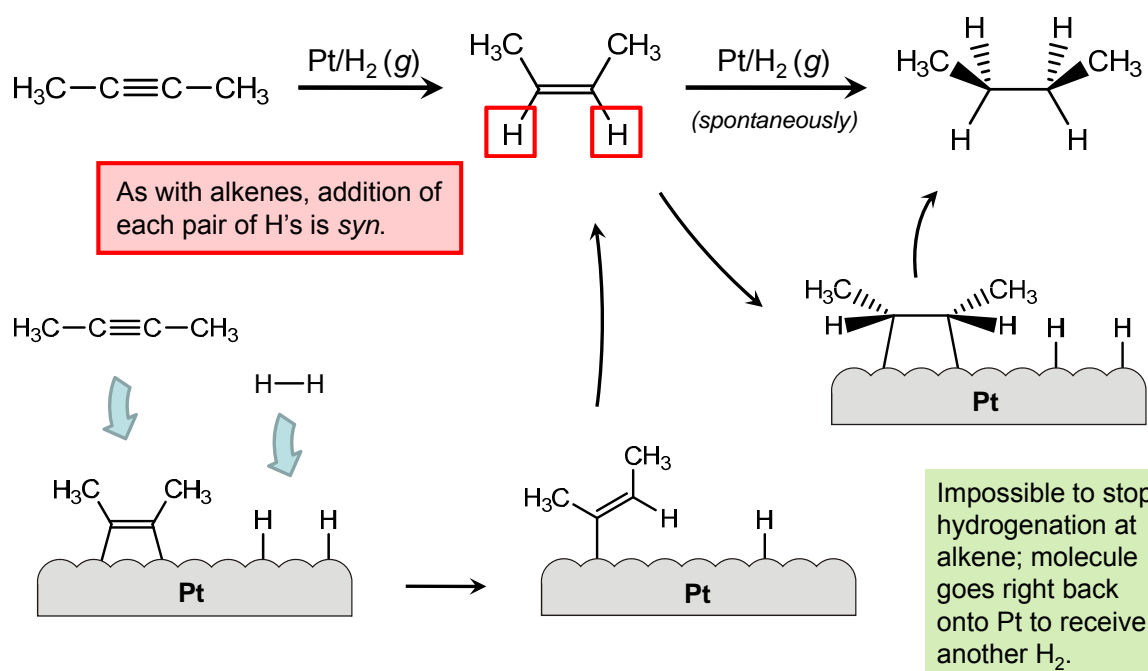


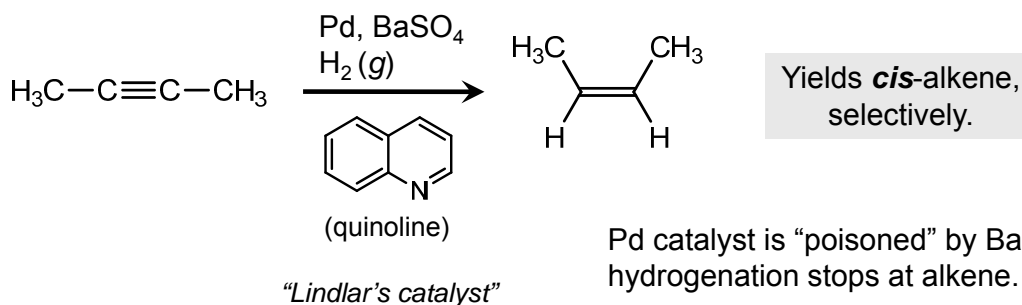
# Catalytic Hydrogenation of Alkynes

Under standard conditions (Pt/H<sub>2</sub>), alkynes are doubly hydrogenated to alkanes.

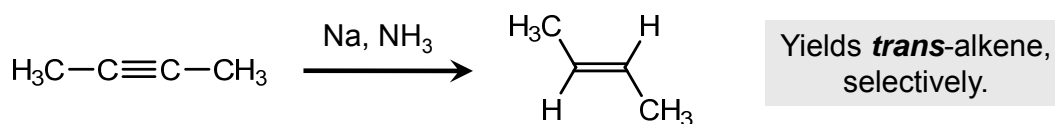


# Selective Monohydrogenation of Alkynes

Alkynes → *cis*-alkenes:

