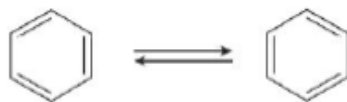


description, the bond between any two carbon atoms is sometimes a single bond and sometimes a double bond.



Kekulé description: An equilibrium

Although benzene is still drawn as a six-membered ring with three alternating π bonds, in reality, **there is no equilibrium between two different kinds of benzene molecules**. Instead, current descriptions of benzene are based on resonance and electron delocalization due to orbital overlap.

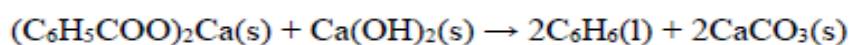
In the nineteenth century, many other compounds having properties similar to those of benzene were isolated from natural sources. Because these compounds possessed strong and characteristic odours, they were called **aromatic compounds**. It is their chemical properties, though, not their odour that make these compounds special.

- *Aromatic compounds resemble benzene - they are unsaturated compounds that do not undergo the addition reactions characteristic of alkenes.*

Isolation of Benzene

Benzene and other arenes can be obtained by distilling coal. This is a particular messy process in the laboratory, and requires a lengthy business of separating the products from one another. However, in industry it is an economic way of isolating benzene. There is strong demand for coke, which is produced by heating coal in the absence of air. For every tone of coal turned into coal, about 70 dm³ of coal tar is made. This is an oily liquid, which contains a variety of products. If the coal tar is separated by fractional distillation, around 30 dm³ of benzene can be collected. Methylbenzene, naphthalene, and anthracene are also obtained in smaller quantities.

In the laboratory, a quicker way to make benzene is to heat the calcium salt of benzoic acid, (C₆H₅COOH)₂Ca, with soda lime (soda lime contains calcium hydroxide together with sodium hydroxide):



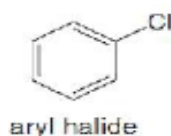
Other Facts about Friedel - Crafts Alkylation

Additional facts about Friedel - Crafts alkylations must be kept in mind.

1. Vinyl halides and aryl halides do *not* react in Friedel–Crafts alkylation

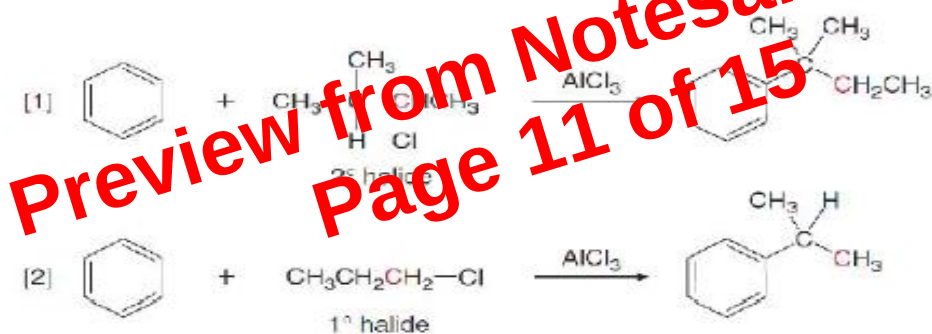
Most Friedel - Crafts reactions involve carbocation electrophiles. Because the carbocations derived from vinyl halides and aryl halides are highly unstable and do not readily form, these organic halides do *not* undergo Friedel–Crafts alkylation.

$\text{CH}_2=\text{CHCl}$ vinyl halide



2. Rearrangements can occur

The Friedel - Crafts reaction can yield products having rearranged carbon skeletons when 1° and 2° alkyl halides are used as starting materials, as shown in Equations (1) and (2). In both reactions, the carbon atom bonded to the halogen in the starting material (labelled in red) is not bonded to the benzene ring in the product, thus indicating that a rearrangement has occurred.



Intramolecular Friedel–Crafts Reactions

All of the Friedel–Crafts reactions discussed thus far have resulted from intermolecular reaction of a benzene ring with an electrophile. Starting materials that contain both units are capable of **intramolecular reaction**, and this forms a new ring. For example, treatment of compound **A**, which contains both a benzene ring and an acid chloride, with AlCl_3 , forms α -tetralone by an intramolecular Friedel - Crafts acylation reaction.