Universidad Zaragoza

Academic Year/course: 2024/25

60461 - Chemistry of advanced materials

Syllabus Information

Academic year: 2024/25
Subject: 60461 - Chemistry of advanced materials
Faculty / School: 100 - Facultad de Ciencias
Degree: 543 - Master's in Molecular Chemistry and Homogeneous Catalysis
ECTS: 2.0
Year: 1
Semester: Second semester
Subject type: Optional
Module:

1. General information

The **objective of the subject** is to acquire basic knowledge for the development of advanced materials based on the relationship between chemical structure and properties associated to a specific application, to know synthetic methodologies to obtain the designed material and to plan the preparation and processing depending on the optimal structure to be obtained.

A previous knowledge (undergraduate or graduate level) of inorganic and organic Chemistry, as well as a basic knowledge of materials science is recommended. It is complemented by other elective subjects of the master's degree such as Supramolecular Chemistry and Advanced Structural Characterization Techniques.

2. Learning results

- To learn about advanced materials of current interest, both organic and inorganic in nature.
- To identify the involvement of chemistry in the current development of advanced materials.
- To know the fundamentals of the rational design of these materials.
- To apply novel chemical principles to the synthesis and preparation of advanced materials.
- To assess the most appropriate techniques for the preparation and characterization of advanced materials.

3. Syllabus

1. Introduction to advanced materials

2. Synthetic bases of macromolecules

Conventional polymerization techniques. Controlled radical polymerizations: RAFT and ATRP. Ring-opening polymerization and enzymatic polymerization: application to the development of biodegradable and renewable-based polymers.

3. Design and functionalization of macromolecules.

Copolymer design: topology and composition control. Hyperbranched macromolecules. Functionalization of macromolecules. Application to the development of advanced polymers.

4.Development of nanoparticles: inorganic, organic and hybrid.

Nanoparticle preparation methods. Functionalization of nanoparticles and applications.

5. Porous materials: Microporous, mesoporous and macroporous materials. Applications.

4. Academic activities

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

- Classroom lectures with active student participation (1.5 ECTS)
- Problem solving or practical cases (0.4 ECTS)
- Supervised work (0.1 ECTS)
- Tutorials

The teaching and assessment activities will be conducted in person unless, due to the health situation, the provisions issued by the competent authorities and by the University of Zaragoza make it necessary to carry them out telematically or semi-telematically with rotating reduced seating capacity.

5. Assessment system

1. The continuous assessment of this subject is based on the following activities with the weighting shown below:

A1.- Performance, presentation and defence of a paper based on a scientific article or on a specific topic related to advanced materials. The critical discussion of the work will be assessed (30 %).

A2.- Written test of the subject based, mainly, on theoretical-practical questions (70 %).

2. For those students who have not passed the subject or wish to improve their grade, there will be a global test in the two official calls. This test will consist of a written exam based on theoretical and practical questions, problems or case studies. In addition, the completion, presentation and discussion of a paper will be required. The weighting of each of these parts will be as follows:

70 % grade for the overall written test + 30 % for the work done

However, those students who have obtained a grade equal to or higher than 5 in the A2 activity (during the continuous assessment), can keep their grade for the global evaluation in the official calls for exams.

6. Sustainable Development Goals

4 - Quality Education
5 - Gender Equality
10 - Reduction of Inequalities