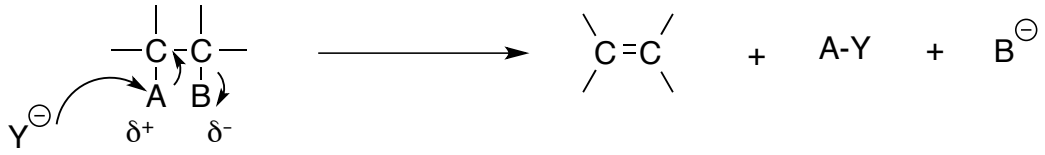
Recall:

Elimination reaction



2 Types of Mechanisms: E_1 and E_2

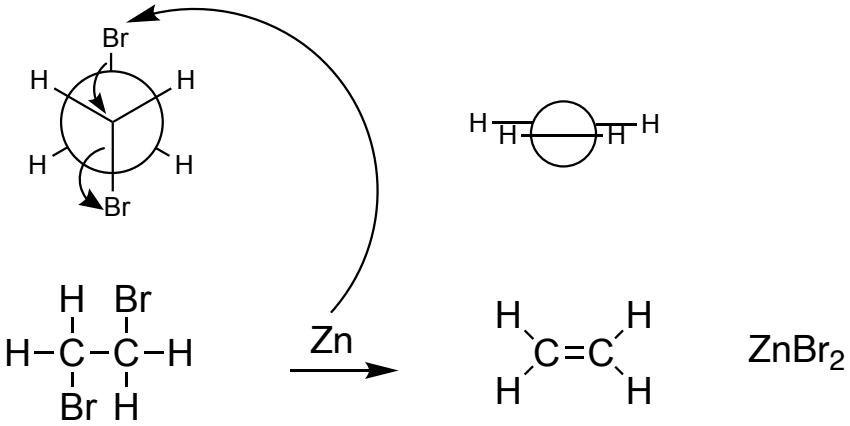
E_2 Reaction (E=Elimination)**:**

- Rate depends on two concentrations
- Stereospecific
- Concerted (bonds being formed and broken at the same time)
  - No intermediate
- follows Zaitsev Rule: most substituted alkene will be the major product
- Anti-periplanar geometry
- 1º, 2º, 3º, but especially primary and secondary

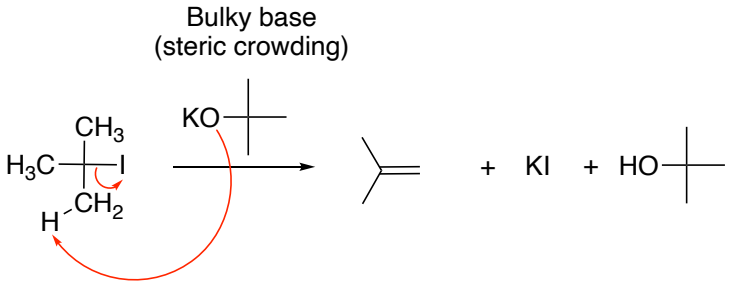
Example:

Dehalogenation

Example 1:

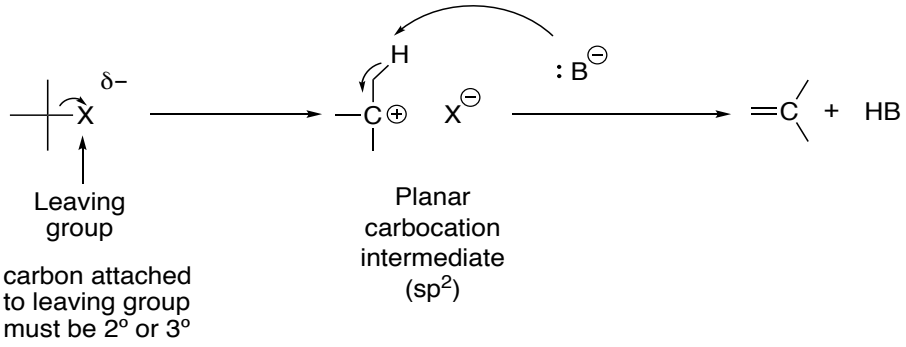


Example 2:



