

## 27234 - Organometallic Chemistry

### Información del Plan Docente

Academic Year	2016/17
Academic center	100 - Facultad de Ciencias
Degree	452 - Degree in Chemistry
ECTS	5.0
Course	4
Period	Second semester
Subject Type	Optional
Module	---

### 1. Basic info

#### 1.1. Recommendations to take this course

#### 1.2. Activities and key dates for the course

### 2. Initiation

#### 2.1. Learning outcomes that define the subject

#### 2.2. Introduction

### 3. Context and competences

#### 3.1. Goals

#### 3.2. Context and meaning of the subject in the degree

#### 3.3. Competences

#### 3.4. Importance of learning outcomes

### 4. Evaluation

### 5. Activities and resources

#### 5.1. General methodological presentation

#### 5.2. Learning activities

#### 5.3. Program

**Chapter 1** .- Milestones in Organometallic Chemistry. Ligands: types and geometry. Organometallic compounds: types. Energy, Polarity and reactivity of the M-C bond.

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**Chapter 2** .- Main group Organometallics. Syntheses. Experimental techniques. Purification. Structural characterization.

**Chapter 3** .- Structure and bonding of the main group organometallic complexes. Properties.

**Chapter 4** .- Transition metal organometallic complexes. The 18 valence e rule (18VE).

**Chapter 5** .- Transition metal organometallic complexes:  $\pi$ -donor ligands. Preparation of transition-metal-alkyl and -aryl compounds. Thermodynamic versus Kinetic Lability. Reactivity: Insertion reactions. Alkenyl and alkynyl complexes.

**Chapter 6** .- Metal carbonyls. Bonding modes. Synthesis, structure and reactivity. Carbonyl metallates and carbonyl metal hydrides. Isocyanide complexes.

**Chapter 7** .- Transition metal carbene complexes. Transition metal carbyne complexes. Synthesis, structure and reactivity.

**Chapter 8** .- Transition metal complexes with olefins. Preparation, structure and bonding. Alkyne complexes. Bridging or terminal alkynes.

**Chapter 9** .- Transition metal allyl and enyl derivatives. Preparation, structure, bonding and reactivity.

**Chapter 10** .- Transition metal complexes with aromatic rings. Complexes sandwich and semisandwich. Complexes with three or four members aromatic rings. Cyclopentadienyl derivatives. Binary cyclopentadienyl complexes.

**Chapter 11** .- Metal complexes with benzene or its derivatives as ligands. Bis(arene) metal complexes. Semisandwich arene metal carbonyls. Complexes with seven or eight members aromatic rings.

**Questions:** The 18 valence e rule (18VE) . Insertion reactions. Oxidative addition reactions. Nucleophilic attack reactions: Davies, Green and Mingos rules. Questions on complexes with ligands type.  $\pi$ -acceptor;  $\pi$ -donor;

### 5.4.Planning and scheduling

### 5.5.Bibliography and recommended resources

- |    |                                                                                                                                                                                                          |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BB | Bochmann, M.. Organometallics and Catalysis, an introduction. Oxford University Press, 2015                                                                                                              |
| BB | Crabtree, Robert H.. Química Organometálica de los metales de transición / Robert H. Crabtree ; Eduardo Peris Fajarnés [trad.] Castelló de la Plana : Publicacions de la Universitat Jaume I, D. L. 1997 |
| BB | Elschenbroich, Christoph. Organometallics : A concise introduction / Christoph Elschenbroich, Albrecht Salzer. 3rd ed. Weinheim. VCH, 2005                                                               |

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- BB** Hill, Anthony F.. Organotransition metal chemistry / Anthony F. Hill Cambridge: Royal Society of Chemistry, cop. 2002
- BC** Bochmann, Manfred. Organometallics. 1, Complexes with transition metal- carbon [s]-bonds / Manfred Bochmann . - [1st ed. repr.] Oxford [etc.] : Oxford University Press, 2000
- BC** Bochmann, Manfred. Organometallics. 2, Complexes with transition metal- carbon [p]-bonds / Manfred Bochmann . - 1st ed. repr. Oxford [etc.] : Oxford University Press, 2000
- BC** Carriedo Ule, Gabino A.. Curso de iniciación a la química organometálica / Gabino A. Carriedo Ule, Daniel Miguel San José . - [1ª ed.] Oviedo : Universidad de Oviedo, Servicio de Publicaciones, D.L.1995
- BC** Pruchnik, Florian P. Organometallic chemistry of the transition elements / Florian P.Pruchnik ; translated from polish by Stan A.Duraj . - [1st ed.] New York [etc.] : Plenum Press, cop.1990
- BC** Spessard, Gary O.. Organometallic chemistry / Gary O. Spessard, Gary L. Miessler New Jersey : Prentice-Hall, cop.1997

### Online resources:

Organometallic HyperTextBook -  
[<http://www.ilpi.com/organomet/>]