



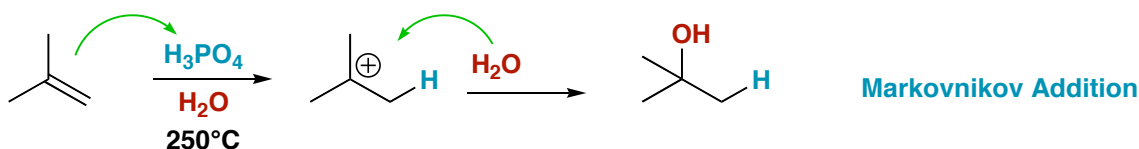
Chem 341 • Organic Chemistry I

Lecture Summary 19 • October 08, 2007

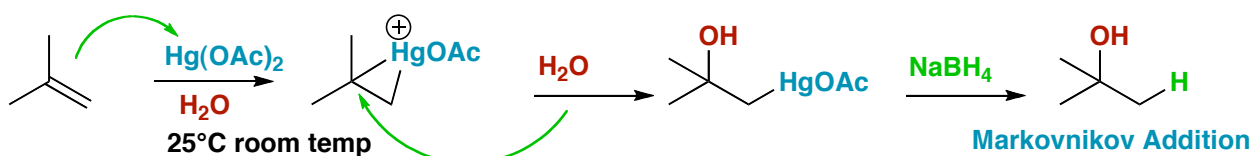
Chapter 7 - Alkenes: Reactions and Synthesis

Hydration of Alkenes

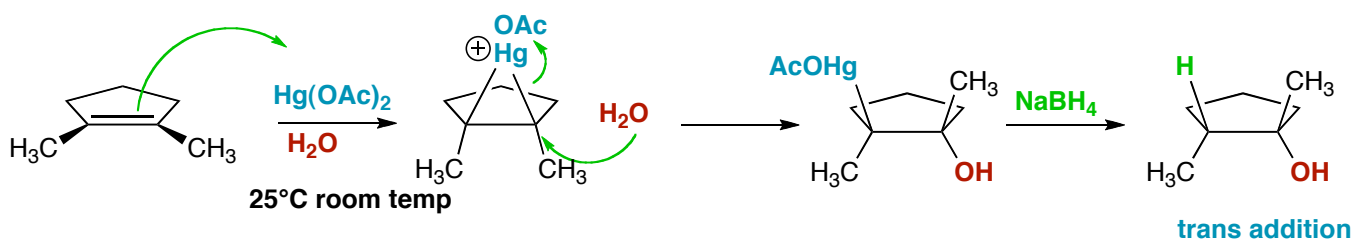
The electrophilic addition of water to a double bond is a more difficult reaction than halohydrin formation. By itself, water is not electrophilic enough to react and it requires a strong acid catalyst and high heat.



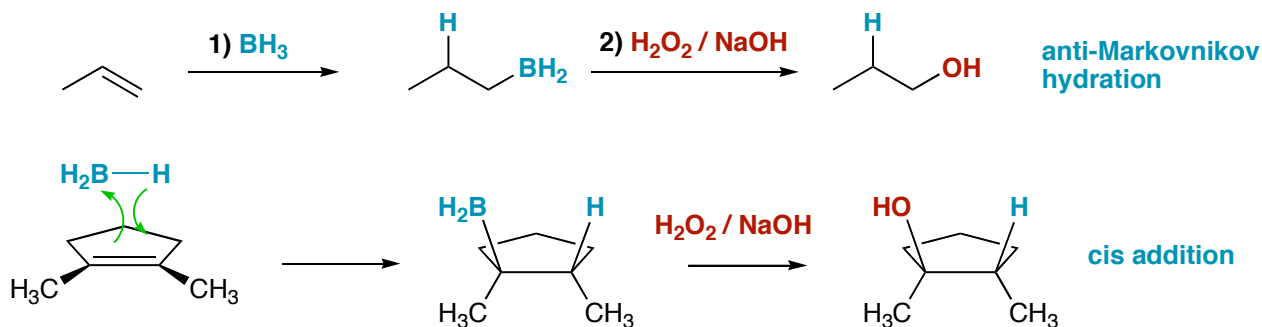
A milder method to accomplish the Markovnikov addition of water is to use a mercury salt to promote the reaction. This will add at room temperature to form a oxymercuration product and the mercury is exchanged for H in a second step using sodium borohydride. Note that, unlike H^+ catalyzed addition that goes through a carbocation, the mercury salt can bridge like the bromonium systems and control a selective trans addition.



