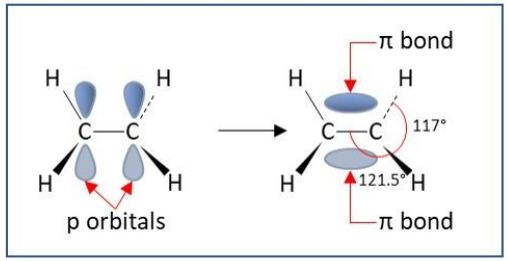
Alkenes



General formulae: (C_nH_{2n})

The modified p-orbitals overlap linearly to form covalent bonds called **σ bonds** (C-C) .
p-orbitals overlap sideways to form **π- bonds**.
H-C-H bond angle in ethene: 117˚

Alkenes are more reactive than alkanes due to the double bonds.

$$CH_2 = CH_2 + H_2 \xrightarrow{Ni\ catalyst} CH_3 - CH_3$$

$$CH_2 = CH_2 + H_2O(g) \xrightarrow{conc.H_3PO_4} CH_3 - CH_2OH$$

(60 atm & 600 K)

Bonding in alkenes

Example: Bonding in ethene

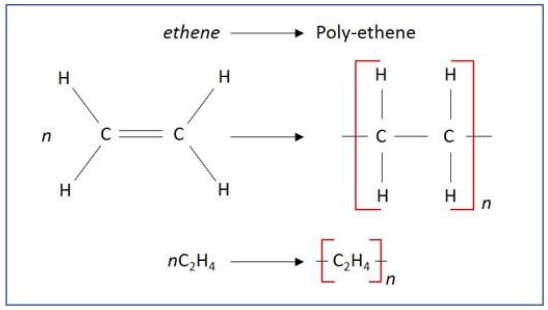
Polychloroethene is rigid due to strong intermolecular forces. Made flexible using plasticiser.
In addition polymerisation, the π-bond of C=C bond is broken, and monomers are linked together.

Additional reactions of alkenes

Reaction with sulphuric acid is also an electrophilic addition reaction. (H-OSO_2OH)

$CH_2{=}CH_2 + H_2SO_4 \rightarrow CH_3CH_2OSO_2OH$
$CH_3CH_2OSO_2OH + H_2O \rightarrow CH_3CH_2OH + H_2SO_4$

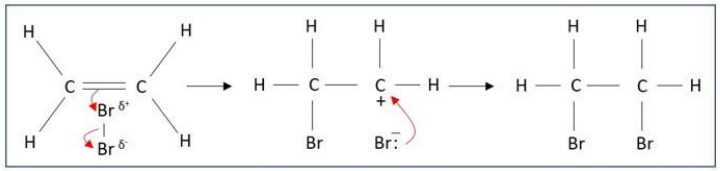
Polymers from alkenes



Addition of alkanes with hydrogen halides

$CH_2{=}CH_2 + HCl \rightarrow CH_3CH_2Cl$
$CH_3CH{=}CH_2 + HCl \rightarrow CH_3CH_2CH_2Cl$ &
$CH_3CH{=}CH_2 + HCl \rightarrow CH_3CHClCH_3$ (major product)
Markownikoff's rule: halogen attached to the carbon containing the least number of hydrogen atoms is the major product.
Tertiary carbocation> secondary carbocation> primary carbocation (Stability)

Electrophilic addition in alkenes



$CH_2{=}CH_2 + Br_2 \rightarrow BrCH_2{-}CH_2Br$ (bromine water decolourises)
Propene + Br_2 → 1-bromopropane & 2-bromopropane