E1 Reaction:

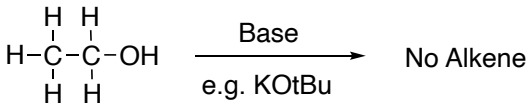
- Rate depends on one concentration
- Not concerted (carbocation intermediate)
- Not stereospecific
- Favored with leaving group being 3°

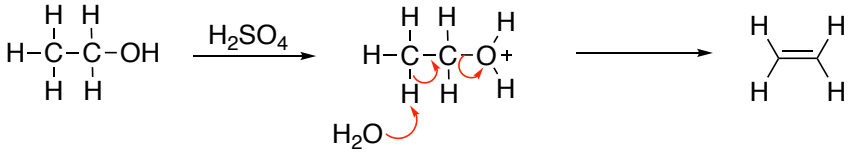


Dehydration

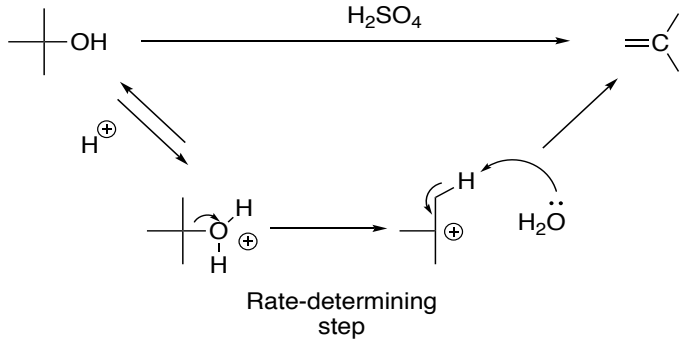
-OH and -OR are not leaving groups, but H-OH and H-OR are okay (they can leave favoured by heat or strong acid)

Example 1:

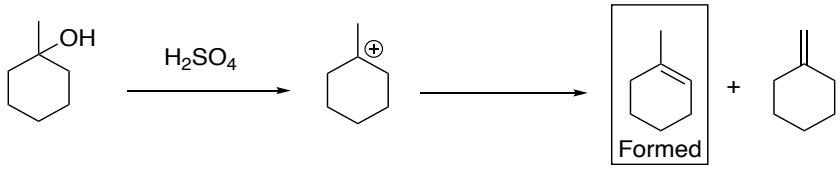




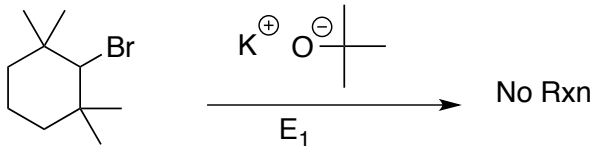
Example 2:

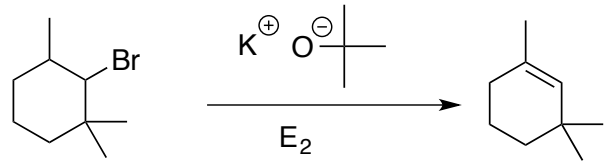


Example 3:

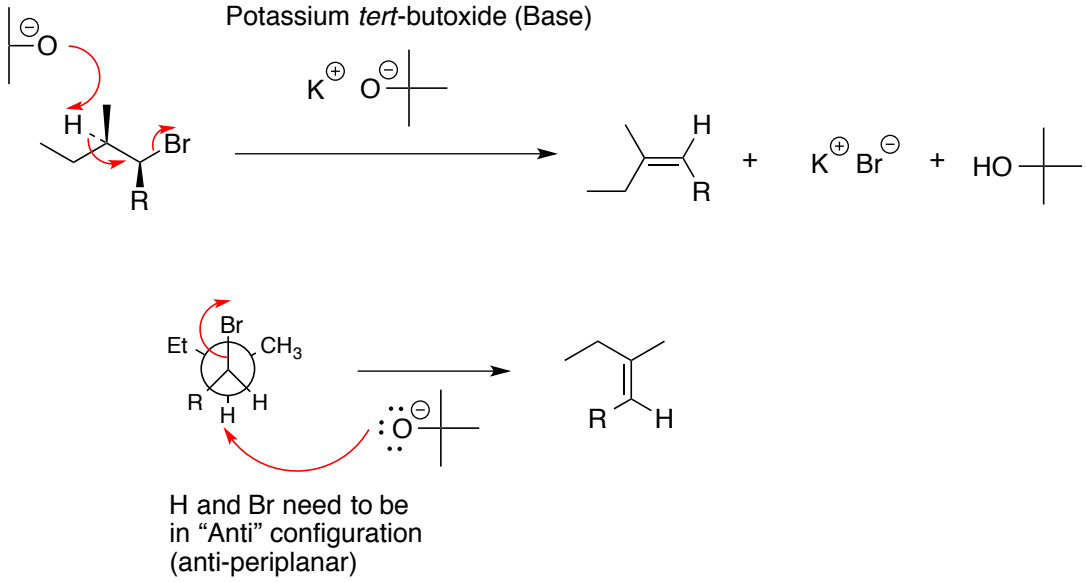


Example 4:

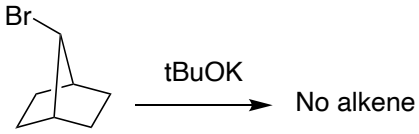




Example 5:



Example 6:



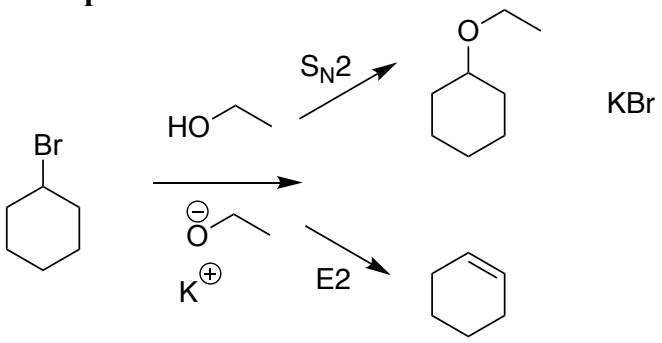
(too unstable – will not form according to Bredt's rule

Elimination vs Substitution

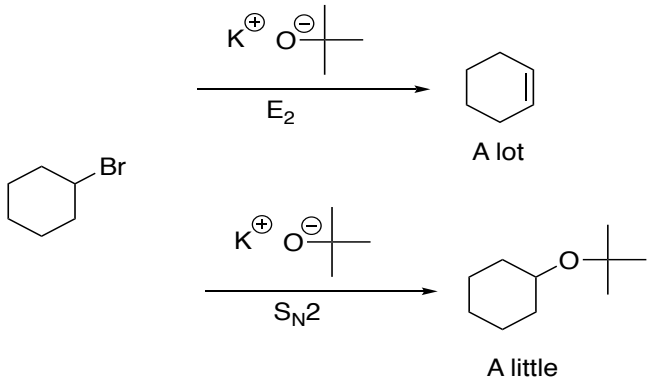
Substitution	vs.	**Elimination**
- Low Temp		- High Temp (Heat)
- Weaker Base		- Stronger Base
- Dilute H^+		- Conc. H^+
- Leaving group on 1° carbon		- 2°, 3°
- Small Nucleophile		- Large Nucleophile

Note: HO-H, HOR are leaving groups but requires strong acid (H^+) such as H_2SO_4

