

## SURFACE CHEMISTRY

Certain properties of solids and liquids depends on the nature of the surface. The molecules on the surface are in different environment when compared to those in the bulk. This is because particles on the surface have unbalanced valencies. To balance this they attract other molecules on the surface. **The branch of chemistry which deals with the study of nature of surface and the changes that takes place on the surface is called surface chemistry.**

The process of concentration of a substance on the surface of solid or a liquid is called adsorption. The solid substance on the surface of which adsorption takes place is called **adsorbant**. The substance which gets adsorbed on the solid surface is called **adsorbate**.

Ex : adsorption of hydrogen by charcoal. The adsorbent is charcoal and the adsorbate is hydrogen.

### **Differences between adsorption and absorption :**

<b>Adsorption</b>	<b>Absorption</b>
1. It is a surface phenomenon.	1. It is a bulk phenomenon
2. In this process one substance is deposited on the surface of another substance	2. In this process one substance another substance into it.
3. Adsorption depends mainly on the surface area	3. Absorption depends on the quantity of the substance

### **Types of adsorption :**

There are two types of adsorption

i) Physical adsorption    ii) Chemical adsorption

**Physical adsorption or physisorption :** The molecules are held to the surface by weak vanderwaals forces .

Ex : adsorption of hydrogen by charcoal

**Chemical adsorption or chemisorption :** The adsorbed molecules are held to the surface of the solid by strong force.

Ex : Adsorption of hydrogen gas by platinum.

## Differences between physical and chemical adsorption

Chemical adsorption	Physical adsorption
1. The molecules are held together by chemical bonds.	1. The molecules are held together by weak van der Waals forces.
2. It is irreversible	2. It is reversible
3. Unimolecular layer is formed on the surface	3. Multimolecular layer is formed on the surface
4. High temperature favours the reaction	4. Low temperature favours the reaction
5. Pressure has no effect on chemical adsorption	5. An increase in pressure increases physical adsorption

The adsorption of gases on solids depends on

**1. Surface area of the solid :** Increase in surface area increases physical and chemical adsorption

**2. Nature of the gas:** Easily liquefiable gases are readily adsorbed on the surface. In chemical adsorption the gases which form chemical bonds with the surface of solids are more adsorbed.

**3. Temperature :** Increase in temperature decreases physical adsorption and increases chemical adsorption.

**4. Pressure :** Increase in pressure increases both physical and chemical adsorption.

### Applications :

1. Adsorption of gases on solids is used to preserve vacuum between walls of dewars containers used for the storage of liquid air or liquid nitrogen.
2. Finds applications in the field of research as well as in industries.
3. Used in the heterogeneous catalysis of gaseous reactions on solid surfaces.
4. Adsorption indicators like eosin, fluorescein are used in analytical chemistry
5. Action of drugs and proteins is based on adsorption principle

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