Universitat Autònoma de Barcelona

2021/2022

Characterization of Materials

Code: 102513
ECTS Credits: 6

Degree	Type	Year	Semester
2502444 Chemistry	OT	4	0

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

Contact

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Use of Languages

Principal working language: spanish (spa)
Some groups entirely in English: No
Some groups entirely in Catalan: No
Some groups entirely in Spanish: No

Teachers

Luis Escriche Martínez
Juan Francisco Piniella Febrer
Ramón Yáñez López

Prerequisites

It is recommended to have completed and passed Spectroscopy and Materials Science. It is necessary to have k

Objectives and Contextualisation

Characterization of all types of materials at any stage of their production and transformation. In addition, be able t

as well as interpret the information obtained from sophisticated and novel techniques.

Competences

- Adapt to new situations.
- Apply knowledge of chemistry to problem solving of a quantitative or qualitative nature in familiar and professional fields.
- Be ethically committed.
- Communicate orally and in writing in ones own language.

- Evaluate the health risks and environmental and socioeconomic impact associated to chemical substances and the chemistry industry.
- Learn autonomously.
- Manage the organisation and planning of tasks.
- Manage, analyse and synthesise information.
- Obtain information, including by digital means.
- Propose creative ideas and solutions.
- Reason in a critical manner
- Recognise and analyse chemical problems and propose suitable answers or studies to resolve them.
- Resolve problems and make decisions.
- Show an understanding of the basic concepts, principles, theories and facts of the different areas of chemistry.
- Show initiative and an enterprising spirit.
- Show motivation for quality.
- Show sensitivity for environmental issues.
- Use IT to treat and present information.
- Use the English language properly in the field of chemistry.
- Work in a team and show concern for interpersonal relations at work.

Learning Outcomes

1. Adapt to new situations.
2. Analyse and extract information on the composition and structure of material from results obtained using spectroscopic, microscopic and thermal techniques.
3. Be ethically committed.
4. Communicate orally and in writing in ones own language.
5. Compare the microscopic techniques for the characterisation of nanomaterial.
6. Describe the physical principles that govern interactions between X-ray radiation and matter, as well as X-ray diffraction techniques in single crystal and powder form.
7. Distinguish the different microscopic and spectroscopic surface analysis techniques.
8. Identify the basic principles of spectroscopic electron-spin resonance and nuclear magnetic resonance techniques of solids.
9. Identify the health risks associated to the use of radiation and electromagnetic fields in the different techniques for characterising materials.
10. Interpret the results obtained by thermal techniques for the characterisation of materials.
11. Justify the spectroscopic response of materials using their structural characteristics.
12. Learn autonomously.
13. Manage the organisation and planning of tasks.
14. Manage, analyse and synthesise information.
15. Obtain information, including by digital means.
16. Propose creative ideas and solutions.
17. Read, analyse and extract information from texts in the English language on the different areas of the field of material chemistry.
18. Reason in a critical manner
19. Recognise basic English terms in the crystallographic and structural fields, as well as those associated to spectroscopic and microscopic techniques and to the databases used in the characterisation of materials.
20. Resolve problems and make decisions.
21. Show initiative and an enterprising spirit.
22. Show motivation for quality.
23. Show sensitivity for environmental issues.
24. Use IT to treat and present information.
25. Use spectroscopic, crystalline structure, powder diffraction and other databases related bibliographic data.
26. Work in a team and show concern for interpersonal relations at work.

Content

1. Simetría Infinita

2. Difracción de Rayos X

3. Técnicas de Difracción de Rayos X

4. Microscopía Óptica, Electrónica y de Proximidad

5. Técnicas de Análisis Térmica

6. Espectroscopías de Dispersión y de Absorción

Methodology

Methodology:

The student will perform three types of activities: directed, autonomous a
1.- Directed activities:
Theoretical classes.
Probleme classes: The knowledge acquired in the lectures and autonc
2.- Autonomous activities: With these activities, the student alone, or in a
3.- Supervised activities: The student can request the tutor of the subject

The teachers will dedicate approximately 15 minutes of a class to allow the students to answer the questions of e

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Lectures	42	1.68	2, 5, 6, 7, 14, 9, 8, 10, 11, 17, 15, 18, 19, 20, 25
Type: Supervised			
Tutorials	5	0.2	1, 2, 5, 4, 21, 22, 6, 7, 13, 14, 9, 8, 10, 11, 17, 3, 23, 15, 16, 18, 19, 20, 26, 25, 24
Type: Autonomous			
Problem resolution	16	0.64	1, 2, 12, 5, 7, 13, 14, 8, 10, 11, 15, 18, 20, 26, 25
Search of	7	0.28	1, 21, 13, 14, 8, 10, 15, 16, 18, 20, 26, 24

bibliography			
Study	60.75	2.43	1, 2, 12, 5, 21, 22, 6, 7, 13, 14, 9, 8, 10, 11, 17, 3, 23, 15, 16, 18, 19, 20, 26, 25, 24
Writing of works	10.25	0.41	1, 2, 12, 5, 4, 21, 22, 6, 7, 13, 14, 9, 8, 10, 11, 17, 3, 23, 15, 16, 18, 19, 20, 26, 25, 24

Assessment

Evaluation of the subject:

The subject will be evaluated continuously and will consist of the followin

Theoretical part
It represents 70% of the final grade. The student can choose two ways o
1) The continuous evaluation that will be carried out through two partial t
2) The final evaluation that will consist of a final test.
Continuous assessment:
First partial: The contents dealt with in the first part of the subject will be
Second partial: The contents dealt with in the second part of the subject
If these tests are passed with an average grade equal to or greater than
If the average is less than 5 or any of the partial marks is less than 4, the
Final test:
The students will take a final test that will include the theoretical contents
Students who take the final test can do one or two parts.
To participate in the final exam, the student must have been previously e
Students who want to improve the score obtained in the continuous asse

Evidence / Seminars:
Represent 30% of the final grade. Students must solve and / or present i

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Evidences	30	1	0.04	1, 2, 12, 5, 4, 21, 22, 6, 7, 13, 14, 9, 8, 10, 11, 17, 3, 23, 15, 16, 18, 19, 20, 26, 24
Final test	70	4	0.16	1, 2, 12, 5, 4, 21, 22, 6, 7, 13, 14, 9, 8, 10, 11, 17, 3, 23, 16, 18, 19, 20, 25
First partial	35	2	0.08	1, 2, 12, 5, 4, 21, 22, 6, 7, 13, 14, 9, 8, 10, 11, 17, 3, 23, 16, 18, 19, 20, 25
Second Partial	35	2	0.08	1, 2, 12, 5, 4, 21, 22, 6, 7, 13, 14, 9, 8, 10, 11, 17, 3, 23, 16, 18, 19, 20, 25

Bibliography

Ferraris, G., Gilli, G., Zanotti, G., Catti, M., Artioli, G., Viterbo, D.,Giacovazzo, C. and Monaco, H.L. *Fundamentals of Crystallography*. IUCR Texts on Crystallography. Oxford Science Publications, 2002

Leng, Yang. *MATERIALS CHARACTERIZATION: Introduction to Microscopic and Spectroscopic Methods* WILEY, 2008

Software

In case the teaching is not on-site: Teams

Required software: Office or similar.