CHEM 261 Nov 8, 2017

Upcoming Topics:

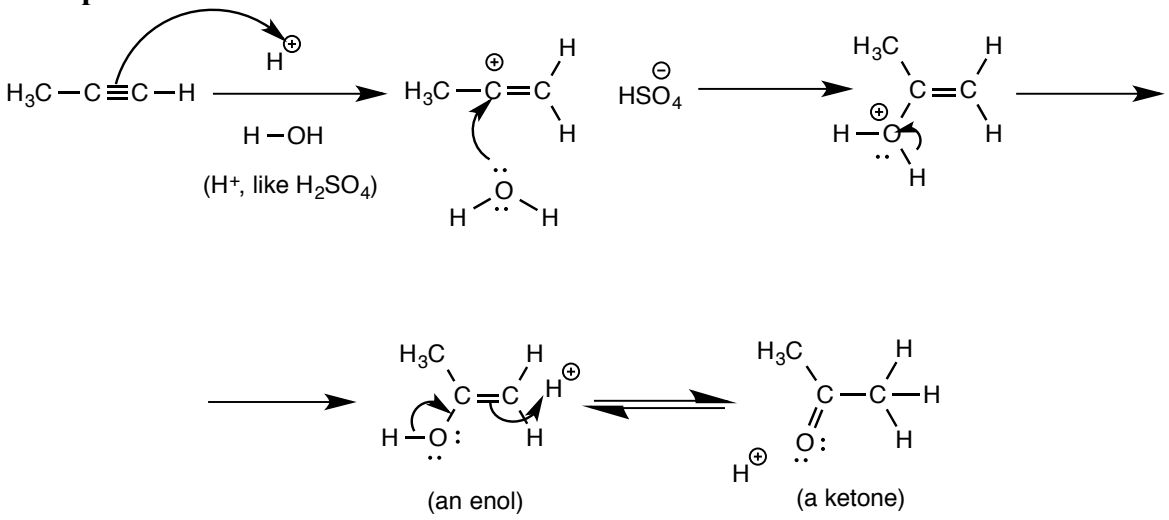
1. Alkyne Reactions
2. Radical Additions to Alkenes
3. Polymers
4. Conjugated Systems
5. Aromatics

REVIEW

:Base picks up a proton (H^+) very fast, may be negatively charged

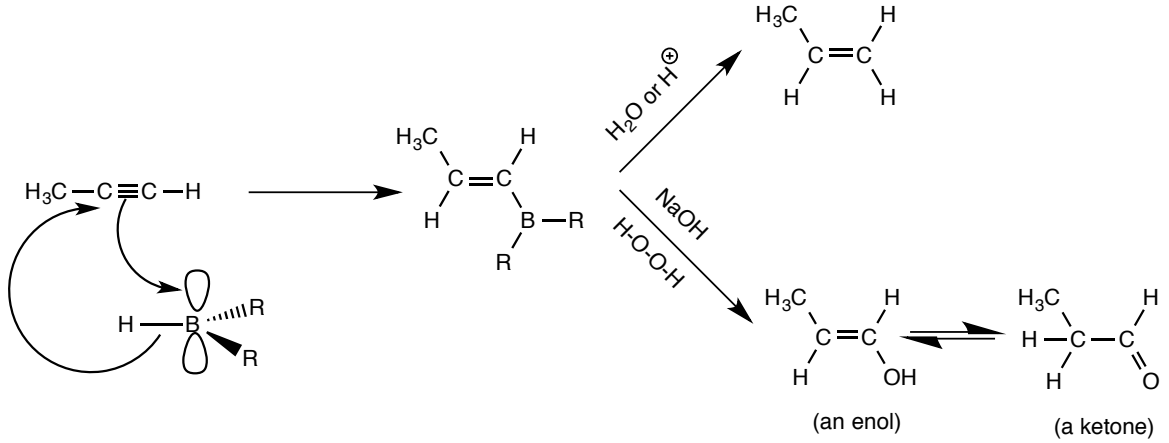
:Nucleophile attaches other atoms (like carbon)

