

Types of Catalysts

There are several types of catalysts that can be used depending on the need or requirement of the chemical reaction. They are as follows;

Positive Catalysts

Catalysts that increase the rate of a chemical reaction are positive catalysts. It increases the rate of reaction by lowering the activation energy barriers such that a large number of reaction molecules are converted into products, thereby the percentage of yield of products increases.

Positive catalyst example: In the preparation of NH_3 by Iron oxide acts as a positive catalyst and increases the yield of ammonia in spite of less reaction of Nitrogen.

Negative Catalysts

Catalysts that decrease the rate of reaction and negative catalyst. It decreases the rate of reaction by increasing the activation energy barrier which decreases the number of reactant molecules to transform into products and hence the rate of reaction decreases.

Negative catalyst example: Decomposition of Hydrogen peroxide into water and oxygen is retarded by using Acetanilide, this acts as a negative catalyst to decrease the rate of decomposition of hydrogen peroxide.

Promoter or Accelerators

A substance that increases the catalyst activity is known as a Promoter or accelerator.

Example: In Haber's process molybdenum or a mixture of potassium and Aluminium oxides act as Promoters.

Catalyst Poisons or Inhibitors

Substances that decrease the catalyst activity are known as catalyst poisons or inhibitors.

Example: In the hydrogenation of alkyne to an alkene, catalyst palladium is poisoned with barium sulphate in quinolone solution and the reaction is stopped at alkene level. The catalyst is known as Lindler's catalyst.

Units

The derived SI unit for measuring the catalytic activity of a catalyst is "katal". It is further quantified in moles per second. If we were to describe the productivity of a catalyst it can be defined by the turnover number (or TON). Catalytic activity can be described by the turn over frequency (TOF) which is TON per time unit. Likewise, the enzyme unit is its biochemical equivalent.

Catalysis

When a catalyst is used to increase the rate of a chemical reaction this phenomenon is known as catalysis.

What is the role of catalyst poison in Rosenmund reaction?

In the Rosenmund reaction aldehyde is prepared by reducing Acid halides with hydrogen gas in the presence of palladium. If a catalyst is not poisoned the reaction is not stopped at aldehyde level which is further reduces to alcohol. In order to stop at the aldehyde level. Palladium is poisoned with Barium sulphate.

What are the key factors in heterogeneous catalysis?

In heterogeneous catalysis, the reacting and catalyst are in different states of matter. The most important steps in this process are;

- Adsorption of reactant molecules activation centre.
- Formation of activation complex at the centre.
- This complex decomposes to give products.
- Desorption of products from the surface of the catalyst.