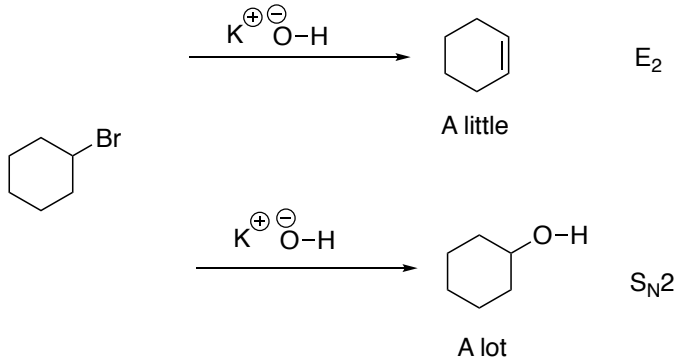
Example 7:



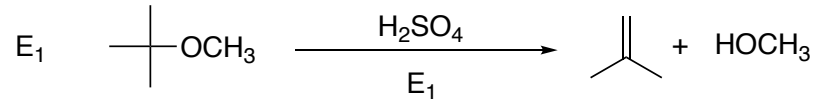
Example 8A: bulky nucleophiles/bases favor elimination



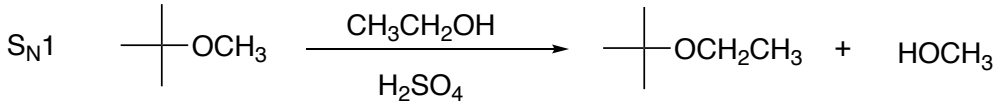
Example 8B: small nucleophiles/bases favor substitution



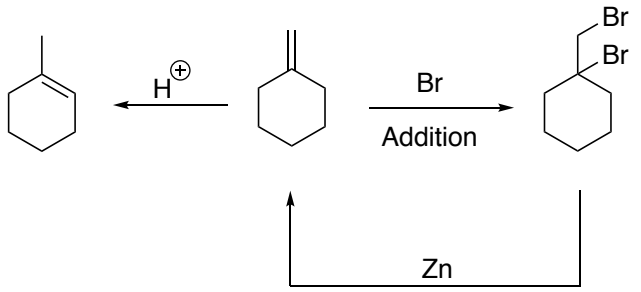
Example 9A:



vs.



Example 9B:

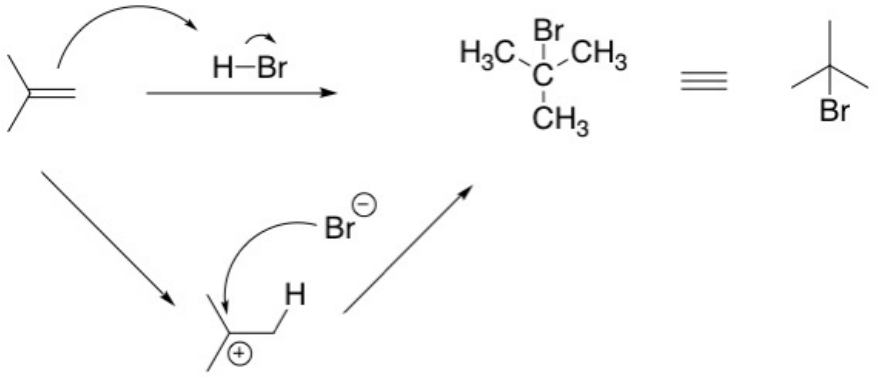


Due to mechanism of Zn, the double bond is stuck at less substituted end.

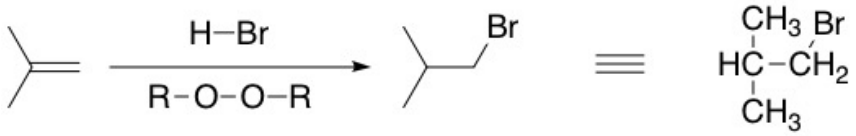
Double bond can go to more substituted if it is left in acid

Recall:

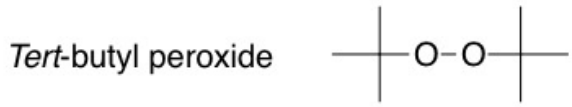
Addition Reactions of Alkenes (Markovnikov addition)



For alternate regiochemistry (addition of Br onto the less substituted carbon) need dialkyl peroxide (radical addition)