Example 1

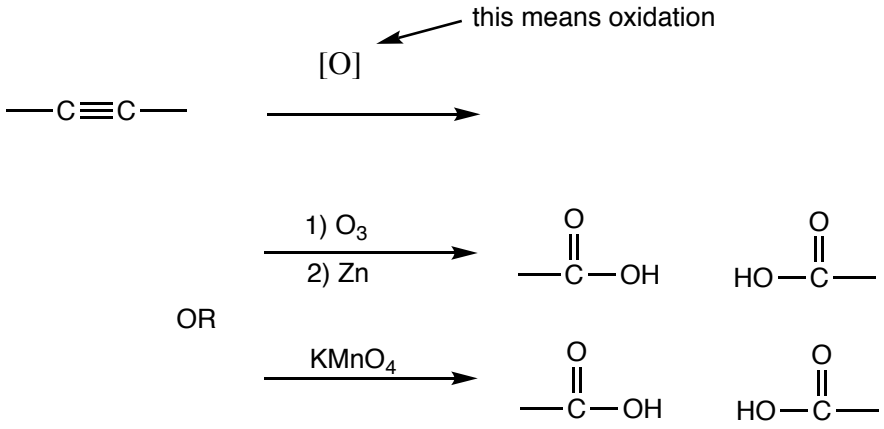


The Keto–Enol forms are called Tautomers (Rapidly interconverting of structural isomers)

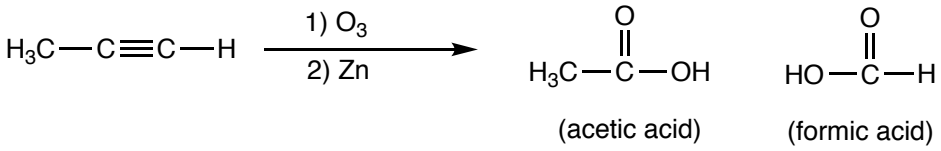
Example 2 (here H adds as H minus (hydride)



