

Polymers and Polymerization

Poly = many

Meros = parts

Monomer → basic unit

Dimer → 2 units

Trimer → 3 units

.....

oligomer → many units

Nature polymers

Nucleotides : DNA, RNA

proteins and peptides : polymers of amino acids

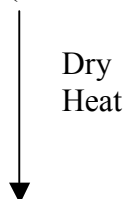
polysaccharides : polymers of sugars

fats, polyketides : polymers of acetic, propionic acids

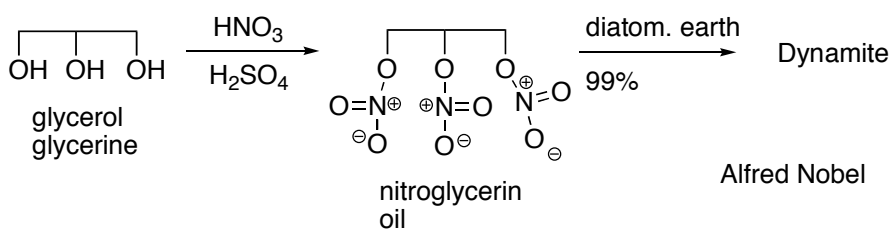
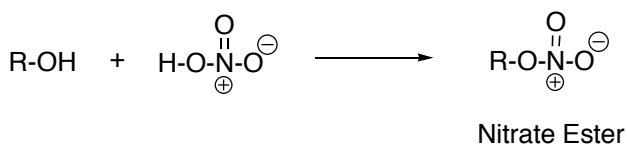
Modification of natural polymers

1826 – Christian Schonbein (University of Basel)

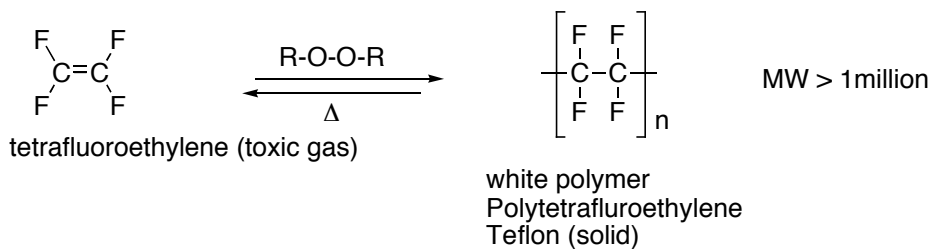
$\text{H}_2\text{SO}_4 + \text{HNO}_3 + \text{Apron (Cotton)} \rightarrow \text{gun cotton (nitrocellulose)}$



Smokeless Powder



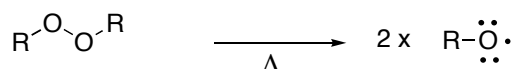
Plunkett (Du Pont):



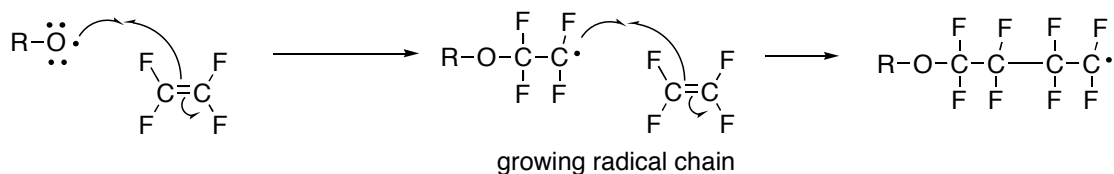
How is TEFLON produced? Catalyst used, but simplistically, can do following:

Radical Catalyzed Polymerization

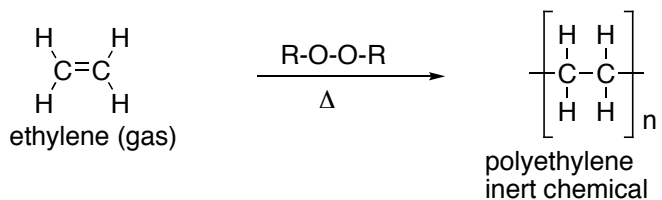
Initiation:



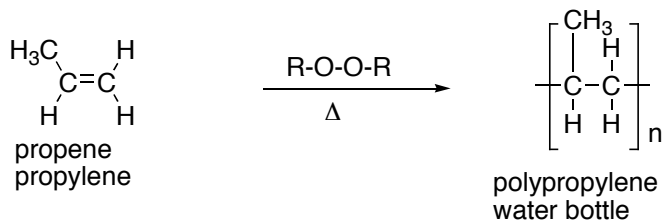
Propagation



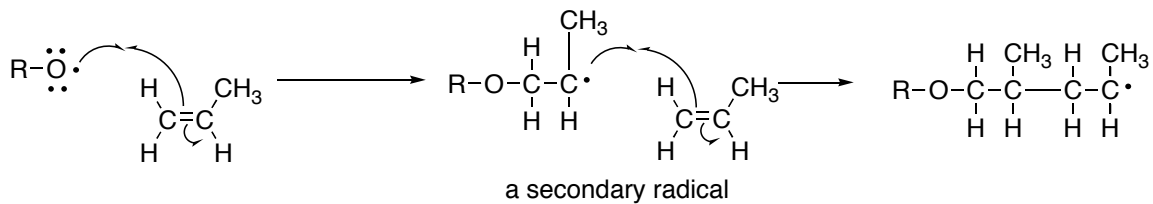
Polyethylene

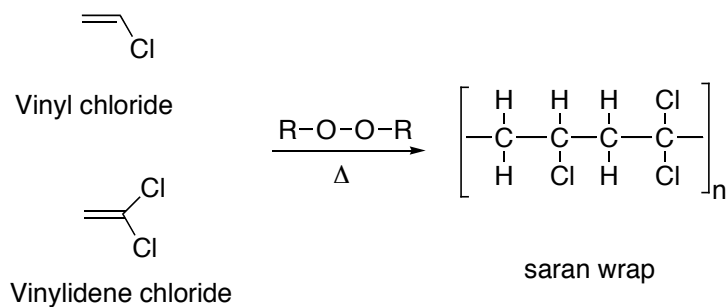


Polypropylene



Mechanism:

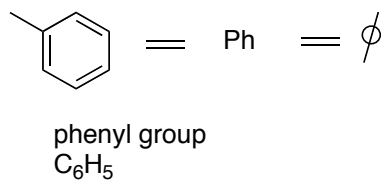
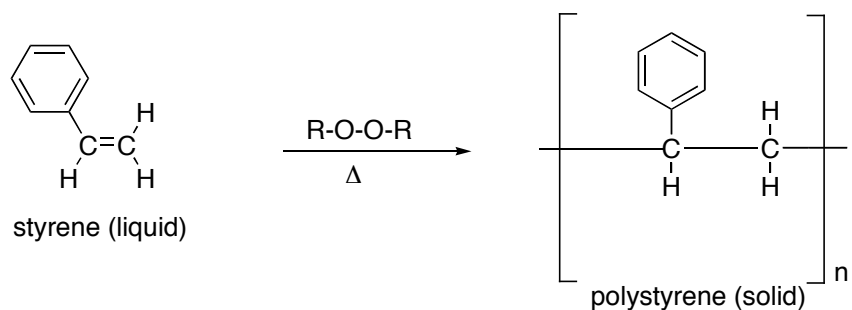




