

Teaching Guide						
	Identifying Data 2021/22					2021/22
Subject (*)	Polymeric and Molecular Materials Code 610509320					
Study programme	Mestrado Universitario en Investigación Química e Química Industrial (Plan 2020)					
	Descriptors					
Cycle	Period Year Type Credits			Credits		
Official Master's Degree	e 1st four-month period First Optional 3				3	
Language	Spanish					
Teaching method	Face-to-face					
Prerequisites						
Department	Química					
Coordinador	Jimenez Gonzalez, Carlos		E-mail	carlos.jim	enez@ud	c.es
Lecturers	Jimenez Gonzalez, Carlos		E-mail	carlos.jim	enez@ud	c.es
Web	https://www.usc.gal/gl/estudos/m	asteres/ciencia	as/master-univer	sitario-investigacio	n-quimica	-quimica-industrial/20202021/
	materiai					
General description	The subject completes the trainin	g module of Na	anochemistry ar	d new materials fro	om the mo	lecular point of view. It also
	provides overviews of the most in	nportant applic	ations of these r	naterials.		
Contingency plan	1. Modifications to the contents					
	There are no changes to the con-	tents.				
	2. Methodologies					
	* Teaching methodologies that a	e maintained				
	Master class, seminar and mixed	test.				
	* Teaching methodologies that ch	nange				
	There is no modification in the te	aching method	ologies, except	hat they will be tau	ght synch	ronously or asynchronously
	using the Moodle and Teams pla	tform or any ot	her that the UDC	c makes available t	o students	S.
	3. Mechanisms for personalized	attention to stu	dents			
	Email, student demand.					
	Equipment (or other similar platfo	orm), at the req	uest of the stude	ent		
	4. Changes in the evaluation					
	There are no changes in the met	hodology or pe	rcentage of eval	uation of the differe	ent activitie	es.
	* Evaluation observations:					
	In the event that master classes	or seminars ca	nnot be held syr	chronously, attend	ance and	active participation in these
	activities will not be evaluated. The	ne mixed test w	vill be carried ou	t using Moodle, Te	ams or an	y other teletraining platform
	that the UDC makes available to	the university of	community.			
	5. Modifications to the bibliograph	ny or webograp	bhy			
	There is no modification.					
	*Teaching methodologies that are	e modified				
	3. Mechanisms for personalized a	attention to stu	dents			
	4. Modifications in the evaluation					
	*Evaluation observations:					
	5. Modifications to the bibliograph	ny or webgraph	ıy			

	Study programme competences / results
Code	Study programme competences / results



A1	Define concepts, principles, theories and specialized facts of different areas of chemistry.
A3	Innovate in the methods of synthesis and chemical analysis related to the different areas of chemistry
A4	Apply materials and biomolecules in innovative fields of industry and chemical engineering.
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
C1	CT1 - Elaborar, escribir e defender publicamente informes de carácter científico e técnico
C3	CT3 - Traballar con autonomía e eficiencia na práctica diaria da investigación ou da actividade profesional.
C4	CT4 - Apreciar o valor da calidade e mellora continua, actuando con rigor, responsabilidade e ética profesional.

Learning outcomes			
Learning outcomes	Study	y progra	amme
	con	npetenc	es /
		results	
The student will know the main specific characteristics of molecular materials	AC1	BC1	
	AC3	BC4	
	AC4	BC5	
		BC7	
		BC10	
The student will understand how molecular properties and supramolecular interactions determine the properties of molecular	AC1	BC1	CC1
materials	AC3	BC4	
	AC4	BC5	
		BC7	
		BC10	
The student will know the main types of molecular materials (liquid crystals, semiconductors, etc.), and their characteristics	AC1	BC1	CC3
	AC3	BC4	
	AC4	BC5	
		BC7	
		BC10	
The student will know the main specific characteristics of polymeric materials, composites and nanocomposites	AC1	BC1	CC4
	AC3	BC4	
	AC4	BC5	
		BC7	
		BC10	
The student will know the techniques used for the study of molecular materials (optical microscopy with polarized light,	AC1	BC1	CC1
differential scanning calorimetry, etc.)	AC3	BC4	
	AC4	BC5	
		BC7	
		BC10	

Contents		
Торіс	Sub-topic	
Chapter 1. Molecular materials: basic concepts	Conceptos básicos	



Chapter 2. Molecular structures of molecular materials	Polímeros conxugados: poliacetilenos, polifenilenvinilenos, politiofenos
	estrutura, propiedades e sínteses
	Compostos policíclicos aromáticos:
	bidimensionales: acenos, rilenos, nanografenos, grafeno
	estrutura, propiedades e sínteses
	tridimensionales: fullerenos, nanotubos de carbono
	estrutura, propiedades e sínteses
	Outros compostos: poliaminas, compostos heterocíclicos, complexos metálicos
	estrutura, propiedades e sínteses
Chapter 3. Types of molecular materials	Liquid crystals, organic semiconductors, carbon allotropes (fullerenes, nanotubes and
	graphenes), photonic and optoelectronic materials, molecular magnets
Chapter 4. Polymers	Classification and uses. Polymers in solution. Properties in the solid state and
	property-structure relationship. Degradation, stability and recycling of polymeric
	materials
Chapter 5. Polymeric composites and nanocomposites.	Porous materials and molecular cavities. Metalosupramolecules. Molecular imprint
	polymers