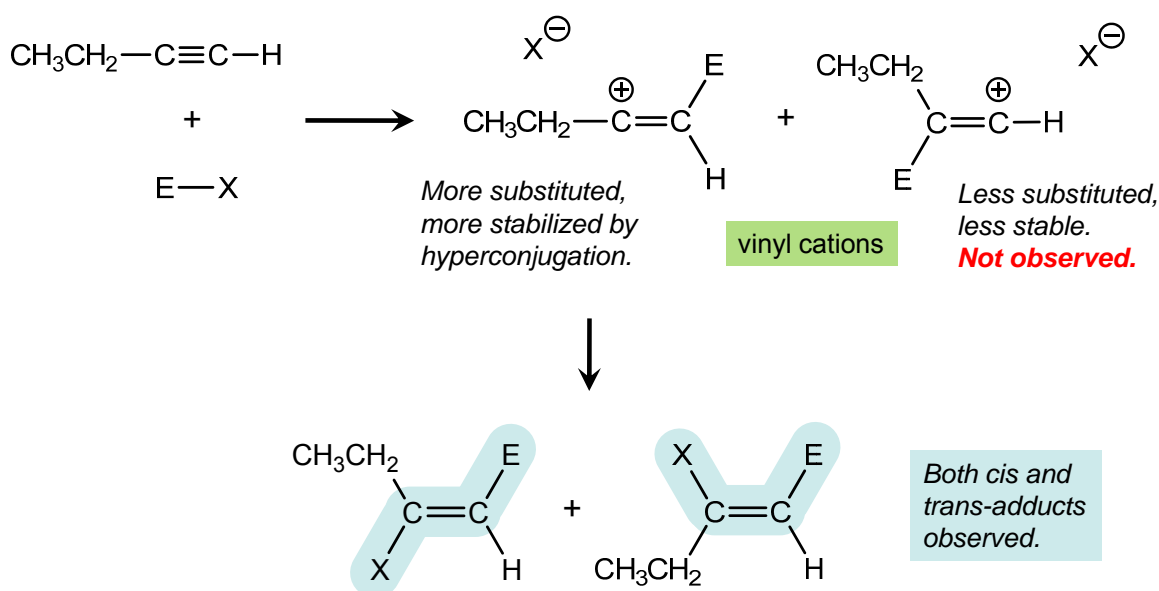


Alkynes → *trans*-alkenes:



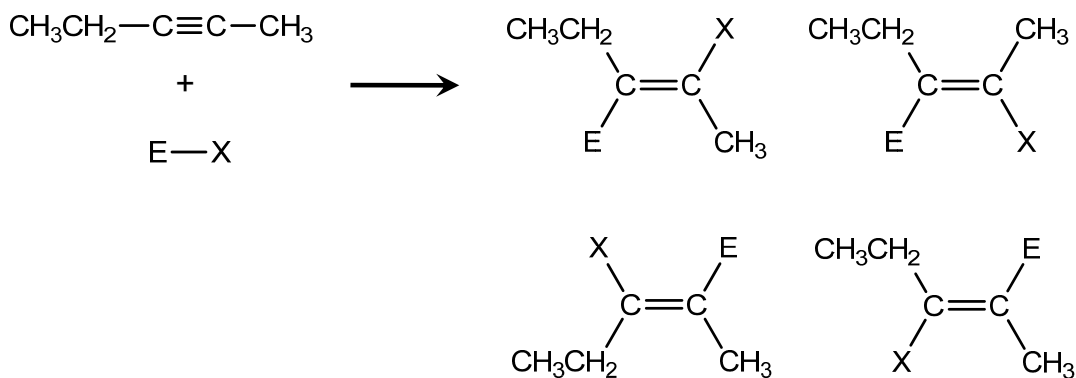
## Electrophilic Addition to Terminal Alkynes

Follows Markovnikov's rule, passing through the most stable carbocation.



## Electrophilic Addition to Internal Alkynes

No basis for regioselectivity. All possible products observed.

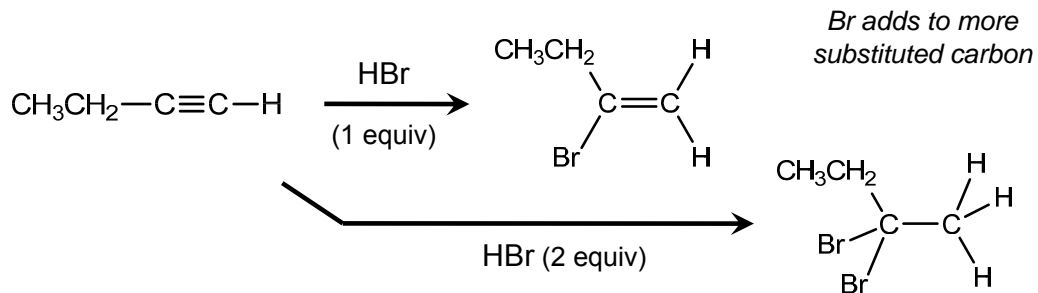


No selectivity means not very useful.

