Alkenes are reactive because of their double bond/s. Common reactions that involve alkenes are the **addition** of a compound across the double bond. Addition is where two parts of a compound are individually added onto the carbon double bond, resulting in a substituted alkane. [1]

Addition

Addition reactions with alkenes are one of the most common. What happens in an addition reaction is the compound breaks apart, and bonds to a carbon in the double bond of the alkene. This double bond is very reactive, and it is easy for molecules to bond into it because of the pi-bond molecule orbital of the double bond. Molecular orbitals will be discussed in a different segment of this website, but for now to generally summarize what a pi-molecular orbital is, it is the electrons used to form the second bond in the double bond.

Halogens

Alkenes will react with Br_2, Cl_2, etc. This is an addition reaction where each halogen bonds to one carbon from the double bond on the alkene. **A picture can be found here** .

The same can be said about the reaction of alkenes to hydrohalogen acids. **Hydrohalogen acids** are acids like HCl, HBr, HI, HF; it is an acid that consists of hydrogen and a halogen. The hydrogen and halogen break apart, and each bond to one of the carbons from the double bond.
Here is an example
.

Hydrogenation

Hydrogenation is the addition of bimolecular hydrogen across the alkene double bond. It turns an alkene into an alkane. This requires the use of transition metal catalyst platinum (Pt). The reaction occurs on the surface of the metal. [2]

Oxidation

Oxidation can be generally defined as the addition of oxygen to a molecule. That being said, the reaction of an alkene with potassium permanganate yields a glycol (which is the addition of an –OH group on each of the carbons in the double bond). **Here is an example.** Additionally, with a higher concentration of potassium permanganate and the presence of heat, alkenes can be oxidized and actually break apart at the site of the double bond. [3]

Here is another example.

Markovnikov's Rule

Not all alkenes are symmetrical. When this happens, the addition across the double bond of an alkene is not random. There is a **regioselectivity** that dictates the 'heavier' part of the molecule will bond to the more **substituted carbon**. Meaning, the carbon in the double bond that is bonded to more carbons will be the receiver of the higher priority segment of the reacting molecule. For example, the addition of an alkene with H-X (X can be a halogen, $HOSO_3$, etc), the X will bond to the carbon that is more substituted. [4]

History

Explore the discoverer's biography, including general facts about his life and anecdotes regarding how he made this particular discovery. Also see other significant scientific discoveries built largely on this concept and other real-world applications in history that may not still be relevant.

Discoverer/Developer

Vladimir Markovnikov (Dec. 22, 1838 – Feb. 11, 1904) was a Russian chemist. He studied economics as an undergraduate and afterwards worked as an assistant at Kazan and Saint Petersburg. Kazan is where he became interested in chemistry, and Butlerov was the teacher.[5]

Afterward, he studied in Germany for two years under Erlenmeyer and Kolbe, then returned to Russia. In Russia, he received his Ph. D in1869, and started to work as a professor at Kazan University. Markovnikov also worked at University of Odessa from 1871-1873. He spent the rest of his career at the University of Moscow.
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At Moscow is where he really started to focus on practical chemistry research, and the history of chemistry. It was during this time that he discovered what is now known as
Markovnikov's rule
.

Vocabulary

Learn important vocabulary for this concept, including words that might appear in assessments (tests, quizzes, homework, etc.) that indicate the use of this concept.

Important Vocabulary	**Term**	**Context**
Addition	The reaction in which two parts of a compound are individually bonded to each
Hydrogenation	The addition of bimolecule hydrogen (H2) across a double bond.
Hydrohalogen acids	HCl, HBr, HF, HI
Markovnikov's rule	The more substituted carbon is the place of regioselectivity in an addition reac
Oxidation	The addition of oxygen to a molecule
Regioselectivity	The specific spot on the molecule that, due to the nature of the reaction and/o
Substituted Carbon	The replacement of carbons bonded to a carbon instead of hydrogen. More ca

Videos

Browse relevant videos from the Journal of Chemical Education's (JCE) Chemistry Comes Alive! library and other video sources.

Combustion

alkene combustion

Hydrogenation

alkenes and alkynes

Works Cited

Review the works cited to write the researched parts of this page, such as the discover's biographical information and other areas.

Works Cited

1 - http://www.elmhurst.edu/~chm/vchembook/503alkenes.html [URL: http://www.elmhurst.edu/%7Echm/vchembook/503alkenes.html]

2 - http://chemistry2.csudh.edu/rpendarvis/AlkeneAddn.html#halogen

3 - [LINK URL: http://www.cliffsnotes.com/study_guide/Alkenes-Oxidation-and-Cleavage-Reactions.topicArticleId-22667,articleId-22625.html]

4 - [LINK URL: http://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/addene1.htm]

5 - [LINK URL: http://en.wikipedia.org/wiki/Vladimir_Vasilevich_Markovnikov]

6 - [LINK URL: http://www.encyclopedia.com/doc/1G2-2830902829.html]