

## **UNIT V-Part I**

# **Catalysis by Organometallic Compounds**

B.Sc. (H) Chemistry

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## **SYLLABUS of UNIT V**

# **Catalysis by Organometallic Compounds**

**Study of the following industrial processes and their mechanism:**

**1. Alkene hydrogenation (Wilkinsons Catalyst)**

**2. Hydroformylation (Co salts)**

3. Wacker Process

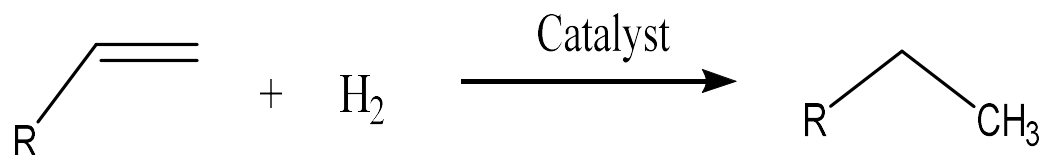
4. Synthetic gasoline(Fischer Tropsch reaction)

5. Synthesis gas by metal carbonyl complexes

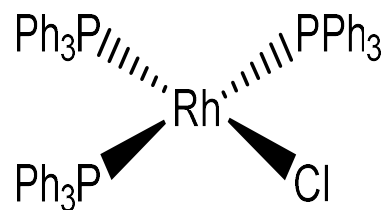
**Part  
I**

**Part  
II**

# 1. Alkene Hydrogenation (Wilkinson's Catalyst)

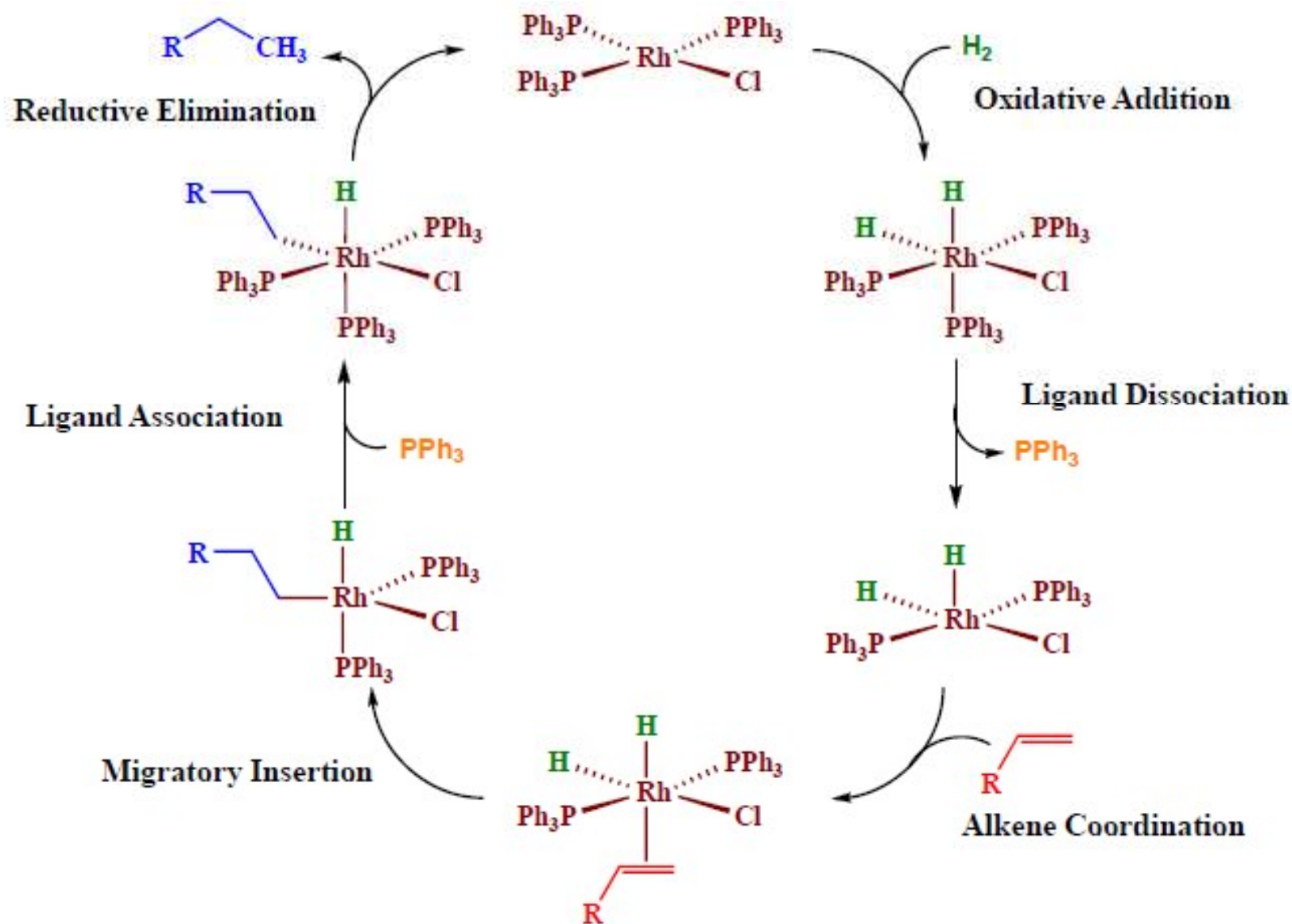


The most commonly used catalyst is the Wilkinson's Catalyst



- Many alkenes are hydrogenated with hydrogen at 1 atm pressure or less.
- Wilkinson's catalyst is highly sensitive to the nature of the phosphine ligand and the alkene substrate.
- Analogous catalysts with alkyl phosphine ligands are inactive.
- Highly hindered alkenes and ethylene are not hydrogenated by the catalyst.

