

What is Adsorption?

Adsorption is a process which involves the accumulation of a substance in molecular species in higher concentration on the surface. If we look at Hydrogen, Nitrogen and Oxygen, these gases adsorb on activated charcoal. Meanwhile, we



we have to note that **adsorption is different from absorption**. The two processes involve totally different mechanisms.

For the adsorption process, two components are required,

- **Adsorbate:** Substance which is deposited on the surface of another substance. For example, H_2 , N_2 and O_2 gases.
- **Adsorbent:** Surface of a substance on which adsorbate adsorbs. For example, Charcoal, Silica gel, Alumina.

Types of Adsorption

On the basis of interaction forces between adsorbate and adsorbent, adsorption is of two types.

1. Physical adsorption:

This type of adsorption is also known as physisorption. It is due to weak **Van der Waals forces** between adsorbate and adsorbent.

For example, H_2 and N_2 gases adsorb on coconut charcoal.

2. Chemical adsorption:

This type of adsorption is also known as chemisorption. It is due to strong chemical forces of bonding type between adsorbate and adsorbent. We can take the example involving the formation of iron nitride on the surface when iron is heated in N_2 gas at 623 K.

Adsorption of gas on a solid is a spontaneous exothermic reaction.

Amount of heat liberated when a unit mass of a gas is adsorbed on the surface is called heat of adsorption.



Characteristics

Characteristics of physical adsorption:

1. This type of adsorption is caused by physical forces.
2. Physisorption is a weak phenomenon.
3. This adsorption is a multi-layered process.
4. Physical adsorption is not specific and takes place all over the adsorbant.
5. Surface area, temperature, pressure, nature of adsorbate effects physisorption.
6. Energy for activation is low (20 – 40 kJ/mol).



Characteristics of chemical adsorption:

1. This type of adsorption is caused by chemical forces.
2. It is a very strong process.
3. This type of adsorption is almost a single-layered phenomenon.
4. Chemisorption is highly specific and takes place at reaction centres on the adsorbant.
5. Surface area, temperature, nature of adsorbate effects chemisorption.