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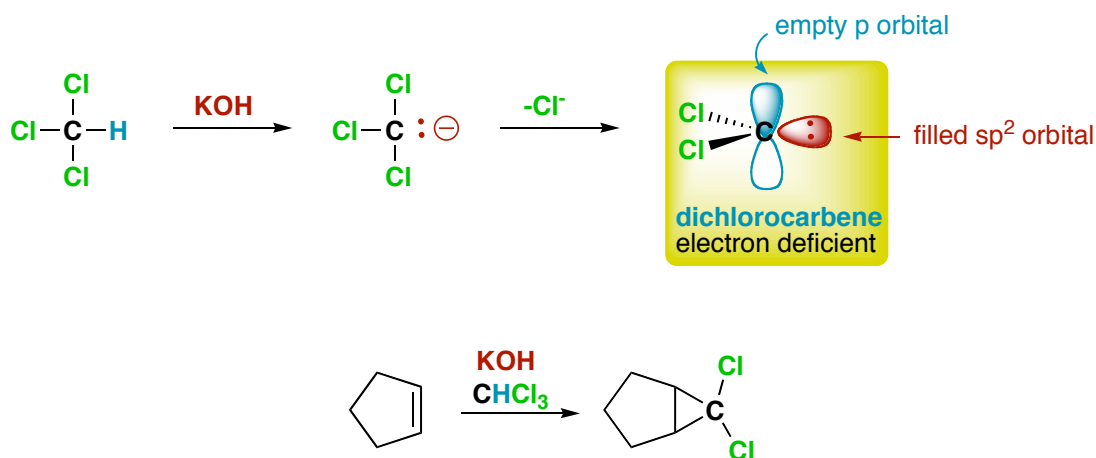


Anti-Markovnikov hydration of double bonds can be accomplished using borane as a reagent. The Hydroboration reaction places the boron and hydrogen onto the double bond at the same time, thus they must add on the same side. This is a cis addition. Also, the boron ends up on the least substituted carbon and they hydride on the most substituted carbon. The boron can be oxidized to an alcohol upon basic hydrogen peroxide treatment.