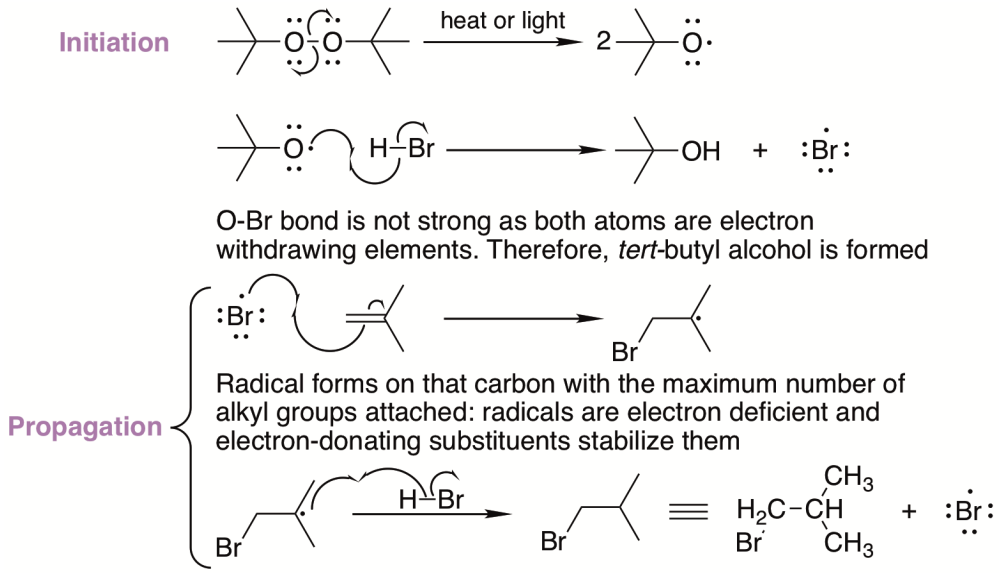


Examples of peroxides



Hydrogen peroxide HO–OH

Radical mechanism



Polymers
Poly = many
Meros = parts

Natural Polymers (Biopolymers)

1. Polysaccharides
   - polymers of sugars (e.g. cellulose, glycogen)

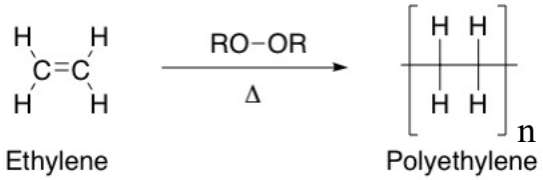
2. Proteins and peptides
   - polymers of amino acids

3. Nucleic acid polymers (DNA and RNA)
   - polymers of nucleotides

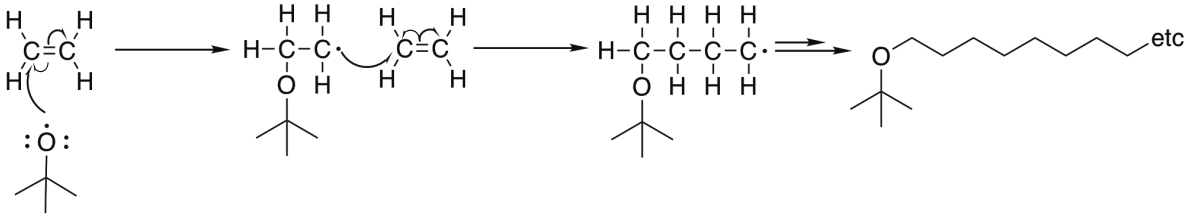
4. Fats and polyketides
   - polymers of fatty acids

5. Polyisoprenoids/terpenoids
   - polymers of isoprene (i. e. natural compound rubber)

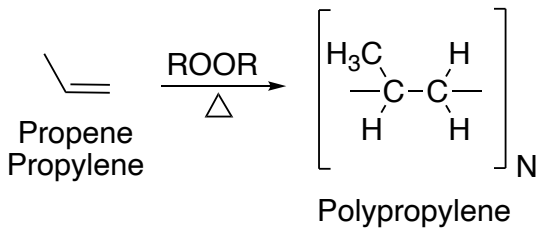
Polyethylene



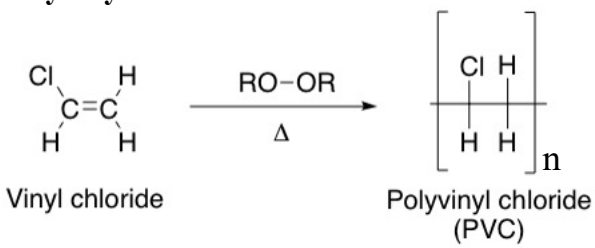
Mechanism:



Polypropylene

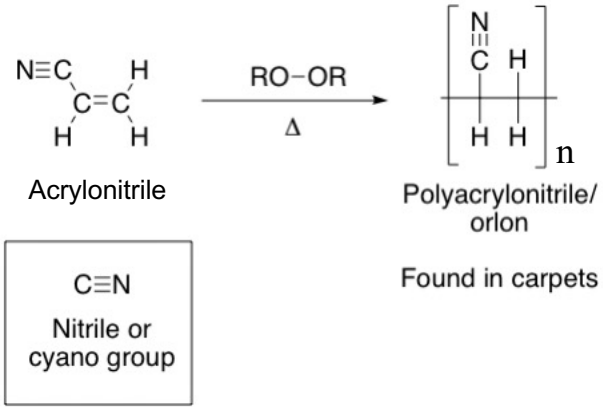


Polyvinyl chloride



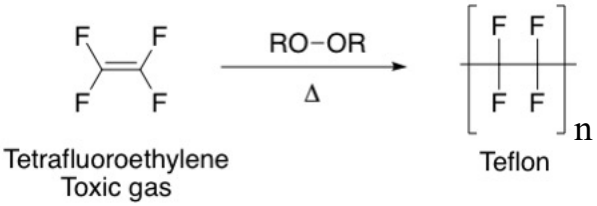
Such polymers containing chloride can form HCl if decomposed.

Polyacrylonitrile



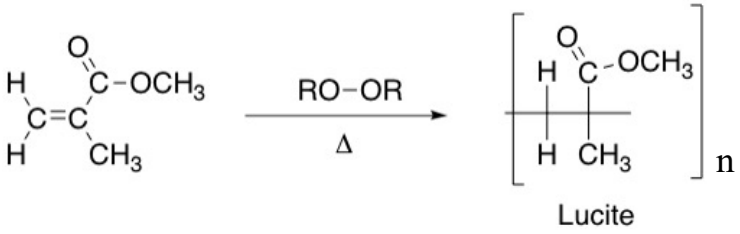
Polyacrylonitrile can form HCN if it is heated to decomposition.

Teflon (Polytetrafluoroethylene)



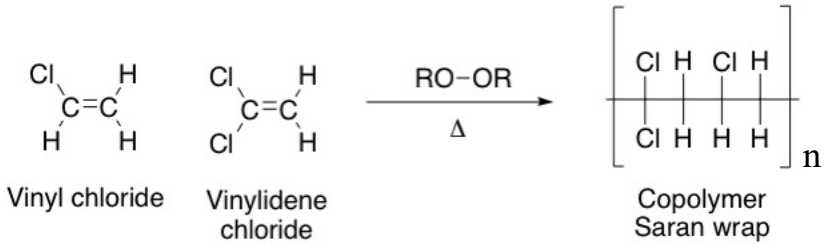
Teflon is very unreactive and does not adhere substances
Many polymers degrade into their components if heated enough, and can further decompose.