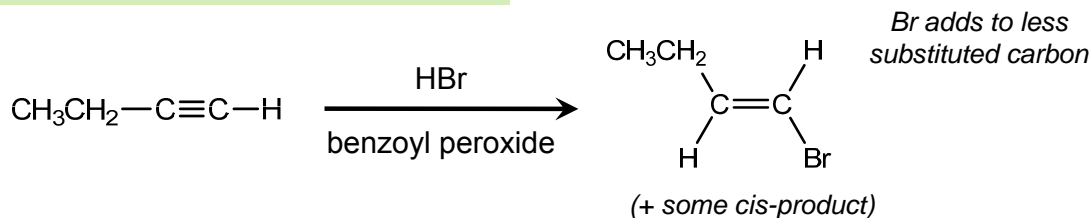
# Hydrohalogenation of Terminal Alkynes

Identical conditions and selectivity to alkenes.

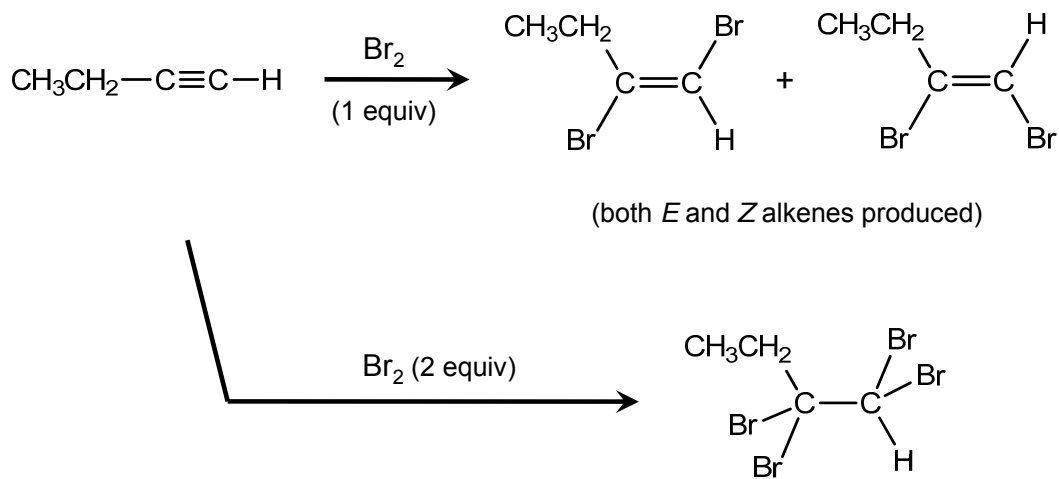
## Markovnikov addition of H-Br:



