

60645 - Electrochemistry and Photochemistry for Industry

Syllabus Information

Academic year: 2023/24

Subject: 60645 - Electrochemistry and Photochemistry for Industry

Faculty / School: 100 - Facultad de Ciencias

Degree: 540 - Master's in Industrial Chemistry

ECTS: 6.0

Year: 1

Semester: Second semester

Subject type: Compulsory

Module:

1. General information

The proposed objectives involve an intensification of knowledge and skills related to the application of electrochemistry and photochemistry in the chemical Industry. The aim is for the student to know how to apply concepts from these two scientific fields to the synthesis of products and other processes of practical interest (electrodeposition of metals, corrosion, manufacture of electrochemical energy converters) and to be able to assess their industrial possibilities and their advantages and environmental implications. The student will achieve transversal competences related to the work in the laboratory, the writing of reports and their oral defence.

These approaches are aligned with the following Sustainable Development Goals (SDG)

Goal 6: Clean water and sanitation. **Goal 7:** Affordable and clean energy. **Goal 9:** Industry, innovation and infrastructure. **Goal 12:** Responsible production and consumption. **Goal 13:** Climate action.

2. Learning results

Upon completion of this subject, the student will be able to:

- Distinguish the most relevant parameters in the processes of electrochemical or photochemical synthesis and electrodeposition of metals.
- Solve problems requiring the use of the laws and equations governing the processes of electrochemical or photochemical synthesis, electrodeposition of metals and corrosion.
- Explain the methods and describe the equipment used in the processes of electrochemical or photochemical synthesis and electrodeposition of metals and assess their range of application in a reasoned manner.
- Explain the methods used in the measurement and prevention of corrosion and assess their range of application in a reasoned manner.
- Describe the most important industrial electrochemical and photochemical processes.
- Analyse the main environmental consequences of electrochemical or photochemical processes. Know the main electrochemical converters and explain how they work.
- Use techniques and equipment for the study of electrochemical and photochemical processes. Write reports on the results of the activities.
- Write a paper on a specific topic related to the subject and defend it orally.

3. Syllabus

1. Fundamentals of electrochemical synthesis.
2. The electrochemical reactor. Components and operation.
3. Traditional and modern industrial applications of electrochemical synthesis.
4. Electrochemistry and environment.
5. Electrodeposition of metals and other related electrochemical applications.
6. Electrochemical energy converters.
7. Fundamentals of industrial photochemistry.
8. Other applications and effects of light. Photochemistry and environment.

4. Academic activities

The subject is made up of 6 ECTS:

- **Lectures** (1.4 ECTS): 36 hours.
- **Problems and cases**(0.5 ECTS):12 h. Individualized solving in small groups of advanced electrochemistry problems related to electrosynthesis, electrodeposits, corrosion, electrochemical energy converters, photochemical reactions and processes as well as environmental photochemistry.
- **Laboratory practices**(0.3 ECTS): 8 hours. Demonstration of experimental techniques to work with electrochemical and photochemical reactors.
- **Presentation of teaching papers**(0.2 ECTS): 4 hours. In-class presentation of the teaching papers.
- **Study and preparation of papers/reports**(3.6 ECTS): 90 h. Autonomous work of the student for the realization of the activities.

5. Assessment system

The student must demonstrate that they has achieved the expected learning results through the following assessment activities:

- **Written test** that will include theoretical and/or practical aspects: **60%** of the final grade (45% theory, 15% cases). The activity takes place at the end of the term.
- **Solving of problems, cases and delivery of reports:**15% of the final grade (5% problems and 10% practice reports). The assessment is continuous throughout the term.
- **Completion, report and presentation of work:**25% of the final grade. The activity takes place in the last half of the term.

The completion of the written test is mandatory, as well as the attendance to the practical classes and the delivery of the reports and papers requested within the deadline set by the teacher. In order to weight the assessment activities, the theoretical and practical parts of the written test must reach independently at least 25% of its maximum value.