

## SUBJECT TEACHING GUIDE

### 377 - Materials for Catalysis

### Master's Degree in New Materials

Academic year 2023-2024

1. IDENTIFYING DATA					
Degree	Master's Degree in New Materials			Type and Year	Optional. Year 1
Faculty	Faculty of Sciences				
Discipline	Optional Module: Materials Subjects				
Course unit title and code	377 - Materials for Catalysis				
Number of ECTS credits allocated	5	Term	Semester based (2)		
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. DE QUIMICA E INGENIERIA DE PROCESOS Y RECURSOS.				
Name of lecturer	ANA CARMEN PERDIGON ALLER				
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Office	E.T.S. de Ingenieros Industriales y de Telecomunicación. Planta: - 3. DESPACHO (S3094)				
Other lecturers	FERNANDO GONZALEZ MARTINEZ ROSA MARTIN RODRIGUEZ				

3.1 LEARNING OUTCOMES
- Be able synthesize and use any of the materials to a catalytic reaction of industrial interest.
- Be able to plan procedures analysis and characterization of catalytic materials
- Write a small report on some aspect of the knowledge acquired.

4. OBJECTIVES
Know and distinguish different materials suitable for use in catalysis.
Learn different procedures and techniques for preparing catalysts.
Know evaluate some physicochemical parameters of these materials and their relationship with their catalytic applications.

6. SUBJECT PROGRAM	
CONTENTS	
1	Heterogeneous catalysts. Introduction. Preparation, procedures. Characterization.
2	Metallic catalysts. Chemisorption, active sites, dispersion, metallic surface, metallic particle size. Chemisorption of H <sub>2</sub> , O <sub>2</sub> /H <sub>2</sub> titration. Experimental techniques, gravimetric, volumetric, dynamic techniques for pulse, TPD, TPR, TPO.
3	Textural characterization of catalysts: Adsorption-desorption isotherms of N <sub>2</sub> .
4	General aspects of chemistry kinetic. Expression of rate of reaction. The integrated rate equation. Order of reaction. Factors that affect the rate of reaction. Reaction mechanisms. Enzymatic catalysis.
5	Homogeneous catalysts with transition metal complexes. Nanomaterials for catalysis. Industrial applications

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessn	%
Work Classroom / laboratory	Others	No	No	40,00
Work	Work	No	Yes	20,00
Final exam	Written exam	Yes	Yes	40,00
TOTAL				100,00
Observations				
<p>In the laboratory, the use of gown and safety glasses that students must acquire will be compulsory. Without this material, entry to the laboratory will not be allowed (UC laboratory work regulations).</p> <p>The personal work will consist of a study and a presentation by the student of a patent in the field of homogeneous catalysis and nanomaterials in catalysis.</p>				
Observations for part-time students				
Part-time students may make a final assessment of the whole subject (50%) and, the development of jobs, at least two block of the subject.				

8. BIBLIOGRAPHY AND TEACHING MATERIALS
BASIC
- Catalysis. Concepts and Green Applications, G.Rothenberg, Wiley-VCH, 2008.
- Heterogeneous Catalysis: Principles and applications, G.C. Bond, Oxford Sci. Pub., 1986.
- Applied homogeneous catalysis with organometallic compounds, B. Cornils, W.A. Herrmann Editors. VCH, 1996.
- Heterogeneous catalysis. Fundamentals and Applications, J.L.H. Ross, Elsevier, 2012.
- Adsorption, Surface Area and Porosity, A S. J. Gregg, K.S.W. Sing, Academic Press, 1982.
- Nanoparticles and Catalysis, D. Astruc, Wiley-VCH, 2008.