### Chapter 14

## Organometallic Reactions and Catalysis

Organometallic compounds undergo a rich variety of reactions that can sometimes be combined into useful catalytic cycles. In this chapter, we will discuss organometallic

### 14.1 Reactions Involving Gain or Loss of Ligands

reactions of particular importance for synthetic and catalytic processes.

Many reactions of organometallic compounds involve a change in metal coordination number by a gain or loss of ligands. If the oxidation state of the metal is retained, these reactions are considered addition or dissociation reactions; if the metal oxidation state is changed, they are termed exidative additions or reductive eliminations. In classifying these reactions, it is often necessary to determine oxidation states of the metals; the donor pair method (Chapter 13) can be used.

Type of Reaction	Change in Coordination Number	Change in Formal Oxidation State of Metal
Addition	Increase	None
Dissociation	Decrease	None
Oxidative addition	Increase	Increase
Reductive elimination	Decrease	Decrease

We will first consider ligand dissociation reactions. These reactions provide an avenue to replace ligands such as carbon monoxide and phosphines.

#### 14.1.1 Ligand Dissociation and Substitution

#### CO Dissociation

Chapter 13 introduced carbonyl dissociation reactions, in which CO may be lost thermally or photochemically. Such a reaction may result in rearrangement of the remaining molecule or replacement of CO by another ligand:

$$Fe(CO)_5 + P(CH_3)_3$$
  $\stackrel{\Delta}{\longrightarrow}$   $Fe(CO)_4(P(CH_3)_3) + CO$ 

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**Chao Zhang** 

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#### **Table of Contents Marshall And Tarr Inorganic**

- 1. Understanding the eBook Marshall And Tarr Inorganic
  - The Rise of Digital Reading Marshall And Tarr Inorganic
  - Advantages of eBooks Over Traditional Books
- 2. Identifying Marshall And Tarr Inorganic
  - Exploring Different Genres
  - o Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
- 3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Marshall And Tarr Inorganic
  - User-Friendly Interface
- 4. Exploring eBook Recommendations from Marshall And Tarr Inorganic
  - Personalized Recommendations
  - Marshall And Tarr Inorganic User Reviews and Ratings
  - Marshall And Tarr Inorganic and Bestseller Lists
- 5. Accessing Marshall And Tarr Inorganic Free and Paid eBooks
  - Marshall And Tarr Inorganic Public Domain eBooks
  - Marshall And Tarr Inorganic eBook Subscription Services
  - Marshall And Tarr Inorganic Budget-Friendly Options

- 6. Navigating Marshall And Tarr Inorganic eBook Formats
  - o ePub, PDF, MOBI, and More
  - Marshall And Tarr Inorganic Compatibility with Devices
  - Marshall And Tarr Inorganic Enhanced eBook Features
- 7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of Marshall And Tarr Inorganic
  - Highlighting and Note-Taking Marshall And Tarr Inorganic
  - Interactive Elements Marshall And Tarr Inorganic
- 8. Staying Engaged with Marshall And Tarr Inorganic
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Marshall And Tarr Inorganic
- 9. Balancing eBooks and Physical Books Marshall And Tarr Inorganic
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection Marshall And Tarr Inorganic
- 10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
- 11. Cultivating a Reading Routine Marshall And Tarr Inorganic
  - Setting Reading Goals Marshall And Tarr Inorganic
  - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Marshall And Tarr Inorganic
  - Fact-Checking eBook Content of Marshall And Tarr Inorganic
  - Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
  - Utilizing eBooks for Skill Development
  - Exploring Educational eBooks
- 14. Embracing eBook Trends
  - Integration of Multimedia Elements

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