### Addition Reactions to Alkenes Using Radicals: Polymers & Polymerization

Recall Previous Addition Reaction of Alkenes Using Cations (e.g. H+)



Can addition occur in opposite sense ? Yes if use radical addition

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



### **Radical mechanism**



Example without HBr - a polymerization reaction occurs



shorthand notation for polypropylene

When 2 radicals meet, chain terminates

Note more stable radical (in this case tetiary) is always formed by addition onto double bond. There is a termination step (not shown) that ends this polymerization. It requires combination of 2 radicals. It could be two growing chain radicals meeting or it could be from peroxide. If less peroxide is used the polymer chain will be longer.

**Polymers** Poly = many Meros = parts

## **Examples of Biopolymers**

- Polysaccharides

   polymers of sugars
- Proteins and peptides
   polymers of amino acids
- Nucleic acid polymers (DNA and RNA)
   polymers of nucleotides
- 4. Fats and polyketides - polymers of fatty acids
- 5. Polyisoprenoids/ terpenoids - polymers of isoprene

# **Polymer formation**

Teflon



Many polymers degrade into their components if heated enough, and can further decompose.

## Polyethylene