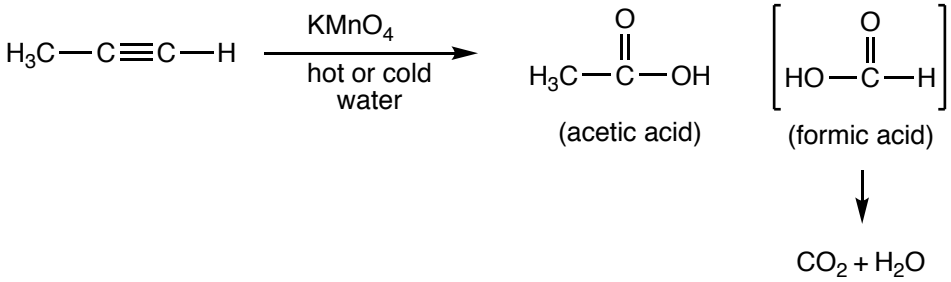
Example 3



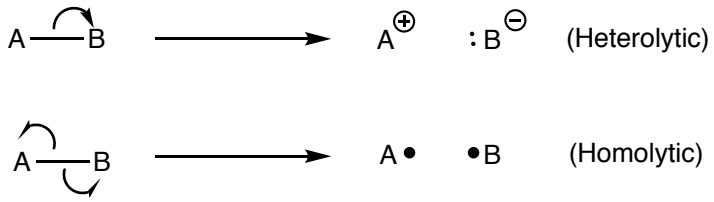
Example 4



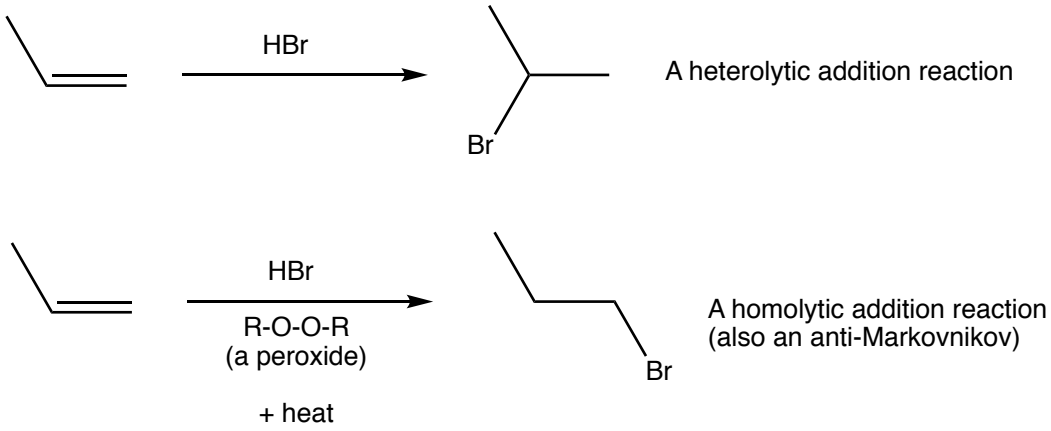
Example 5



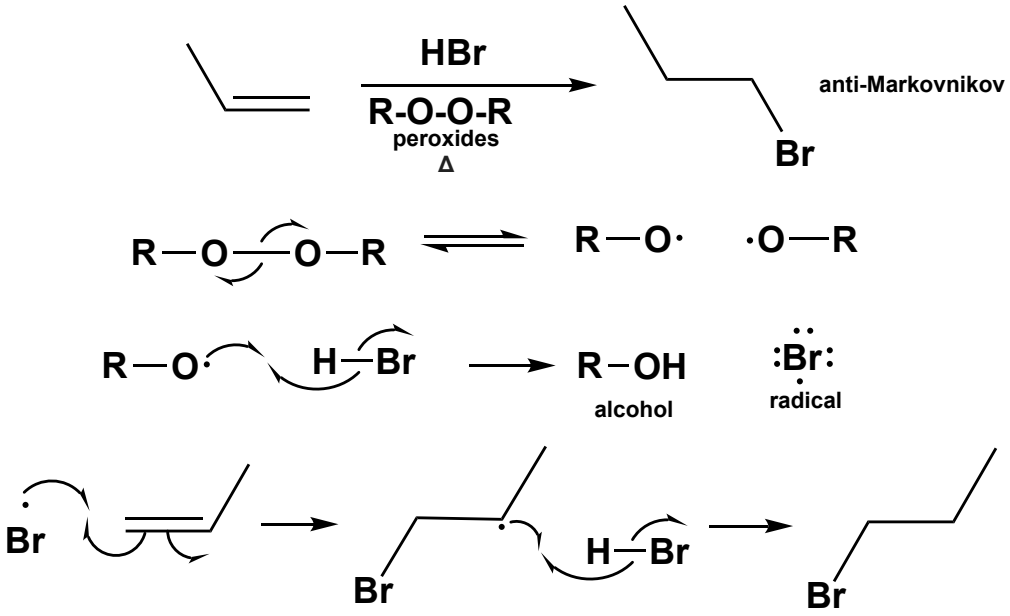
General Reaction Scheme



Example 6



Mechanism of the homolytic addition reaction above:



More highly substituted secondary (2^{o}) radical formed

Polymers

poly – many, meros – parts

Natural Polymers:

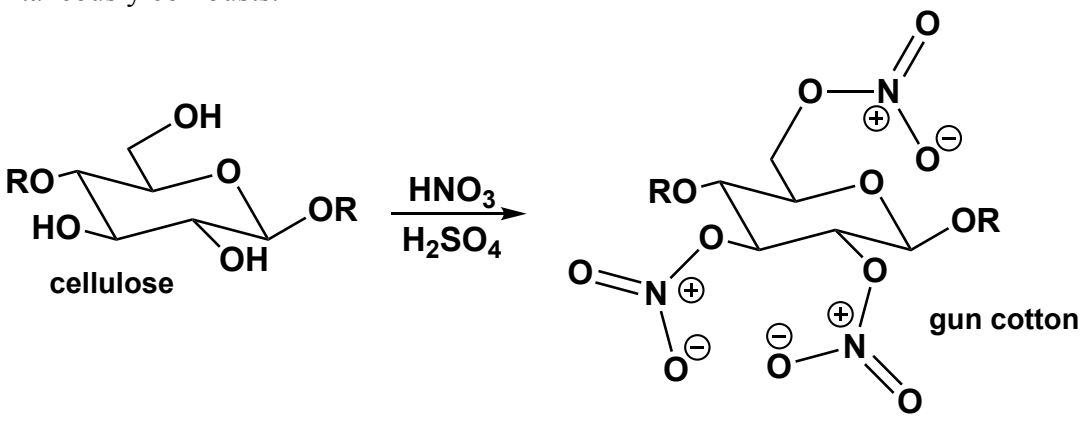
- Nucleic acids (DNA, RNA)
- Proteins and peptides (amino acid polymers)
- Polysaccharides (cellulose)
- Fats, polyketides (polymers of acetic acid)

Human-Made Polymers

- Christian Schönbein, 1826 professor in Basel
  - Mopped up a spill of H_2SO_4 and HNO_3 with an apron made of cotton (cellulose, a polymer of glucose),
  - He washed the apron and hung it up to dry
    - The apron exploded → He had created gun cotton!

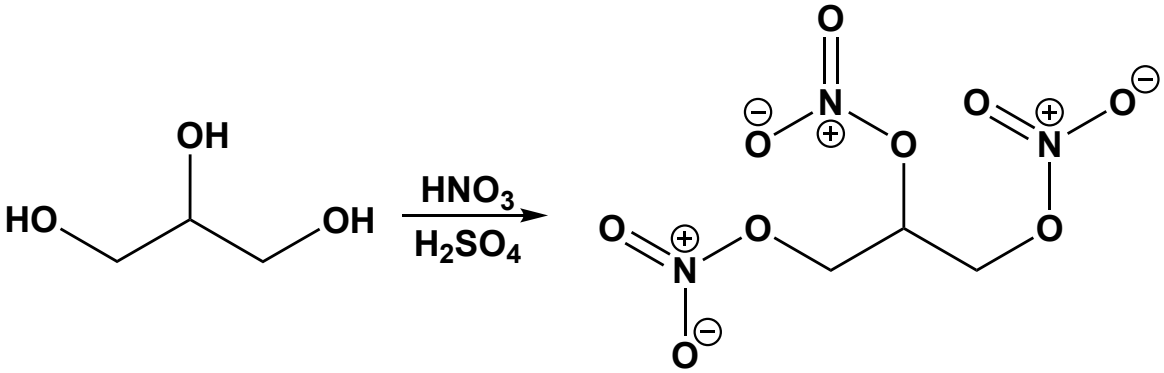
How did this happen?

In the presence of H_2SO_4 and HNO_2, the free hydroxyl groups form a material that spontaneously combusts.



Another example: **glycerol or glycerin**

Under the same conditions, glycerol will form nitroglycerine

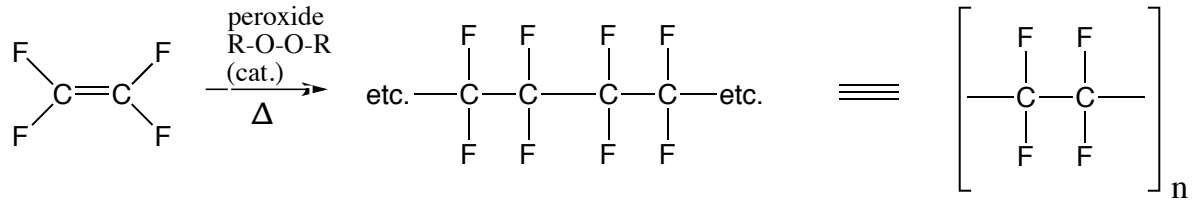


2 to 5 % of nitroglycerine was combined with diatomaceous earth → dynamite!

Who did this reaction? Alfred Nobel, the founder of the Nobel Prize!

- *Wallace Carothers* 1896-1937 DuPont
  - Nylon (polyamide)
  - Dacron (polyester)
- Roy Plunkett 1938 DuPont
  - Teflon (created from tetraflyoroethylene, a toxic gas)

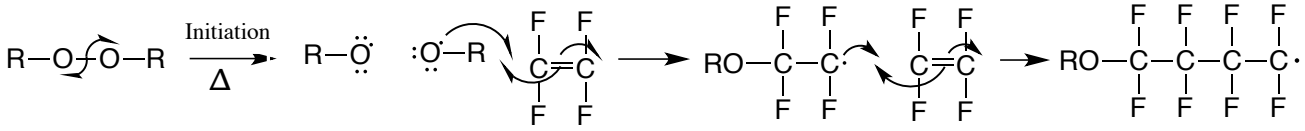
Teflon: Polytetrafluoroethylene



tetrafluoroethylene
toxic gas

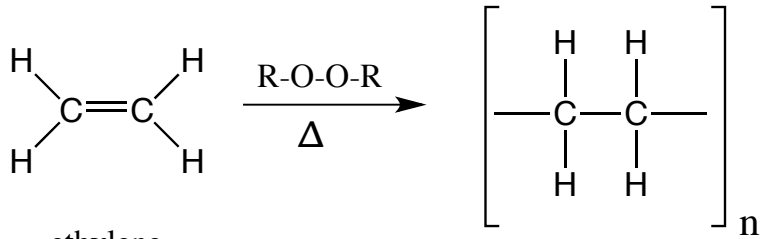
Teflon
MW > 1 million

Polymerization Mechanism of Teflon



repeat to form long chains

PE: Polyethylene



ethylene

polyethylene