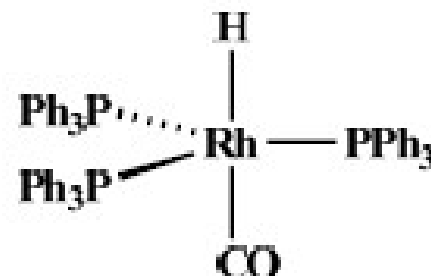
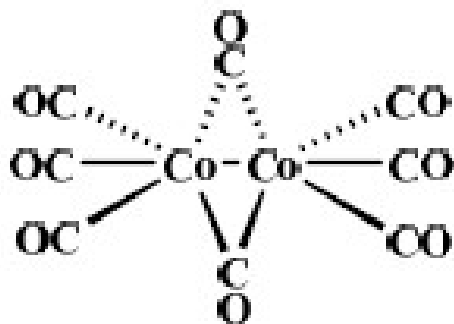
# 1. Alkene Hydrogenation (Wilkinson's Catalyst)



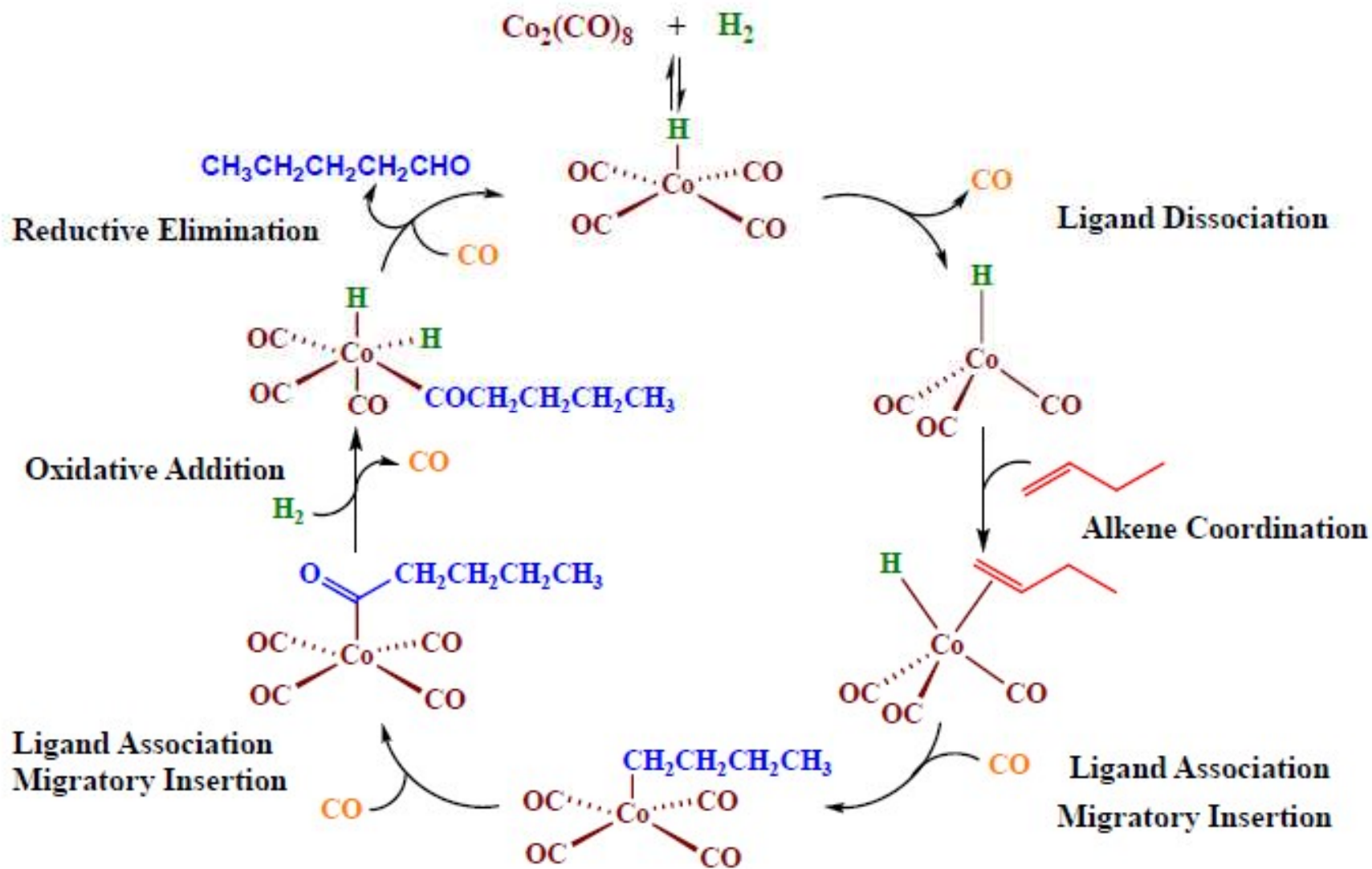
## 2. Hydroformylation



- Both cobalt and rhodium complexes are used as catalysts.
- Alkene isomerization, alkene hydrogenation and formation of branched aldehydes are the possible side reactions.
- Cobalt catalysts operate at 150 °C and 250 atm, whereas Rhodium catalysts operate at moderate temperatures and 1 atm.
- Rhodium catalysts promotes the formation of linear aldehydes. Cobalt catalysts do so if modified with alkylphosphine ligands.



## 2. Hydroformylation



## **References:**

- Shriver & Atkins' Inorganic Chemistry, 5<sup>th</sup> Edition
- Miessler, Gary L. Inorganic chemistry. — Fifth edition / Gary L. Miessler, St. Olaf College, Paul J. Fischer, Macalester College.
- Wikipedia

THANK YOU