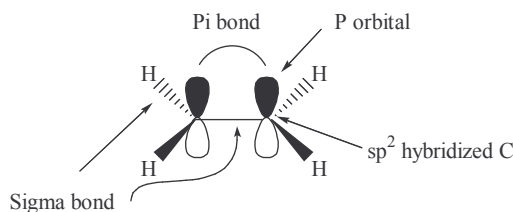


Summary of CH 11 Alkenes

I. Nomenclature

- Common name: Alkane \rightleftharpoons Alkylene
- IUPAC name: Alkane \rightleftharpoons Alkene Alkane \rightleftharpoons Alkenol
- Alkene stereoisomer: (E)- or (Z)- system in general, cis- or trans- for disubstituted alkenes.

II. Structure of alkene: the Pi bond



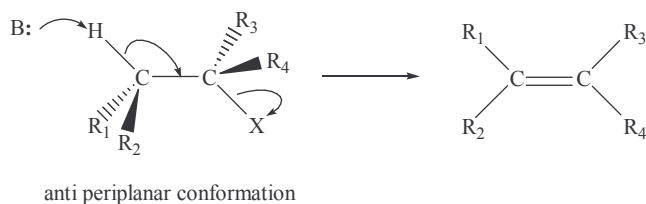
- C=C double bond is viewed as consisting of one sigma bond, resulted from head-to-head overlap of two sp^2 orbitals, and one pi bond, resulted from a side-by-side overlap of two P orbitals.
- Electrons of the Pi bond have greater energy than electrons of the sigma bond.
- Ethene is a planar molecule with trigonal C atoms
- Cis/trans isomerization requires breaking the Pi bond.

III. Relative stability of alkenes

- ΔH° : heat of hydrogenation
- Trans isomers are more stable than cis isomers: steric interaction
- The greater the number of attached alkyl groups, the greater is the alkene's stability: hyperconjugation.

IV. Synthesis of alkenes

- Dehydrohalogenation of alkyl halides.
- E2 reaction is desired: conditions favoring E2.
- Regioselectivity of E2 reaction: Saytzev Rule: elimination occurs to give the most stable, most substituted alkene
Hofmann Rule: elimination with a **bulky base** (e.g. *t*-BuOK/*t*BuOH) favors the formation of the less substituted alkene
- Stereospecificity: E2 reaction must proceed according to the anti periplanar conformation for the H-C-C-X atoms.



- Dehydration of alcohols
- Relative reactivity of ROHs is related to the stability of the carbocation intermediates formed during dehydration
ROH (3°) > ROH (2°) > ROH (1°)
- ROH (2°) and ROH (1°) undergo rearrangement during dehydration, limiting their synthetic utility.