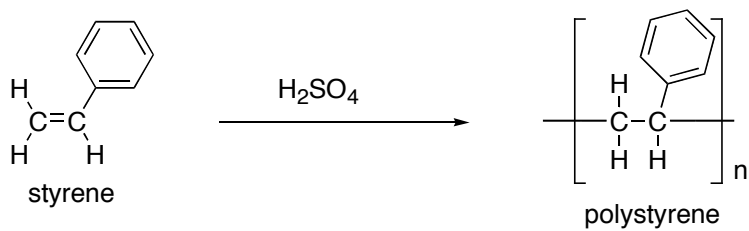
Know: - Mechanism for polymerization

- Recognize polymers

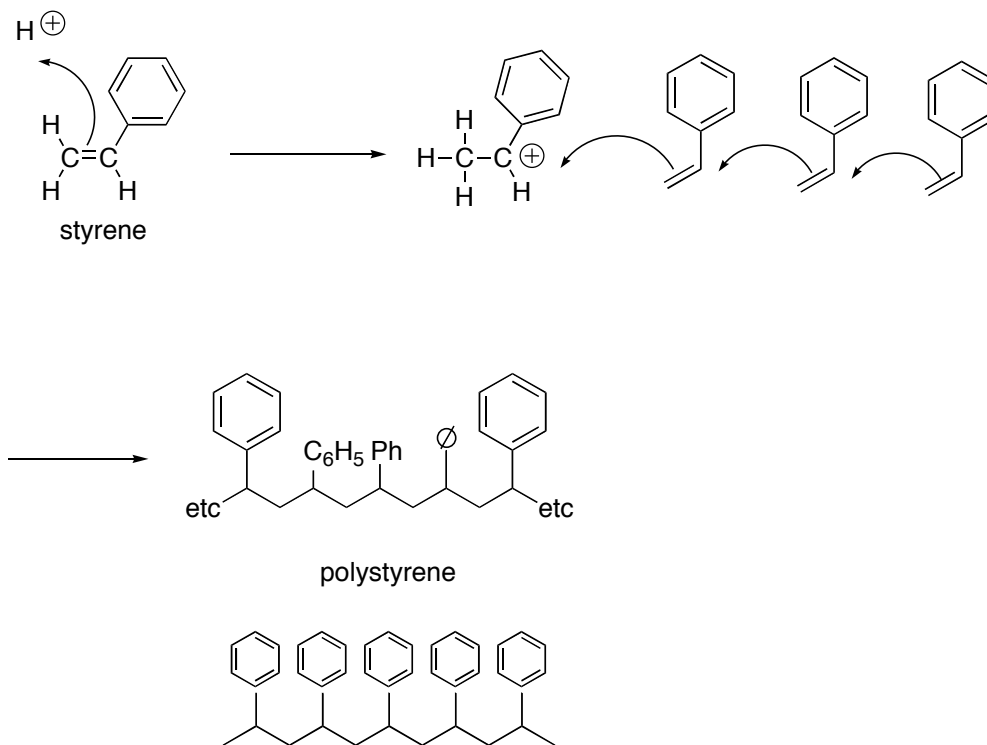
Polystyrene:



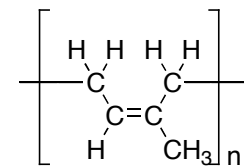
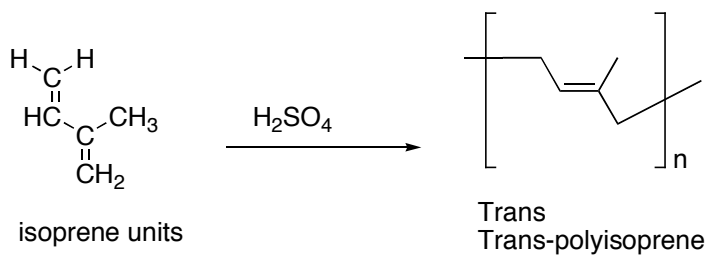
Acid catalyzed polymerization



Mechanism:

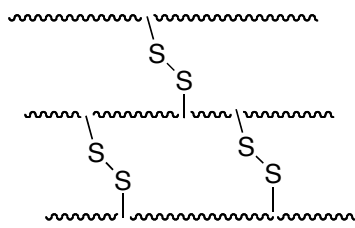


Rubber : commercial source is rubber trees (*Hivea brasiliensis*)



Rubber

- Charles Goodyear – vulcanized rubber in 1839
 rubber + carbon + sulfur + (heat) $\rightarrow$ vulcanized rubber (elastic properties)



the presence of disulfide bonds makes it elastic

Mechanism for polymerization:

