

SUBJECT TEACHING GUIDE

M1302 - Materials for Catalysis

Master's Degree in New Materials

Academic year 2022-2023

| 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 | M1302 - 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 |

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|------------------|--|--|--|--|--|
| Department | DPTO. DE QUIMICA E INGENIERIA DE PROCESOS Y RECURSOS. | | | | |
| Name of lecturer | M. CARMEN PESQUERA GONZALEZ | | | | |
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| Other lecturers | FERNANDO GONZALEZ MARTINEZ ANA CARMEN PERDIGON ALLER ROSA MARTIN RODRIGUEZ | | | | |

3.1 LEARNING OUTCOMES

- Be able to 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. COURSE ORGANIZATION

| CONTENTS | |
|----------|--|
| 1 | Heterogeneous catalysts. Introduction. Preparation, procedures. Characterization. |
| 2 | Metallic catalysts. Chemisorption, active sites, dispersion, metallic surface, metallic particle size. Chemisorption of H ₂ , O ₂ /H ₂ titration. Experimental techniques, gravimetric, volumetric, dynamic techniques for pulse, TPD, TPR, TPO. |
| 3 | Textural characterization of catalysts: Adsorption-desorption isotherms of N ₂ . |
| 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 | | | | |
| 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). 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. | | | | |
| 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. |

