13.7 How Alkene Addition Reactions Occur

Alkene addition reactions are a two-step process. It involves a carbocation intermediary that is + charged.

We will use HBr as an example. In the first step, the alkene reacts with H^+ from HBr, which breaks the double bond…but now the C has only three bonds and is unstable. At this time it bears a + charge and is considered the "carbocation."

In the second step, the anion attaches to the C to fulfill its bond requirements. So, it will react with the Br^- immediately to form a neutral product.

Remember that Markovnikov's rule dictates where the H binds, and where the Br binds!

13.8 Alkene Polymers

A polymer is a large molecule formed by the repetitive bonding together of many smaller molecules called monomers. In this reaction, an initiator breaks the double bond…the initiator is an unpaired e^- that can stimulate a reaction. Starting monomers are usually small, organic molecules. Many simple alkenes are often called vinyl polyers because the partial structure is known as a vinyl group.

This process will continue until the molecule meets up with a chain terminator. The chain terminator will make the molecule no longer have a free radical to react with. Long molecules in a straight-chain polymer can pack closely together creating a rigid material, while branched-chain polymers cannot pack so closely together and yield a flexible material (Saran wrap)

13.9 Aromatic Compounds and the Structure of Benzene

An aromatic is a class of compounds containing benzene-like rings. They are much less reactive than alkenes because they are in a lower energy state due to the fact that they share their e^- among more carbons, so each C-C bond is actually an intermediate between a single bond and a double bond (resonance).

Simple aromatic compounds like benzene are nonpolar, insoluble in water, volatile and flammable. They will, however, dissolve in other hydrocarbons. They are also TOXIC!

13.10 Naming Aromatic Compounds

Substituted benzenes have parent name –benzene.

Ortho, para, meta refer to the position of multiple compounds:

Some substituted aromatic compounds have common names (of course they do!)

Sometimes, benzene is a substituent attached to another parent compound. When this happens, the name "phenyl" is used for the ring.

13.11 Reactions of Aromatic Compounds

Aromatic compounds under SUBSTITUTION reactions…this means that the group coming in takes the place of the ring hydrogens! This does not change the ring itself, remember that the rings are stable!

Nitration is the substitution of a *nitro group* ($-NO_2$) for one of the ring hydrogens. This reaction occurs when benzene reacts with nitric acid in the presence of sulfuric acid as a catalyst.

Halgenation is the substitution of a halogen atom (usually bromine or chlorine) for one of the ring hydrogens. This reaction occurs when benzene reacts with Br_2 or Cl_2 in the presence of an iron catalyst.

Benzene Rxn	Catalyst
Nitration	Sulfuric Acid
Halogenation	Iron
Sulfonation	Sulfuric Acid

Sulfonation is the substitution of a sulfonic acid group ($-SO_3H$) for one of the ring hydrogens. This reaction occurs when benzene reacts with concentrated sulfuric acid and SO_3.