

66221 - Solid Characterization Techniques

Syllabus Information

Academic year: 2023/24

Subject: 66221 - Solid Characterization Techniques

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

Degree: 531 - Master's in Chemical Engineering

ECTS: 6.0

Year:

Semester: Second semester

Subject type: Optional

Module:

1. General information

This subject is intended to present and deepen in solid characterization techniques by means of theoretical classes in which the basics of characterization techniques are exposed. Then, we will move forward to problem and case solving classes and laboratory sessions for the student to see the data processing and equipment used in some of the most common techniques.

These objectives are aligned with the Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda.

<https://www.un.org/sustainabledevelopment/es/>, so that the acquisition of the learning results of the

subject can provide training and competence to contribute to some extent to the achievement of Objectives 9.4 and 9.5 of Goal 9.

2. Learning results

1. To assimilate the fundamentals and equipment necessary for the most common techniques of solids characterization.
2. To select the appropriate solid characterization techniques to solve a practical problem.
3. To know how to operate some solids characterization equipment at a basic level.
4. To critically interpret the results obtained in the characterization of solids.
5. To deepen in some characterization techniques.

3. Syllabus

The foreseen syllabus for this subject is the following:

1. Introduction to characterization techniques.
2. Sample preparation.
3. Scanning and transmission electron microscopy.
4. Local probe: AFM, STM, SFM.
5. Infrared spectroscopy.
6. UV-Vis spectroscopy.
7. Raman spectroscopy.
8. X-ray photoelectron spectroscopy.
9. Nuclear magnetic resonance and electron paramagnetic resonance spectroscopies.
10. X-ray diffraction.
11. Thermal analysis.
12. Textural properties: surface area and pore distribution.
13. Particle size and zeta potential.
14. Chemical analysis.
15. To select the appropriate solid characterization techniques.

4. Academic activities

Master classes (30 h) where the theory will be taught and model problems will be solved.

Problem/case solving classes (20 h). Problems and practical cases of characterization will be solved by the student under the supervision of the teacher.

Laboratory sessions (8 h).

Special practice session (2 h) corresponding to a visit to R&D&I research centres.

Application work and practical research (19 h), individual/group.

Personalized teacher-student tutoring (14 h).

Individual study (47 hours).

Assessment (10 h). Corresponding to a global test and presentations of research papers.

5. Assessment system

Option 1:

Assessment is global and includes:

1. Completion of the proposed problems and cases (20% of the final grade).
2. Individual work consisting of choosing solid samples and studying their characterization by various techniques. It will consist of three parts:
 - Submission of written work (25% of the final grade).
 - Oral presentation of the work (20% of the final grade).
 - Assessment reports of other classmates' work (10% of the final grade).
3. Completion of a multiple-choice exam or practical questions at the end of the subject (25% of the final grade). A minimum grade of 4/10 on this exam is required for averaging.

Option 2:

Those students who do not wish to follow the evaluation according to option 1, may choose to sit for the call for exams, which in this case will consist of two parts:

1. Multiple-choice exam (50% of the final grade). A minimum grade of 4/10 on this exam is required for averaging.
2. Theoretical-practical exam (50% of the final grade). A minimum grade of 4/10 on this exam is required for averaging.

This option can be chosen for both calls of the subject.