B.Sc (Chemistry Hons) - III

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Adsorption

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Adsorption is often described as a surface phenomenon where particles are attached to the top layer of material. It normally involves the molecules, atoms or even ions of a gas, Liquid or solid in a dissolved state that are attached to the surface. Adsorption is mainly a consequence of surface energy. Generally the surface Particles which can be exposed partially tend to attract other Particles to their site.

Adsorption is a process which involves the accumulation of a substance in molecular species in higher concentration on the surface. If we look at H_2, N_2 and O_2, these gases adsorb on activated charcoal. For the adsorption process two components are required:

1) Absorbate :- Substance which is deposited on the surface of another substance. For eg. H, N_2 and O_2 gases

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E) Adsorbent :- Surface of a substance on which adsorbate adsorbs for e.g. Charcoal, Silicagel, Alumina.

Types of Adsorption :-

Depending upon the nature of the forces involved two main types of adsorption process may be distinguished.

1) Physical adsorption or Physisorption
2) Chemical adsorption or Chemisorption
3) The third type of adsorption which is referred as activated adsorption is also known.

Physical Adsorption :-

It involves adsorption of gases on solid surface via weak vander Waals force.

Characteristics of Physical adsorption :-

a) There is no specificity in case of Physical adsorption. Every gas is adsorbed on the surface of the solid.

b) Nature of the adsorbate Easily liquefiable gases are strongly adsorbed physically.

c) Physical adsorption is reversible in nature. If pressure is increased volume of gas decreases as a result more gas is adsorbed. So, by decreasing the pressure, gas can be removed from the solid surface. Low pressure promotes physical adsorption and high temp. decreases the rate of adsorption

d) More surface area more is the rate of adsorption. Porus substances and finally divided metals are good adsorbents.

e) Physical adsorption is a exothermic process

f) No activation energy is needed.

Chemical Adsorption

When the gas molecules or atoms are held to the solid surface via chemical bonds, this type of adsorption is chemical adsorption or chemisorption.

Characteristics of chemical adsorption

a) This type of adsorption is specific as compared to Physical adsorption. Adsorption occurs only

if there is formation of chemical bonds between the adsorbate and adsorbent.

b) Chemical adsorption is irreversible. It is an exothermic process but the process occurs slowly at low temperature. chemisorption is accompanied by increase in temperature. High pressure promotes chemisorption

(c) Chemisorption increases with increase in surface area.

(d) Due to chemical bond formation enthalpy of chemisorption is high.

(e) Activation energy is need of

(f) It results in unimolecular layer.

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