Teaching Guide				
Identifying Data				2015/16
Subject (*)	Técnicas de Preparación e Caracterización de Materiais		Code	610509019
Study programme	Mestrado en Investigación Química e Química Industrial			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree		First		0
Language	SpanishGalicianEnglish			
Teaching method	Face-to-face			
Prerequisites				
Department	Química Fundamental			
Coordinador		E-mail		
Lecturers	Castro Garcia, Socorro	E-mail	socorro.castro.garcia@udc.es	
Web				
General description	This course belongs to the module "Nanochemistry and New Materials", which covers 4 subjects, all closely related: 1. Design and development of advanced materials 2. Characterization of materials 3. Properties of materials 4. Molecular materials This subject is key in that module to understand the relationship between materials synthesis and adequate characterization, with their properties and applications, and therefore the appropriate design and optimization. To attend it is advisable to have well established knowledge of chemistry, particularly Solid State Chemistry.			

Study programme competences / results	
Code	Study programme competences / results
A3	Apply materials and biomolecules in innovative fields of industry and chemical engineering.
A4	Innovate in the methods of synthesis and chemical analysis related to the different areas of chemistry
A7	Operate with advanced instrumentation for chemical analysis and structural determination.
A9	Promote innovation and entrepreneurship in the chemical industry and in research.
B1	Possess knowledge and understanding to provide a basis or opportunity for originality in developing and / or applying ideas, often within a research context
B4	Students should be able to communicate their conclusions, and the knowledge and the reasons that support them to specialists and non-specialists in a clear and unambiguous manner
B5	Students must possess learning skills to allow them to continue studying in a way that will have to be largely self-directed or autonomous.
B7	Identify information from scientific literature by using appropriate channels and integrate such information to raise and contextualize a research topic
B10	Use of scientific terminology in English to explain the experimental results in the context of the chemical profession
B11	Apply correctly the new technologies to gather and organize the information to solve problems in the professional activity.
B13	Assess the human, economic, legal and ethical dimension in professional practice as well as the environmental implications of their work

Learning outcomes	
Learning outcomes	Study programme competences / results

- The student will obtain an overview of the advanced techniques of morphological, structural and microstructural characterization. - The student will learn the advantages and limitations of each one of the characterization technique. - When you need to characterize a material, the student will be able to discern what are the characterization techniques that better fit your needs / possibilities.	AC3 AC4 AC7 AC9	BC1 BC4 BC5 BC7 BC10 BC11 BC13	

Contents	
Topic	**Sub-topic**
Theme 1. Advanced characterization techniques for solids I	Introduction to diffractometric techniques. X-ray diffraction, neutron diffraction.
Theme 2. Advanced characterization techniques for solids II	Introduction to microscopic techniques. Optical microscopies (fluorescence and confocal), electronic microscopies (TEM, SEM, STEM, electron diffraction), scanning probe microscopies (STM, AFM).
Theme 3. Advanced characterization techniques for solids III	Introduction to spectroscopic techniques. EDXS, EELS, XPS, and solid state NMR & ESR.

Planning				
Methodologies / tests	**Competencies / Results**	**Teaching hours (in-person & virtual)**	**Student?s personal work hours**	**Total hours**
Guest lecture / keynote speech	A3 A4 A9 B1 B5 B13	12	0	12
Seminar	A3 A4 A7 B5 B10	7	0	7
Problem solving	A3 A4 B1 B4 B5	0	24	24
Document analysis	A9 B5 B7 B11	0	12	12
Objective test	A3 A4 A7 A9 B1 B4 B10 B13	1	18	19
Personalized attention		1	0	1
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	**Description**
Guest lecture / keynote speech	Theoretical classes. Magisterial lessons (with the use of blackboard and computer), complemented with the tools of virtual teaching
Seminar	Practical seminars conducted by teachers of the Master, or invited professionals from companies, the Administration or other universities. Interactive sessions related to the subjects with discussions and exchange of points of view with the students
Problem solving	Resolution of practical exercises (problems, quizzes, processing and interpretation of information, evaluation of scientific publications, etc.).
Document analysis	Personal study based on different sources of information.
Objective test	Preparation of the different tests for verification of obtaining both theoretical and practical knowledges, and the acquisition of skills and attitudes.

Personalized attention	
Methodologies	**Description**
Seminar Problem solving Document analysis	Individual or small group tutoring.

Assessment			
Methodologies	Competencies / Results	Description	Qualification
Guest lecture / keynote speech	A3 A4 A9 B1 B5 B13	GUEST LECTURE + SEMINARS + PROBLEM SOLVING: 25% of global qualification	0
Seminar	A3 A4 A7 B5 B10	GUEST LECTURE + SEMINARS + PROBLEM SOLVING: 25% of global qualification	0
Problem solving	A3 A4 B1 B4 B5	GUEST LECTURE + SEMINARS + PROBLEM SOLVING: 25% of global qualification	25
Objective test	A3 A4 A7 A9 B1 B4 B10 B13	75% of global qualification	75

Assessment comments
1. Assessment procedure. The assessment of this subject will be done through a system whose sections and their respective weighting is detailed: Assessment system (Weighting): - Final examination (75%) - Continuous evaluation (25%) through: -- problems solving and case studies and -- continuous evaluation of the student by means of written and oral questions during the course and eventual oral presentation of papers and reports. According to this, the final exam will have a weight of 75% in the qualification of the subject. Continuous evaluation will have a 25% weight in the qualification of the subject. The student score is obtained as a result of applying the following formula: Final score = 0.75 x N1 + 0.25 x N2 being N2 and N1 the numerical scores of the corresponding continuous assessment (scale 0-10) and the final examination (scale 0-10), respectively. Face-to-face teaching activities (seminars and tutorials) are compulsory. Repeater students will have the same regime of classes to those who are studying the subject for the first time. 2. Recommendations with regard to the evaluation. The student should review the theoretical concepts introduced in the various topics using the supporting material provided by teachers and the literature recommended for each theme. The degree of success in the resolution of the exercises provides a measure of the student's preparation to deal with the final examination of the subject. Students who find difficulties in working the proposed activities should consult with the teacher, with the goal that it can analyze the problem and help solve these challenges. 3. Recommendations with regard to the recovery. Teacher will discuss with students who do not successfully overcome the evaluation process, and want it, the difficulties encountered in learning the contents of the subject. The teacher will also provide additional material (questions, exercises, exams, etc.) to reinforce the learning of the subject. 4. Others. Attendance at face-to-face activities (face to face lectures, seminars and tutorials) is mandatory. The faults must be documentary supported, accepting reasons referred to in the University regulations.

Sources of information

Basic	- A.R. West: "Basic Solid State Chemistry". Wiley, 2 ed., 1999. - A.R. West: "Solid State Chemistry and its Applications". Wiley, 2 ed., 2014. - L.E. Smart, E.A. Moore: "Solid State Chemistry: An Introduction". CRC Press, 4 ed., 2012.- G. Cao: "Nanostructures and Nanomaterials: Synthesis, Properties and Applications". Imperial College Press, 2004. - J. M. Köhler: "Nanotechnology: an introduction to nanostructuring techniques", Weinheim : Wiley-VCH, 2007- J.-P. Eberhart: "Structural and chemical analysis of materials : X-ray, electron and neutron diffraction, X-ray, electron and ion spectrometry, electron microscopy ". Wiley, 1991.- Angus I. Kirkland and John L. Hutchison (Eds.): ?Nanocharacterisation?. RSC Publishing, Cambridge, 2007.- Kenneth J. Klabunde (Ed.): ?Nanoscale materials in chemistry?. Wiley-Interscience, New York, 2001.- J.A. Schwarz, C.I. Contescu, K. Putyera (Editores): "Dekker Encyclopedia of nanoscience and nanotechnology" (5 volumes). Marcel Dekker, 2004.- John P. Sibila: ?A guide to materials characterization and chemical analysis?. VCH Publishers, 1998. Ademais recomendaranse para cada tema textos complementarios (artigos, páxinas web, textos específicos) no momento da impartición da materia.
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Subjects that are recommended to be taken simultaneously
Propiedades de Materiais/610509020 Deseño e Desenvolvemento de Materiais Avanzados/610509018
Subjects that continue the syllabus
Other comments
In this module it is essential to make a global approach to materials, trying to understand the close relationship that exists between the different materials synthetic procedures and their structural and microstructural characteristics, with their properties and, therefore, with their applications.