

CHEM 20481 - Basic Organic Chemistry - Chapter 5 Review

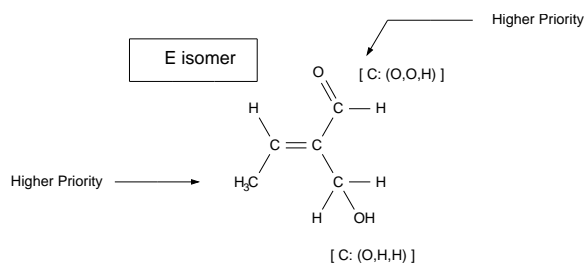
Alkene Synthesis

Nomenclature

-ene suffix. Primary chain must contain C=C, and C=C has priority over alkyl and halide substituents. (Ex. 6-methyl-3-heptene, *not* 2-methyl-4-heptene). In cycloalkene, C₁=C₂ in ring.

Structure

The alkene carbon atoms are sp² hybridized (with 120° bond angles) in alkenes. Rotation about the C=C is not allowed, which gives rise to *cis/trans* stereoisomers. For more complicated alkenes, the E-Z system is used, where Z roughly corresponds to *cis* and E to *trans*.



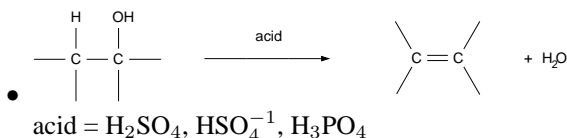
Properties

Alkenes are hydrocarbons, and as such are non-polar molecules with properties similar to alkanes. (Low boiling points, low solubility in water, high vapor pressure, ...).

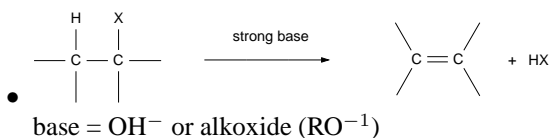
Stability of Alkenes

In general, more highly substituted alkenes are more stable than less substituted alkenes. (Alkyl substituents stabilize the C=C bond). For compounds with identical degrees of substitution, the less sterically hindered isomer is more stable. (*trans*-2-butene more stable than *cis*-2-butene).

Preparation of Alkenes



Dehydration - Follows Zaitsev's Rule
E₁ (for 3° or 2°) or E₂ (for 1° alcohols) mechanism



E₂ mechanism for all alkyl halides
rates: R-I > R-Br > R-Cl > R-F

Mechanisms

You should know (be able to draw) the mechanisms for both E₁ and E₂ eliminations of alcohols and alkyl halides. Note that:

- E₁ elimination can lead to carbocation rearrangements
- The E₂ mechanism generally requires an *anti coplanar* arrangement. For cyclohexane derivatives, this means that both leaving groups (the halide and a hydrogen atom) must be on axial positions