Subject:	**Nanocatalysis**
Semester:	**Spring**
Credits ECTS:	2,5
Professors:	**Dra Pilar Ramírez de la Piscina**
	pramirezdelapiscina@ub.edu
	Dr. Narcís Homs
	narcishomsmarti@ub.edu
Department / Faculty:	**Departamento de Química Inorgánica,**
	Facultad de Química,
	UB

Objectives:

General:

The aim of this course is to give a general panorama of the fundamental concepts in nanocatalysis, an approach from both molecular systems and nanostructured materials will be afforded. The basic concepts of catalysis will allow introducing the different active phases and components of a catalyst. Afterwards, the differential phenomena associated to the nanostructure will be studied. Different preparation methods and characterization techniques will be considered.

Specific competences that the student should acquired at the end of the subject.

1. Know the fundamental concepts related with catalysis.
2. Interpret different phenomena related with catalysts; activation and deactivation processes.
3. Be able to propose appropriate active phases to carry out different catalytic reactions.
4. Know the different preparation methods as a function of the catalyst to be prepared.
5. Identify the characterization techniques appropriate to be used in solving a specific problem.
6. Interpret the information obtained from the application of different characterization techniques and relate it with the behavior of the catalysts.

CONTENTS

Topic 1

Introduction. Basic concepts in catalysis. Classification of catalysts. Approach to nanocatalysis from molecular and nanostructured systems.

Topic 2

Surface of solids. Adsorption processes. Elemental steps of the catalytic reactions.

Topic 3

Catalysts. Components: Active phase, support, promoter. Catalysis by metals. Reactions catalyzed by oxides. Acid catalysis. Bifunctional catalysts. Activation and deactivation processes. Catalytic differential phenomena associated to the nanostructure. Model catalysts.

Topic4

Preparation of catalysts. Use of molecular precursors in the preparation of catalysts and supported nanoparticles. Impregnation and precipitation methods. Preparation of nanoparticles by electron beam lithography. Other methods of preparation of nanostructured catalysts.

Tema 5

Characterization of catalysts. Chemisorption methods. Temperature Programmed processes. Transmission electron microscopy (TEM). FTIR and Raman spectroscopy. X-ray photoelectron spectroscopy (XPS). Atomic force microscopy (AFM). Scanning tunneling microscopy (STM). Catalytic reactions as a characterization tool. Other techniques of characterization

Plan:

Lectures:	**21,5 horus**
Assignments:	**15 hours**
Study:	**32,5 horas**

References

Basic

Nanocatalysis 2006, Ed. D. Y. Murzin, Research Signpost, 2006.

Catalysis: an integrated approach, Editors: R. A. Van Santen, P.W.N.M. van Leeuwen, J. A. Moulijn, B. A. Averill, Studies in Surface Science and Catalysis 123, Elsevier (1999).

T. Bell, The impact of nanoscience on heterogeneous Catalysis, Science, 299 (2003) 1688.

R. Schlögl, S. Bee, A. Hamid, Nanocatalysis: mature science revisited or something really new? Angewandte Chemie International Edition, 43 (2004) 1628.

Complementary

Spectroscopy in catalysis, J. W. Niemantsverdriet, Wiley-VCH, (2000)