Chem 164/261 Assignment & Lecture Outline 4: Alkenes and Alkynes – Addition and Elimination Reactions

Read

Organic Chemistry, L Wade, UA Custom Edition, 2013, Volume 1 (Chem 164/261)

- Functional Group List Inside Front Cover (also Handout)
- Chapter 8 Structure and Synthesis of Alkenes
- Chapter 9 Reactions of Alkenes
- Chapter 10 Alkynes

Problems: (do all "*solved problems*" in chapters listed below)

Do Not turn in, answers available in "Student Solutions Manual for Organic Chemistry" for LG Wade

- **Chapter 8:** 8.1 to 8.11; 8.13 to 8.25; 8.31 to 8.33; 8.40; 8.53; 8.54
- Chapter 9: 9.1 to 9.4; 9.6; 9.10; 9.11; 9.13; 9.15; 9.17 to 9.19; 9.23; 9.24; 9.29; 9.34; 9.37; 9.40; 9.47; 9.49; 9.63
- Chapter 10: 10.1; 10.5; 10.7; 10.12; 10.20; 10.21; 10.23; 10.26 to 10.29; 10.32

Lecture Outline # 4

I. Structure and Nomenclature

- A. Alkenes with one double bond
 - 1. Nomenclature
 - 2. Orbital Hybridization
 - 3. Stereoisomerism cis, trans, and Z, E.
 - 4. Cycloalkenes
- B. Polyenes
- C. Alkynes
 - 1. Nomenclature
 - 2. Structure and Orbital Hybridization

II. Physical Properties and Sources

- A. Physical Properties solubility, density, BP, MP
- B. Occurrence of Alkenes and Alkynes
- C. Terpenes and Isoprene Units

III. Reactions of Multiple Bonds between Carbons

- A. General Characteristics Addition Reactions, electrophiles and nucleophiles
 - 1. Arrow Conventions for Mechanisms
- B. Addition Reactions of Alkenes Stereospecificity

- 1. Hydrogenation
- 2. Halogenation
- 3. Halohydrin Formation
- 4. Hydrogen Halide Addition Markovnikov's Rule
- 5. Water Addition Alcohol synthesis
- 6. Alcohol Addition Ether synthesis
- 7. Mercuration Demercuration
- 8. Hydroboration Oxidation
- 9. Hydroboration and Treatment with Acid
- C. Oxidation of Alkenes
 - 1. Ozonolysis
 - 2. Osmium Tetroxide and Potassium Permanganate
 - 3. Epoxidation
- D. Addition Reactions of Alkynes
 - 1. Hydrogenation
 - 2. Halogenation
 - 3. Hydrogen Halide Addition
 - 4. Hydration aldehyde and ketone synthesis tautomers
 - a) Markovnikov Addition of Water
 - b) Hydroboration Oxidation
- E. Oxidation of Alkynes
 - 1. Ozonolysis
 - 2. Potassium Permanganate

IV. Synthesis of Alkenes and Alkynes - Eliminations

- A. Elimination Reactions
 - 1. El Mechanism Saytzeff Rule, Leaving Groups
 - 2. E2 Mechanism Stereochemistry
- B. Synthesis of Alkenes and Alkynes
 - 1. Dehydrohalogenation
 - 2. Dehalogenation of <u>vic</u> dihalides
 - 3. Dehydration of alcohols
- C. Hydrogenation Dehydrogenation
- D. Replacement of Acetylenic Hydrogen
 - 1. Acidity of Alkynes
 - 2. Alkylation Substitution Reactions
 - 3. Coupling of Acetylenes

V. Polymerization and Radical Reactions of Alkenes

- A. Radical Additions
 - 1. Hydrogen Halide Addition
 - 2. Addition of Alkyl Radicals
- B. Polymers and Polymerization
 - 1. Polyethylene and General Mechanism
 - 2. Other types of Polymers Nomenclature and Properties