

10: Alkenes and Alkynes. Electrophilic and Concerted Addition Reactions

Preview

10.1 Addition Reactions

General Considerations (10.1A)

Ionic Addition Reactions (10.1B)

Electrophilic Addition

Electrophiles and Nucleophiles

Nucleophilic Additions

Non-Ionic Addition Reactions (10.1C)

Radical Addition

Concerted Addition

Summary

10.2 Electrophilic Addition of H-X or X₂ to Alkenes

Addition of H-X (10.2A)

Intermediate Carbocations

Markovnikov's Rule

Carbocation Rearrangements

Stereochemistry

Electrophilic Addition of Br₂ (10.2B)

Mechanism

Stereochemistry

Electrophilic Addition of Other Molecular Halogens (10.2C)

Cl₂ Addition

F₂ or I₂ Addition

Iodonium Ions are Possible

Formation of Halohydrins (10.2D)

Mechanism

Orientation

10.3 Addition of H-X and X₂ to Alkynes

Addition of H-X (10.3A)

Addition of X₂ (10.3B)

10.4 Alkenes to Alcohols by Electrophilic Addition

Acid Catalyzed Hydration of Alkenes (10.4A)

Mechanism

Orientation of Addition

Rearranged Products

Oxymercuration-Demercuration (10.4C)

Overall Transformation

Mechanism

Hydration of Alkynes (10.4C)

(continued)

10.5 Alkenes to Alcohols by Hydroboration

Hydroboration of Alkenes with BH_3 (10.5A)

Overall Reaction Sequence

Formation of the Organoborane Intermediate

Concerted Addition Mechanism

The BH_3 Reagent

Conversion of R_3B to the Alcohol ($R-OH$)

Hydroboration with RBH_2 and R_2BH Reagents (10.5B)

Disiamylborane

Thexylborane

9-BBN

Regioselectivity

Hydroboration of Alkynes (10.5C)

10.6 Addition of H_2 to Alkenes and Alkynes

Catalytic Hydrogenation of Alkenes (10.6A)

Heterogeneous Catalysts

Heterogeneous Catalysis Mechanisms

Homogeneous Catalysts

Structures of Homogeneous Catalysts

Homogeneous Catalysis Mechanisms

Hydrogenation of Alkynes (10.6B)

Catalytic hydrogenation

Lindlar Catalyst

Sodium Metal in NH_3

H_2 Addition Reactions are Reduction Reactions (10.6C)

Review