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Deg III Chem. Hons, Paper - V

Topic :- Adsorption (Continued)

Type of Adsorption :-

Two types of Adsorption have been recognised, Physical adsorption and chemical adsorption.

Physical Adsorption :-

If the Physical forces of attraction hold the gas molecules to the solid, the adsorption is known as physical adsorption. The Physical forces of attraction are :-

(1) Permanent dipole moment in the adsorbed molecule
(2) Polarisation
(3) Dispersion effect
(4) Short range repulsive effect

Examples :-

(1) Adsorption of various gases on charcoal.
(2) Adsorption of Nitrogen on mica

Chemical Adsorption :—

If the chemical forces hold the gas molecules to the surface of the adsorbent the adsorption is known as chemical adsorption or Chemisorption.

In chemisorption, the adsorption first rapidly increases and gradually approaches a limiting value. The rapid rise in the beginning is due to the strong tendency of the surface to hold the gas molecules. When these forces are satisfied the limiting value is reached. The saturation of the forces of chemisorption may be due to any one of the following reasons :—

(1) Adsorbent has active centres which are first occupied by the gas molecules. Thereafter adsorption takes place at less active centres and the binding forces are not so strong.

(2) Chemisorption may result in transfer of electrons from the adsorbent to adsorbate or vice-versa

As Chemisorption Proceeds solid become less and less active to gain or lose electrons.

Examples :—

(1) Adsorption of oxygen or tungsten
(2) Adsorption of hydrogen on nickel
(3) Adsorption of oxygen on gold, silver and Platinum.

Distinction between Physical Adsorption and Chemical Adsorption.

Physical Adsorption	Chemical Adsorption
(1) It involves Physical forces.	(1) It involves transfer of electrons between gas and solid.
(2) Heat of adsorption is generally less than 10 K cal/mole	(2) Heat of adsorption is greater than 20 K cal/mole.
(3) It is reversible	(3) It is Irreversible.
(4) Multi Layers are Possible in Physical adsorption	(4) only monoLayer is formed.

Physical Adsorption	Chemical Adsorption
(5) It is a general Phenomenon which will occur with any gas solid system provided only that the conditions of temperature and pressure are suitable.	(5) It will only take Place if the gas is capable of forming chemical bonds with surface atom.
(6) It is appreciable at low temperature and high pressure.	(6) It can occur at high temperature
(7) No appreciable activation energy is involved.	(7) chemisorption is an activated Phenomenon and involves high activation energy.
(8) It is an instataneous Process.	(8) It may be fast or slow.
(9) Physical adsorption is a function of Covering of surface.	(9) It is absorbed at fixed sights on the surface. These sites are Called active Centres.