66221 - Solid Characterization Techniques

Información del Plan Docente

Academic Year	2016/17
Academic center	110 - Escuela de Ingeniería y Arquitectura
Degree	531 - Master's in Chemical Engineering
ECTS	6.0
Course	1
Period	Second semester
Subject Type	Optional
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

The learning process that is designed for this course is based on the following:

The learning process will take place at several levels: lectures, problem classes, laboratory practice and tutoring works, increasing the level of student participation. In the lectures, the theoretical bases and some model problems are presented. The problem solving classes and laboratory practice are the effective complement of lectures to verify the compression of the matter and help to develop in students a point of view more applied for characterization techniques. Finally, tutoring and works will be a complement.

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5.2.Learning activities

The program to achieve the expected results includes the following activities:

Lectures (30 h). The theory of the various topics that have been proposed will be presented and also model problems will be solved.

Problem solving classes (20 h). 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 h). Sessions of management of some equipment of characterization techniques related to contents developed in the lectures.

R&D **visits** . Research centers, as an educational complement to the above activities, are visited.

W orks and practical research (19 h non-contact), individual or group. They are of two types: 1) Data processing of characterization equipment. 2) Final work in which solid samples are selected and their characterization will be studied by several techniques.

Tutoring (14 h).

Individual study (46 hours non-contact). It is strongly recommended that students perform individual study continuously along the semester,
Evaluation (10 h). Corresponding to a type-test exam where the theoretical and practical knowledge of the student will be assessed. Also a presentation of research work to detect the level of analysis and synthesis achieved by the student will be performed.

5.3.Program

The program has next 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.Planning and scheduling

Schedule and presentation of works

Lectures, solving problems classes and labs are given according to schedule established by EINA.

Each teacher informs about schedule for tutoring.

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 the report on solid samples, valuation reports of other student reports and the oral presentation.

5.5.Bibliography and recomended 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

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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