Lucite (polymethyl methacrylate) (aka acrylic glass / plexiglass)



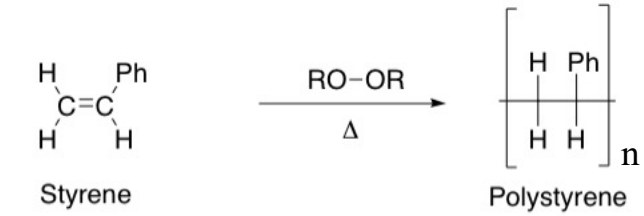
Found in windshields

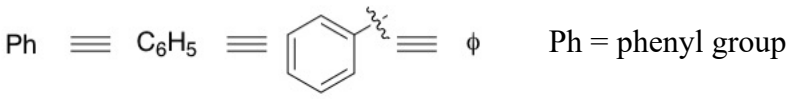
Copolymers



Copolymers are composed of two different subunits.

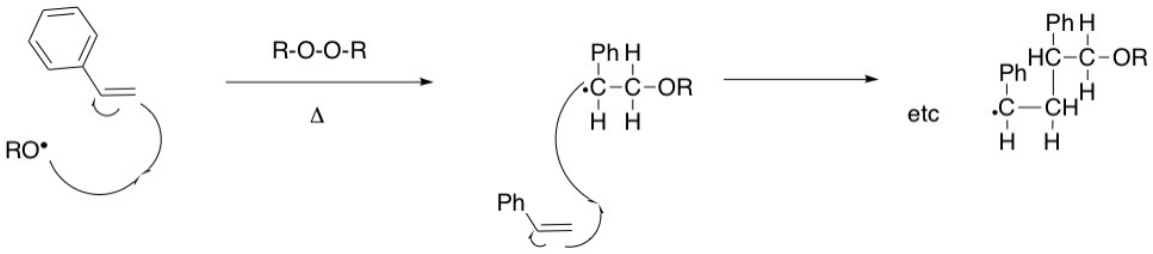
Polystyrene



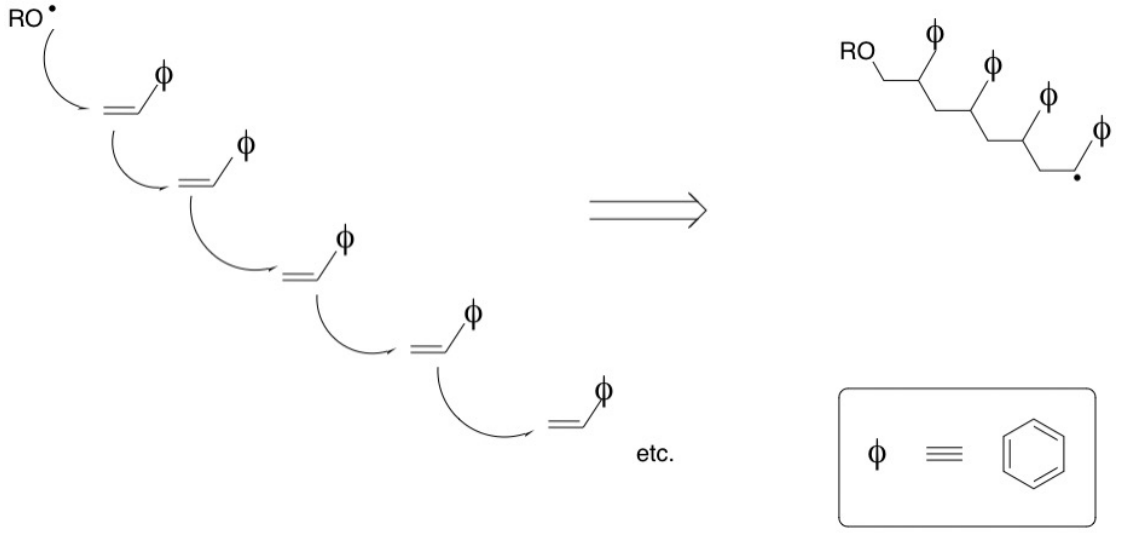


Ph = phenyl group

Example: Mechanism of polystyrene formation



Short-hand for mechanism of polystyrene formation



Divinyl benzene can be added as a cross-linker so chains link on both of its double bonds This make the copolymer more solid (as you encounter in many products) – typically about one part in 100 to one part in 6 of divinylbenzene may be added