

Información del Plan Docente

Academic Year	2017/18
Faculty / School	100 - Facultad de Ciencias
Degree	452 - Degree in Chemistry
ECTS	5.0
Year	4
Semester	Second semester
Subject Type	Optional
Module	---

1.General information**1.1.Introduction****1.2.Recommendations to take this course****1.3.Context and importance of this course in the degree****1.4.Activities and key dates****2.Learning goals****2.1.Learning goals****2.2.Importance of learning goals****3.Aims of the course and competences****3.1.Aims of the course****3.2.Competences****4.Assessment (1st and 2nd call)****4.1.Assessment tasks (description of tasks, marking system and assessment criteria)****5.Methodology, learning tasks, syllabus and resources****5.1.Methodological overview**

The learning process for this subject has been based on:

- * Theoretical classes (4 ECTS)
- * Laboratory Practices (1 ECTS)

5.2.Learning tasks

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The learning program offered to the student to help achieve the expected results includes the following activities:

- 1.- Learning activity to acquire basic knowledge of Organometallic Chemistry. This activity comprises 40 sessions (50 min/session) of lecture-interactive classes in a large group, part of the lecture will be dedicated to solving problems associated with the corresponding topics.
- 2.- Formative laboratory activity. It will be held in the laboratory N° 1 on the basement of building D, in three sessions of 3.3 hours. This activity is an obligatory attendance in which the students, individually, will carry out the synthesis of a series of ligands and complexes that must characterize from the spectroscopic data that the teachers will provided.
- 3.- Tutorials. Teachers will reserve 6 hours a week for individual tutorials with the students.

5.3.Syllabus

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

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: donor ligands. Preparation of transition-metal-alkyl and -aryl compounds. Thermodynamic versus Kinetic Lability. Reactivity: Insertion reactions. Alkenyl and alkynyl complexes. Complexes containing metal-hydride bonds.

Chapter 6 .-. Organometallic complexes with sigma interactions. Metal-dihydrogen complexes. Complexes containing M-sigma (H-C) interactions (agostic). Complexes with M-sigma interactions (H-X) (X = B, Si ...) and some different cases. Oxidant addition processes of H-H, H-C, H-X bonds and some different examples.

Chapter 7 .- Metal carbonyls. Bonding modes. Synthesis, structure and reactivity. Carbonyl metallates and carbonyl metal hydrides. Isocyanide complexes.

Chapter 8 .- Transition metal carbene complexes. Transition metal carbyne complexes. Synthesis, structure and reactivity.

Chapter 9 .- Transition metal complexes with olefins. Preparation, structure and bonding. Alkyne complexes. Bridging or terminal alkynes. 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. 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.

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Questions: The 18 valence e rule (18VE). Insertion reactions. Oxidative addition reactions. Nucleophilic attack reactions: Davies, Green and Mingos rules. Questions on complexes with type π ; ligands.

5.4.Course planning and calendar

Calendar of teaching or laboratory sessions and presentation of works: course schedules and exam dates are posted on the bulletin board and on the Faculty of Science website: <http://ciencias.unizar.es/web/horarios.do>

5.5.Bibliography and recommended resources

The teaching material prepared by the teachers of the subject will be provided to the student in reprography and/or in the website: <https://moodle2.unizar.es/add/>.

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, Ibrecht Salzer. 3rd ed. Weinheim. VCH, 2005

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/>]