## Anti-Markovnikov addition of H-Br:

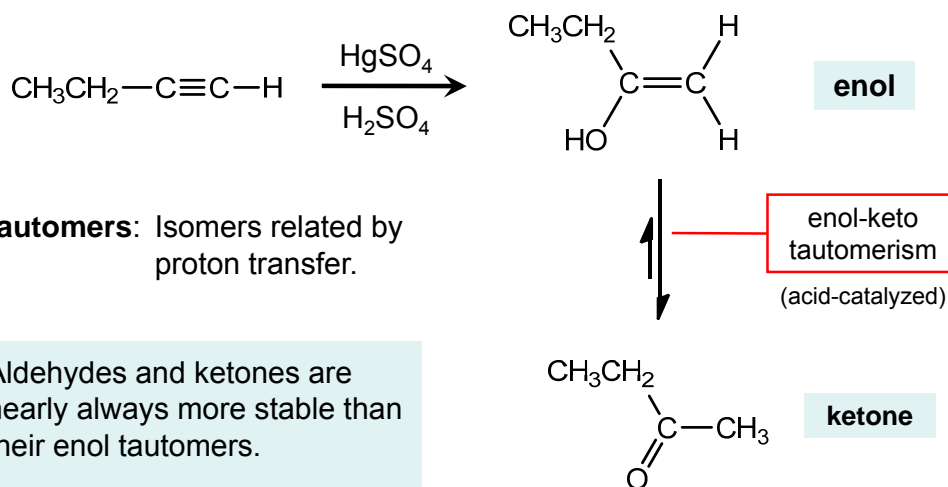


# Halogenation of Alkynes

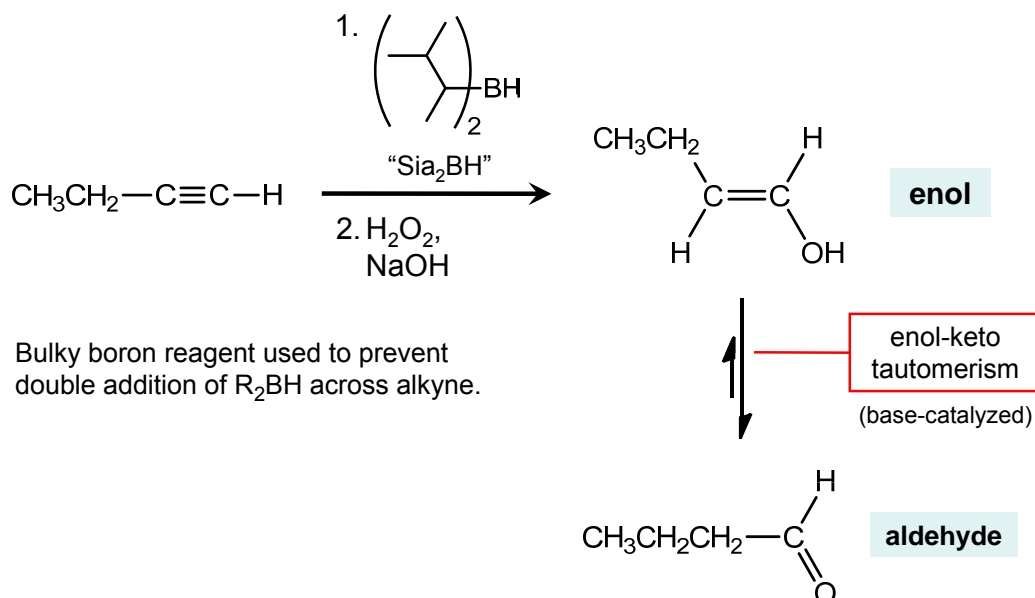


# Markovnikov Hydration of Alkynes

Forms an alkenyl alcohol—an enol—as a reactive intermediate.  
But the eventual product is a ketone.

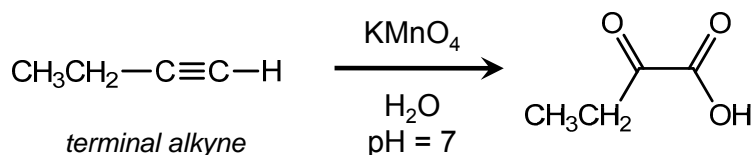
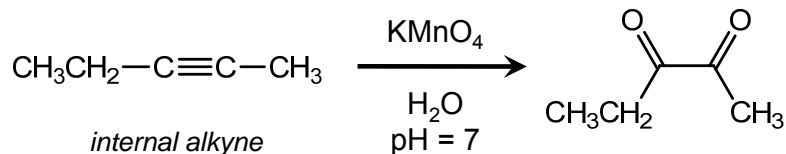


# Anti-Markovnikov Hydration of Alkynes



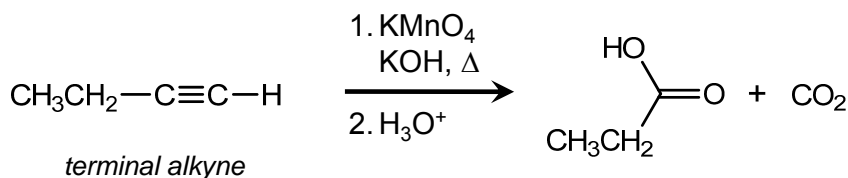
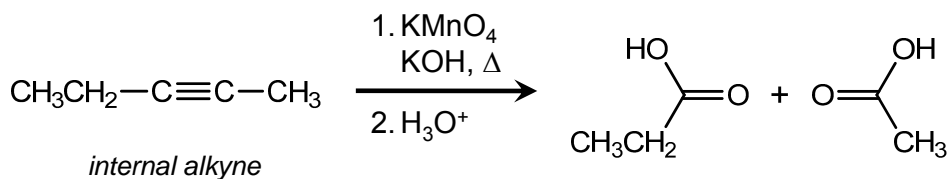
## Mild Permanganate Oxidation of Alkynes

At pH = 7, permanganate ( $\text{MnO}_4^-$ ) converts alkynes to C=O groups, but keeps the C-C bond intact.



## Strong Permanganate Oxidation of Alkynes

Under harsher conditions,  $\text{MnO}_4^-$  cleaves the  $\text{C}\equiv\text{C}$  bond to yield carboxylic acids.



$\text{O}_3, \text{H}_2\text{O}$  (ozonolysis)  
also cleaves C-C bond,  
w/ same products.

## Chapter 9 Material Not Covered in Lecture:

**Nomenclature, Physical Properties, Commercial Importance:**

Read Wade 9.2-9.4.

**Addition of Acetylide Ions to Carbonyl Groups:**

Wade, Chap. 9.7B.  
Covered w/ Chap. 10.

**Synthesis of Alkynes by Elimination Reactions:**

Wade, Chap. 9.8.  
Not important.