

66221 - Solid Characterization Techniques

Información del Plan Docente

Academic Year	2017/18
Faculty / School	110 - Escuela de Ingeniería y Arquitectura
Degree	531 - Master's in Chemical Engineering
ECTS	6.0
Year	
Semester	Indeterminate
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 methodology followed in this course is oriented towards achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as

- Lectures, where the theoretical bases and some model problems are presented.
- Problem sessions and laboratory sessions are the effective complement of lectures to verify the understanding of the course contents.

66221 - Solid Characterization Techniques

- Assignments.
- Tutorials.

Students are expected to participate actively in the class throughout the semester.

5.2.Learning tasks

The course includes the following learning tasks:

- **Lectures** (30 hours). The theory of the proposed topics will be presented and also model problems will be solved.
- **Problem solving sessions** (20 hours). Exercises supervised by the professor will be solved by the students. Problems will be related to the theoretical part explained in lectures.
- **Laboratory sessions** (8 hours). Sessions of management of some equipment of characterization techniques related to contents developed in the lectures.
- **R&D visits** (2 hours). Research centers, as an educational complement to the above activities, are visited.
- **Assignments** (19 hours). Individual or in group. They are of two types: 1) Data processing of characterization equipment. 2) Final assignment in which solid samples are selected and their characterization will be studied through several techniques.
- **Tutorials** (14 hours).
- **Study** (47 hours). It is strongly recommended that students study continuously along the semester.
- **Evaluation** (10 hours). A test exam where the theoretical and practical knowledge of the student will be assessed. Moreover, a presentation of the assignments will be done to detect the level of analysis and synthesis achieved by the students.

5.3.Syllabus

The course will address the following topics:

1. Introduction to the characterization techniques
2. Sample Preparation
3. Optical Microscopy
4. Scanning and Transmission Electron Microscopy
5. Scanning Probe Microscopies: AFM, STM, SFM
6. Infrared spectroscopy
7. UV-Vis Spectroscopy
8. Raman Spectroscopy
9. X-ray Photoelectron Spectroscopy
10. Nuclear magnetic resonance spectroscopy and electron paramagnetic resonance
11. Neutron and X-ray techniques
12. Thermal analysis
13. Textural properties: surface area and pore distribution
14. Particle size and zeta potential.
15. Chemical analysis
16. Other techniques for solid characterization

5.4.Course planning and calendar

Along the course, students will solve problems and cases proposed by the teachers on different characterization techniques.

The last two weeks of the course, students will present their report on solid samples, valuation reports of other students' reports and the oral presentation.

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the EINA website.

5.5. Bibliography and recommended resources

- | | |
|-----------|---|
| BB | Handbook of heterogeneous catalysis / edited by G. Ertl ... [et al.] . - 2nd comp. rev. and enl. ed. Weinheim : Wiley-VCH, cop. 2008 |
| BB | Skoog, Douglas A.. Principios de análisis instrumental / Douglas A. Skoog, F. James Holler, Stanley R. Crouch ; traductor, María Bruna Josefina Anzures ; revisión técnica Francisco Rojo Callejas, Juan Alejo Pérez Legorreta . - 6ª ed. México, D. F. : Cengage Learning, cop. 2008 |
| BB | Técnicas de análisis y caracterización de materiales / Marisol Faraldos, Consuelo Goberna (Editoras) Madrid : Consejo Superior de Investigaciones Científicas, 2002 |
| BC | Bailey, J.. Characterization and analysis of polymers / J. Bailey et al John Wiley & Sons Inc. 2008 |
| BC | Brundle, C.R. Encyclopedia of materials characterization / C.R. Brundle, C.A.Jr. Evans, S. Wilson Butterworth-Heinemann 1992 |
| BC | Niemantsverdriet, J. W.. Spectroscopy in catalysis : an introduction / J. W. Niemantsverdriet . - 2nd, completely rev. ed. Weinheim : Wiley-VCH, 2000 |
| BC | Surface analysis by Auger and x-ray photoelectron spectroscopy / edited by David Briggs and John T. Grant Chichester : IM Publications, 2003 |