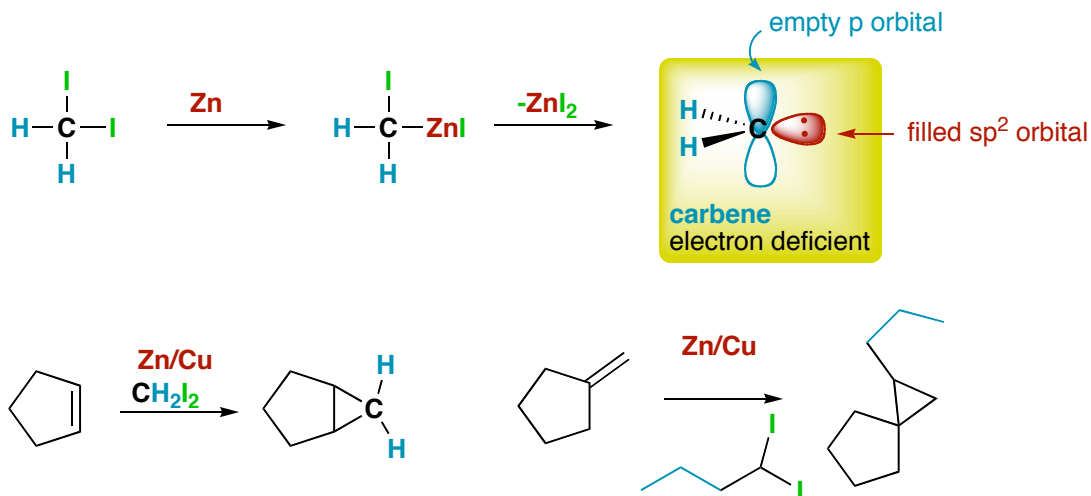
Addition of Carbenes

Carbenes are highly reactive intermediates that have an electron deficient carbon. The carbon contains a lone pair of electrons as well as an empty orbital. Overall, the formal charge is neutral, however, carbenes do not have an octet and are reactive with alkenes. Shown below are a couple of useful methods to prepare carbenes. The first takes chloroform (trichloromethane) and a strong base to affect overall the elimination of H and Cl to form dichlorocarbene. The second method utilizes Zn to carry out overall an elimination of I and I from a carbon. Carbenes have dual reactivity and will form two bonds at once when presented with an alkene. In this way, cyclopropane structures are formed.



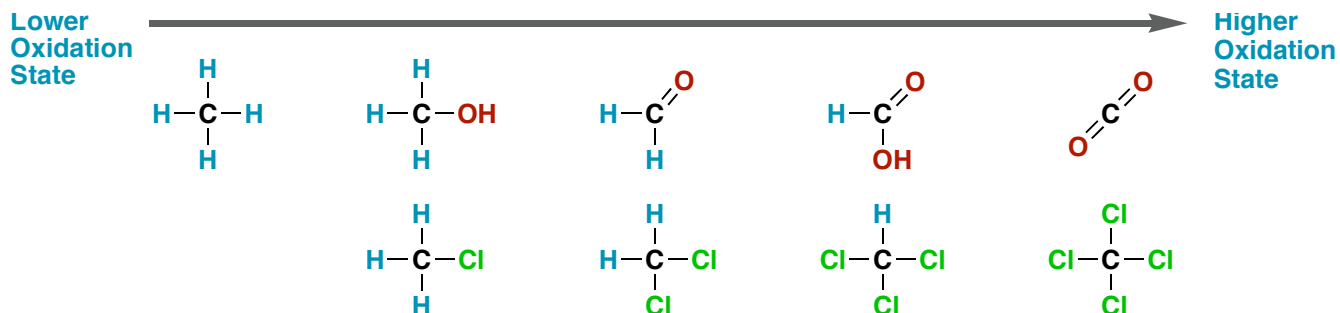
Addition of Carbenes

The second method utilizes Zn to carry out overall an elimination of I and I from a carbon. Carbenes have dual reactivity and will form two bonds at once when presented with an alkene. In this way, cyclopropane structures are formed. This is a much more versatile method as many differently substituted diiodoalkanes can be utilized.



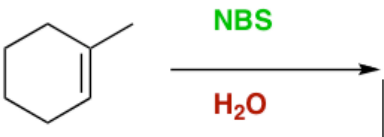
Oxidation States of Organic Molecules

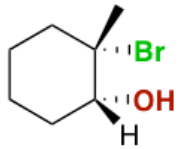
Organic chemists think about oxidation states a little bit differently. Classically, the oxidation of an element occurs when it gives up an electron and becomes an ion. Since carbon molecules have mostly covalent bonds, we need to think about oxidation states a little bit more broadly. We think about a higher oxidized carbon as one that has more bonds to atoms that are more electronegative than it. Thus, in the chart below, methane would have the lowest oxidation state while carbon dioxide would be the highest. When we call a reaction an oxidation, we are increasing the bonds to more electronegative atoms, and when we use the word reduction, we are decreasing them. In other words, we are increasing or decreasing carbon's ownership of the shared electrons.

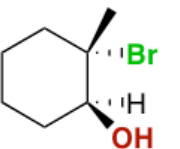


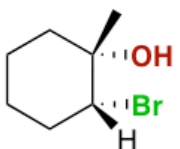
Quiz of the day

Q: What is the product of the following reaction?



1: 

2: 

3: 

4: 