Planning				
Methodologies / tests	Competencies /	Teaching hours	Student?s personal	Total hours
	Results	(in-person & virtual)	work hours	
Seminar	B7 B10	9	0	9
Oral presentation	C1	2	9	11
Mixed objective/subjective test	A1 A4 A3	2	7	9
Guest lecture / keynote speech	B1 B4 B5 C3 C4	12	34	46
Personalized attention		0		0
/*)The information in the planning table is for guidance only and does not take into account the betarageneity of the students				

(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

	Methodologies
Methodologies	Description
Seminar	Given that the tutorials will be essentially face-to-face, they may be partially carried out with virtual success
Oral presentation	Realización de traballos, tanto individualmente, como en grupo, sobre temas científicos relacionados coas distintas materias
	do
	Máster.
	Exposición oral de traballos, informes, etc., incluíndo debate con profesores e alumnos
Mixed	The final tests will be face-to-face
objective/subjective	
test	
Guest lecture /	An expository and interactive teaching will be face-to-face. However, and with exceptional success, in order to facilitate the
keynote speech	compatibility of teaching activities and the gradual development of the teaching skills of teachers and students, face-to-face
	teaching can be combined with virtual teaching in a maximum of 10% of cases. the total hours of the subject. In any case, this
	limitation will not apply to titles whose reports include a higher percentage

Personalized attention		
Methodologies	Description	



Seminar	The proposed teaching methodology is based on student work, which thus becomes the main protagonist of the
	teaching-learning process. In order for the student to obtain an optimal performance of his effort, it is essential that there is a
	continuous and close student-teacher interaction, so that the latter can guide the former in this process. This interaction will be
	given in a special way in the workshops and problem solving sessions. Through the student-teacher interaction, as well as the
	different evaluation activities, it will be determined to what extent the students have achieved the competence objectives
	established in each thematic unit, and will decide the students who need personalized attention through individualized
	tutorials. Therefore, teachers may periodically invite students to tutorials, which will be held at the most appropriate times for
	each student, with the intention that they receive the necessary guidance. Regardless of the tutorials proposed by the
	teachers, students can attend the tutorial, at their own request, as many times as they wish, and at the time that is most
	appropriate for them

Assessment				
Methodologies	Competencies /	Description	Qualification	
	Results			
Guest lecture /	B1 B4 B5 C3 C4	Será avaliada a participación do alumno nas sexións expositivas, a través de	5	
keynote speech		preguntas formuladas polo profesor ou a través do debate cos compañeiros		
Seminar	B7 B10	Dentro dos seminarios realizaranse unha serie de actividades evaluables: Resolución	15	
		de problemas e casos prácticos (10%) Realización de traballos e informes escritos		
		(10%)		
Oral presentation	C1	O alumno presentará de forma oral, ao longo do desenrolo da materia, un ou varios	15	
		dos resultados obtidos dentro das actividade plantexadas nos seminarios		
Mixed	A1 A4 A3	Co propósito de avaliar a adquisición de coñecementos e competencias realizarase	65	
objective/subjective		unha proba final (de acordo co calendario establecido no Centro). Nesta proba		
test		exporanse problemas e cuestións relativas aos contidos da materia, análogos aos		
		realizados durante as sesións presenciais durante o curso		

Assessment comments

SISTEMA DE AVALIACIÓN PONDERACIÓN MÍNIMA PONDERACIÓN MÁXIMA establecida na pagina web da USCExame final 55.0 75.0 Resolución de problemas e casos prácticos 10-15

Realización de traballos e informes escritos 5-10

Exposición oral (traballos, informes, problemas e casos prácticos) 5-10

Avaliación continua do alumno mediante preguntas e cuestións orais durante o curso 5-10

	Sources of information
Basic	- E. V. Anslyn, D. A. Dougherty (2006). Modern Physical Organic Chemistry. University Science Books
	- M. C. Petty (2008). Molecular Electronics; From Principles to Practice. Wiley
	- J. Scheirs (1998). Polymer recycling : science, technology and applications. John Wiley & amp; Sons



Complementary	- Fernando Langa, Jean-Francois Nierengarten (2008). Fullerenes : principles and applications. Royal Society of
	Chemist
	- Michael M. Haley and Rik R. Tykwinski (2006). Carbon-rich compounds : from molecules to materials. Weinheim :
	Wiley
	- Guldi, D. M.; Martín, N.Eds. Kluwer (2002). Fullerenes: From Synthesis to Optoelectronic Properties. Academic
	Press, Dordrecht, Netherland
	- Y. Li (2015). Organic Optoelectronic Materials. Springer
	- C. Brabec, U. Scherf, V. Dyakonov (2014). Organic Photovoltaics: Materials, Device Physics, and Manufacturing
	Technologies. Weinheim: Wiley-VCH
	- P. J. Collings (2001). Introduction to Liquid Crystals Chemistry and Physics. London: Taylor & amp; Francis
	- S. Kumar (2001). Liquid Crystals: Experimental Study of Physical Properties and Phase Transitions. Cambridge:
	Cambridge University Press
	- S. Chandrasekhar (1992). Liquid Crystals: Experimental Study of Physical Properties and Phase Transitions.
	Cambridge: Cambridge University Press,

Recommendations	
Subjects that it is recommended to have taken before	
Subjects that are recommended to be taken simultaneously	
Advanced Materials Characterization Techniques/610509121	
Material Properties/610509122	
Subjects that continue the syllabus	
Other comments	
It is compulsory to	
have previously taken the subjects of the Advanced Compulsory Training module	
and it is recommended to take the remaining subjects of the Nanochemistry and	
New Materials module	

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.