidal particles is called coagulation or precipitation of the sol. It is done by boiling, mixing two oppositely charged sols or by addition of electrolytes.

★ Emulsions.

They are formed when both the dispersed phased and dispersion medium are liquids in a colloidal system.

Types of emulsions:

- Oil dispersed in water type
  ex: Milk, vanising cream.
- Water dispersed in oil type.
  ex: Butter, cream

★ Blood is an albuminoid suspended in water which implies that blood is a colloid. Alum and $FeCl_3$ solution stop bleeding due to coagulation.

★ Colloidal sol adsorbs one of its own ion from the solution preferentially and get charged. This charge attracts ions of opposite charge from the solution and forms an electrical double layer. This is called Helmholtz electrical double layer.