60460 - Supramolecular chemistry

Información del Plan Docente

Academic Year	2016/17
Academic center	100 - Facultad de Ciencias
Degree	543 - Master's in Molecular Chemistry and Homogeneous Catalysis
ECTS	2.0
Course	1
Period	Second semester
Subject Type	Optional
Module	---

1.Basic info

1.1.Recommendations to take this course

Knowledge of Organic Chemistry, Inorganic Chemistry, Physical Chemistry and Biochemistry is required. Text comprehension in scientific English is desirable. Class attendance and continuous study facilitates passing the course.

1.2.Activities and key dates for the course

Programmed activities will take place during the second semester in weekly two-hour sessions. The information about schedules, calendars and exams is available at the websites of the Sciences Faculty, https://ciencias.unizar.es/calendario-y-horarios , and the Master, http://masterqmch.unizar.es . Presentation of works will be done according to the schedule to be announced well in advance.

2.Initiation

2.1.Learning outcomes that define the subject

To know and apply the fundamental concepts and identify the basic interactions of supramolecular chemistry.

To understand the types and basic processes of formation of supramolecular systems.

To be familiar with the main types of supramolecular systems.

To know and apply most common preparation methods of supramolecular systems.

To apply the most suitable techniques for the characterization of supramolecular systems.

To be familiar with the applications of supramolecular chemistry and supramolecular systems in catalysis, biomimetic systems and materials.

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2.2.Introduction

The course aims to provide a general overview and basic knowledge of supramolecular chemistry, based on non-covalent interactions, emphasizing its character as a versatile and effective tool for building complex systems from well-defined units and their application in different areas of work and research.

3.Context and competences

3.1.Goals

The course and the expected results meet the following approaches and objectives:

To be familiar with the non-covalent interactions, responsible for the formation of different supramolecular systems, and to establish the principles of recognition between molecules.

To know the potential and applications of supramolecular systems.

3.2.Context and meaning of the subject in the degree

The course Supramolecular Chemistry is an optional subject (2 ECTS) that is taught in the second semester. It is included into the optional module Horizons in Molecular Chemistry.

The course is key to know, understand and apply the wide variety of non-covalent interactions in different fields of chemistry, with special emphasis on catalytic processes, materials development and processing of biological and biomimetic processes. Contents of the course directly connect with the subjects of *Molecular Chemistry and Catalysis* module, and it is essential for contextualizing subjects such as *Advanced Materials Chemistry* , *Chemistry at the Frontiers of Biology* and *Sustainable Chemistry and Catalysis* .

3.3.Competences

To apply the acquired knowledge and skills of problem-solving with Supramolecular Chemistry tools in wider or multidisciplinary contexts related to Molecular Chemistry and Catalysis, including original contributions transferable to the social environment.

To extend and use specific vocabulary and terminology of Supramolecular Chemistry under the context of Inorganic, Organometallic, and Organic Chemistry and Catalysis.

To be able to design and synthesize new organic, inorganic or organometallic molecules of industrial and technological interest.

To apply protocols, procedures and advanced experimental techniques of synthesis and characterization of supramolecular systems.

Capacity to assimilate, evaluate and critically analyze research findings in Molecular Chemistry and Catalysis in an objective manner, and relate these findings with the acquired theoretical knowledge.

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3.4.Importance of learning outcomes

Through knowledge of the basics of Supramolecular Chemistry and the different types of supramolecular systems, the graduate will have new knowledge, complementary to those acquired in previous degrees, and a versatile and effective tool, which will allow her/him to propose and evaluate the design, development and characterization of molecular systems with a wide range of applications and innovative and impacting possibilities, particularly in the field of catalytic processes, materials science and nanoscience.

4.Evaluation

The assessment of this course is based on the following activities, weighted as indicated:

Problem solving, theoretical and practical issues and related activities (15%)

Realization, presentation and discussion, individually or in groups, of supervised works based on scientific publications related to the contents of the course (35%).

Global written test will be performed in the evaluation period and consists of solving problems and issues (50%).

The final grade will be the best of the following marks:

MARK 1 = 0.15 x test marks + 0.35 x presented work mark + 0.50 x global written test mark.

MARK 2 = global written test mark.

The global written test will consist of an examination on all the contents covered in the course, including the different activities (seminars, supervised works, etc.). The course is considered passed if the weighted average according to the indicated percentages is equal to or higher than 5 points on a maximum score of 10.

The number of official examination calls per registration and their use will be subjected to the statements of the *Regulation of Permanence in Master Studies and* *Regulation of the Learning Assessment* . The latest document will also regulate the general design and scoring criteria of the assessment activities, as well as the exam schedules and timetable for the post-examination review.

5.Activities and resources

5.1.General methodological presentation

The learning process designed for the subject is essentially based on formal lectures, complemented by practicals, seminars and tutorials.

In the problem-solving class sessions, practical questions about the contents of the subject, with the participation of students will be developed.

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In the seminars, development of supervised works related to the course, oral presentations and group discussions will be addressed by students.

5.2.Learning activities

Interactive lectures classes (1.2 ECTS).

Problem-solving classes (0.4 ECTS).

Elaboration and presentation of supervised practical works (0.4 ECTS).

5.3.Program

1. Introduction to Supramolecular Chemistry.

2. Molecular recognition. Guest-host systems.

3. Control of supramolecular topology. Self Assembly. General features. Molecular cages, helicates, rotaxanes and catenanes.

4. Molecular self-assemblies. Supramolecular crystals. Supramolecular aggregates (micelles, vesicles and others). Gels. Liquid crystals. Self-assembled systems at interfaces (SAM LB and LBL).

5. Learning from nature: bio-supermolecules.

6. Applications of Supramolecular Chemistry. Molecular devices, molecular machines and other supramolecular systems.

5.4.Planning and scheduling

The schedule of the course and exam calls are posted on the website of the Faculty of Sciences: https://ciencias.unizar.es . The presentation of works will be held according to the schedule to be announced.

The students will be provided with diverse teaching material either at reprography or through the University's web tool: https://moodle2.unizar.es/add .

5.5.Bibliography and recomended resources

- Steed, Jonathan W.. Supramolecular chemistry / Jonathan W. Steed, Jerry L. Atwood. 2nd. Edition Chichester [etc.] : John Wiley, 2009
- Ariga, Katsuhiko. Supramolecular chemistry fundamentals and applications : advanced textbook / Katsuhiko Ariga, Toyoki Kunitake Heidelberg : Springer, 2006
- J. W. Steed, D. R. Turner, K. J. Wallace. Core Concepts in Supramolecular Chemistry. Wiley. 2007
- Schneider, H.-J.. Applications of Supramolecular Chemistry. 1st ed. CRC Press. 2012
- Linda S. Hirst, Fundamentals of Soft Matter Science. CRC Press. 2013.