Alkylation Reactions Encyclopedia Article

Alkylation Reactions

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Alkylation Reactions

Alkylation reactions are reactions where an **alkyl group** is introduced into a **molecule**. Many different types of alkylation reactions are known. For example, alkyl groups can be introduced into aliphatic hydrocarbons or **aromatic hydrocarbons** by alkylation reactions. Alkylation reactions can also be used to prepare ethers from alkyl alcohols or aromatic alcohols. Alkylated amines can be prepared by alkylation; however, special methods are normally required to control the number of alkyl groups introduced onto **nitrogen**. Important synthetic methodology also exists for the alkylation of enolate ions. Alkylation is often promoted through the use of **heat** or of an appropriate catalyst such as an acid catalyst.

One very important alkylation reaction is the Friedel Crafts Alkylation Reaction, used for the alkylation of aromatic species, which was discovered in 1877. Many alkyl halides, alcohols, or alkenes can be reacted with **benzene** in the presence of certain catalysts to give an alkyl benzene. Other aromatic hydrocarbons give similarly substituted alkyl aromatic products. A Lewis acid, such as **aluminum** chloride, is often the catalyst used for this reaction. This reaction is used industrially for the synthesis of hydrocarbons. If the reaction is carried out at high temperatures, rearrangement of the alkyl group may occur. For example reaction of n-propyl halides with benzene at low temperatures affords mainly n-propyl benzene but at higher temperatures the major product is isopropyl benzene (Figure 1) . In Friedel-Crafts reactions, alkyl chlorides are more reactive than alkyl bromides and alkyl iodides react only with difficulty.

Alkylation is used industrially to produce basic building blocks for the synthesis of more elaborate materials. One commonly used application is in the production of anti-knock **gasoline**.