

66223 - Nanostructured Materials

Información del Plan Docente

Academic Year	2016/17
Academic center	110 - Escuela de Ingeniería y Arquitectura
Degree	531 - Master's in Chemical Engineering
ECTS	3.0
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 is going to be developed in several levels: lessons, problems resolution (case studies), laboratory practice, special practice and tutorial works, with an increase level of student's participation. In the lessons of theory there is going to be explained the theoretical principles of the subject and there is going to be resolved some model problems. The lessons of problems and case studies, laboratory practice and special practice are the useful support to lessons of theory, because these enable the learning of the subject and also help to develop a more apply knowledge in the student. Finally, the tutorial works are going to complement all these activities and will be key to succeed in this subject

66223 - Nanostructured Materials

5.2. Learning activities

The learning process used during the lectures will be based on:

-Classroom lectures (15 h). These lectures cover the basics of nanotechnology and provides a solid understanding of the subject.

- Problems and cases discussion (10h). A variety of cases will be solved in base of the previous knowledge acquired in the classroom lectures

- Practical session: Laboratory (3h). The student will produce a nanomaterial in the laboratory. A variety of characterization techniques will enable to study the unique properties of the nanomaterial. A practical summary will be required.

- Special Practical session: Visit to a nanomaterial production laboratory and electron microscopy facilities (2h).

- Guided Activities (7h). The student will give a talk summarizing the main aspects of his/her work in a public defense

-Self-study (24h)

-Ongoing assessment (3h).

5.3. Program

Section 1- Introduction to Nanomaterials

1- Nanomaterials

Section 2- Porous nanomaterials

2- Amorphous nanomaterials: Silica based

3- Crystalline nanomaterials: Zeolites, ALPOs, MOFs

Section 3- Carbon based nanomaterials

4- Active carbon and graphite based nanomaterials

5- Carbon nanotubes, graphene and fullerenes

Section 4- Nanoparticles and composites

6- Nanoparticles: Production techniques

66223 - Nanostructured Materials

7-Nanocomposites

8- Toxicity

5.4.Planning and scheduling

The course calendar is defined by the EINA (Engineering School calendar) and they will be posted in the EINA website as well as in the Master website (http://titulaciones.unizar.es/mas_inge_quim/). Deadlines for tasks and further supporting information will be posted in the learning platform moodle (<https://moodle.unizar.es/>).

5.5.Bibliography and recommended resources

- | | |
|----|--|
| BB | Handbook of zeolite science and technology / Edited by Scott M. Auerbach, Kathleen A. Carrado, Prabir K. Dutta New York, Basel : Marcel Dekker, cop. 2003 |
| BB | Nanostructured materials and nanotechnology / H.S. Nalwa (ed). Academic Press, San Diego (2002) |
| BB | Smart, Lesley. Química del estado sólido : una introducción / Lesley Smart y Elaine Moore ; versión en español de Patricia Quintana Owen y María A. Castellanos Román ; con la colaboración técnica de Raúl Valenzuela Monjarás y María Vallet Regí . - [1a ed.] Wilmington, Delaware [etc] : Addison-Wesley Iberoamericana, cop. 1995 |
| BC | Chemistry of zeolites and related porous materials : synthesis and structure / Ruren Xu ... [et al.] Singapore : John Wiley & Sons (Asia), cop. 2007 |
| BC | Cragg, Peter J.. A practical guide to supramolecular chemistry / Peter J. Cragg Chichester (England) : John Wiley & Sons, cop. 2005 |
| BC | Cussler, E. L.. Chemical product design / E. L. Cussler, G. D. Moggridge . - 2nd ed. Cambridge, United Kingdom : Cambridge University Press, 2011 |
| BC | Fahlman, Bradley D.. Materials chemistry / by Bradley D. Fahlman . - 2nd ed. Dordrecht [etc.] : Springer, cop. 2011 |
| BC | Rankin, David W. H.. Structural methods in molecular inorganic chemistry / David W. H. Rankin, Norbert W. Mitzel, Carole A. Morrison . - 1st ed. Chichester : John Wiley & Sons, 2013 |