

ORGANIC CHEMISTRY 1 LECTURE GUIDE 2019

BY RHETT C. SMITH

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By Rhett C. Smith, Ph.D.

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Companion Books from the Proton Guru:

Organic Chemistry 1 Reactions and Practice Problems 2019

by Rhett C. Smith

Organic Chemistry 1 Primer 2019,

by Rhett C. Smith, Andrew G. Tennyson, and Tania Houjeiry

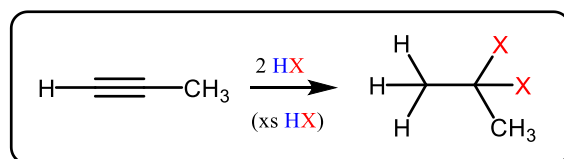
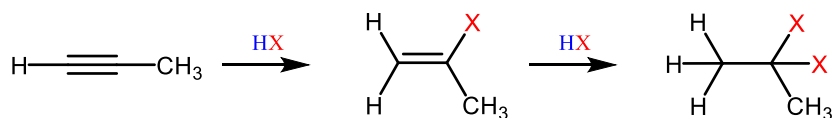
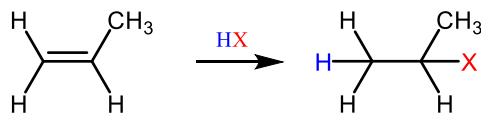
Introduction to Lecture Topics III.12-16: Reactions of Alkynes

Alkynes have Two Pi-Bonds

Alkynes can undergo many of the same reactions as alkenes by adding reagents across pi bonds. The alkyne unit has two pi bonds, so they can react once or twice to add across one or both of the alkyne pi bonds, following the same trends as we saw for alkenes. Consider hydrohalogenation:

Hydrohalogenation

*Get rid of pi bond.
Add H (less subst. C)
Add X (more subst C)*



Notes

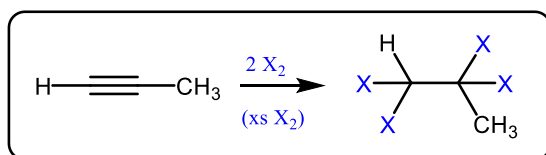
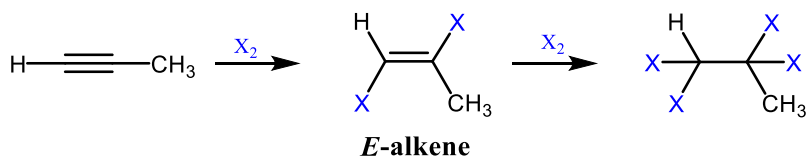
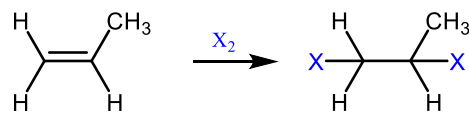
Introduction to Lecture Topics III.12-16: Reactions of Alkynes

Alkynes have Two Pi-Bonds

... and halogenation:

Halogenation

Get rid of pi bond.
Add X to each side,
anti- to each other



Notes

Introduction to Lecture Topics III.12-16: Reactions of Alkynes

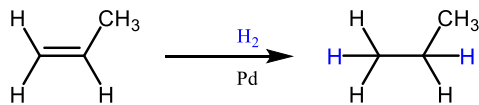
Alkynes can be Reduced

Alkynes can also be hydrogenated, either all the way to alkanes, by *syn*-addition of one equiv H_2 , or by *anti*-addition of one equiv H_2 depending on the reagents:

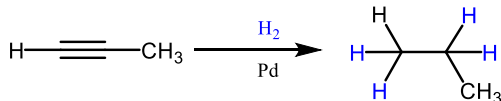
Three ways to Add H!

H_2/Pd

Get rid of pi bond.
Add H to each side,
syn- to each other

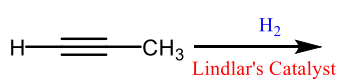


Alkyne: H_2/Pd



H_2 is always excess!!

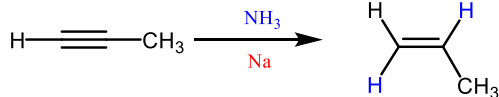
Syn- Addition



Lindlar is weak.
He can only move 2 H atoms.
Pathetic.

An aversion to Syn: The sodium story

Anti- Addition



Notes

Introduction to Lecture Topics III.12-16: Reactions of Alkynes

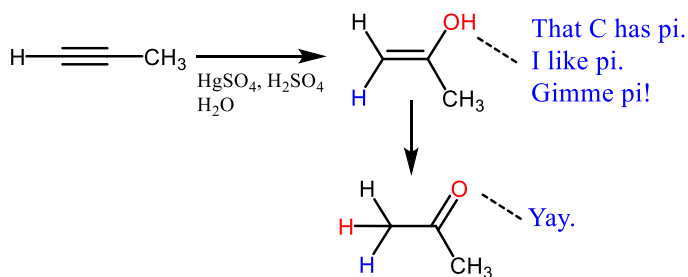
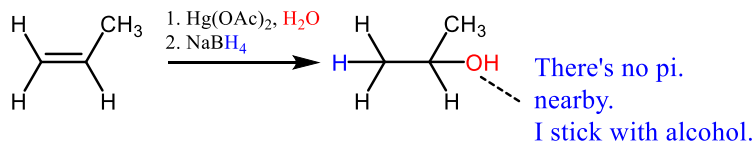
Attempts to make alcohols actually lead to carbonyls

The biggest difference we will see between alkyne and alkene addition reactions is when we try to make an alcohol from an alkyne. It turns out that a double bond to the same C that has an -OH on it is often unstable and rearranges to a carbonyl (we will see why and how later):

Try to make an alcohol

Oxymercuration

Get rid of pi bond.
Add H to less subst side,
OH to more subst side



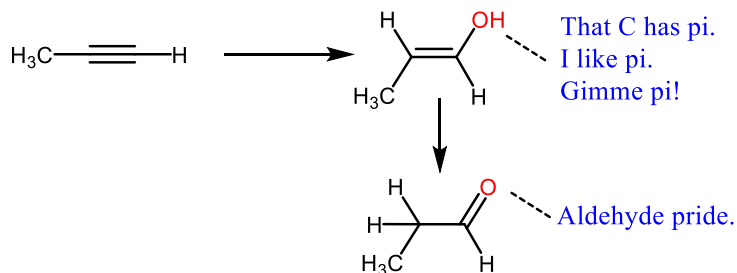
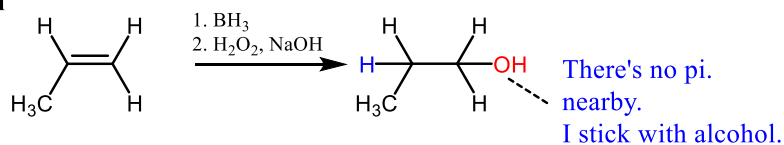
Notes

... This is the case whether we try to make a Markovnikov or a non-Markovnikov alcohol:

Try to make an alcohol

Hydroboration/Oxidation

*Get rid of pi bond.
Add H to more subst side,
OH to less subst side*



Notes