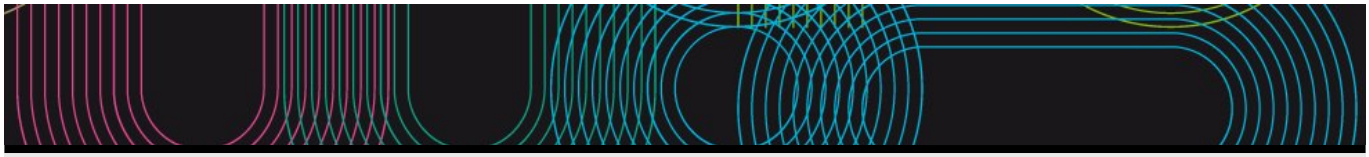

IDENTIFYING DATA				
Production of Basic Components from Lignocellulosic Waste				
Subject	Production of Basic Components from Lignocellulosic Waste			
Code	O01M142V01213			
Study programme	Máster Universitario en Ciencia y Tecnología Agroalimentaria y Ambiental			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Optional	1st	2nd
Teaching language	#EnglishFriendly Galician			
Department				
Coordinator	Gullón Estévez, Beatriz			
Lecturers	García del Río, Pablo Gullón Estévez, Beatriz Romaní Pérez, Aloia			
E-mail	bgullon@uvigo.es			
Web				
General description	Know and implement the main technologies for the production of platform chemicals from residual lignocellulosic materials			

Training and Learning Results	
Code	
A1	
B3	(*)Que os estudantes sexan capaces de desenvolver habilidades personais de razoamento crítico e constructivo para mellorar o funcionamiento dos proxectos de investigación en que intervén.
B4	(*)Que os estudantes sxean capaces de adaptarse a novas situacións, con grandes doses de creatividade e ideas para asumir o liderado de investigadores.
C1	
C8	
C10	
D1	
D2	
D3	
D4	
D5	
D6	
D7	
D8	
D9	
D10	
D11	Motivación poa calidade con sensibilidade hacia temas medioambientais

Expected results from this subject	
Expected results from this subject	Training and Learning Results

Knowing the potential of lignocellulosic residues (wood, prunings, straws, ...) as substrates for obtaining high added value products, candidates to replace to those now obtained from petroleum. Knowing the potential as platform chemicals of hydroxymethylfurfural (HMF), furfural, levulinic acid and formic acid	A1 B4 C10 D1
Knowing the different processes in the treatment of lignocellulosic materials for obtaining the aforementioned platform chemicals. Obtain laboratory skills to carry them out.	A1 B3 B4 C1 C8 C10 D1 D2 D4 D5 D7 D8 D11
Knowing the different analytical techniques for determining the chemical composition and structure of materials and studied compounds. Obtain skills to perform them at laboratory and knowledege for interpretation of the obtained data.	A1 C1 C8 C10 D1 D2
Critical analysis of recent studies published in scientific literature.	A1 B3 B4 C1 C10 D1 D2 D3 D4 D6 D8 D9 D10
Acquiring skills in synthesis and organization of information, writing and exposition, through the development and public presentation of a related topic work.	A1 B3 B4 C10 D1 D2 D3 D4 D6 D8 D11

Contents	
Topic	
Introducion	- Biomass as a renewable resource - Platform chemicals obtained from biomass
Biomass fractionation	- Treatments for hemicellulose solubilization - Delignification treatments - Cellulose hydrolysis
Hemicelluloses	- Composition - Obtention
Cellulose	- Caracterization - Obtention
Levulinic acid	- Characteristics and properties - Production by acid hydrolysis of hexoses - Production using solid catalysts - Production using enzymes
Hydroxymethylfurfural (HMF)	- Characteristics and properties - Production by acid hydrolysis of hexoses - Biphasic systems - Production using ionic liquids

Furfural	- Characteristics and properties - Production by acid hydrolysis of pentoses - Biphasic systems - Production using ionic liquids

Planning

	Class hours	Hours outside the classroom	Total hours
Presentation	2	36	38
Mentored work	4	17	21
Lecturing	8	8	16

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

Methodologies

	Description
Presentation	The supervised work made by the student will be presented in the classroom to the teacher and classmates. Evaluation will consider organization of the information and domain of the exposed subject. Additionally the answers to the questions posed by the teacher and classmates will be considered, and participation as listener, according to the comments and questions raised in the classmates' presentations.
Mentored work	Related with "Laboratory Practice" methodology, scheduled seminars address to perform analysis of the obtained experimental data. More specifically, applying material balances to the studied processes, implementing the kinetic modeling for acid hydrolysis of sugars in a spreadsheet, or offline integration of different chromatograms.
Lecturing	Presentation at classroom of the fundamentals of the subject, using audiovisual methods and, in some cases, making basic experiments requiring little material and low-tech.

Personalized assistance

Methodologies	Description
Presentation	During the performance of the tutored work the professor will orient in the compiling, classifying and organizing of the information. This orientation will continue during subsequent elaboration of material to be used in exposition in classroom.
Mentored work	In the presential part of the seminars, calculation methodologies to be employed for the interpretation of the experimental data obtained will be presented. Any student doubt will be solved. In the non presential part any question or consult made by the students will be answered using the e-learning platform, e-mail or in person during tutoring time.

Assessment

	Description	Qualification	Training and Learning Results			
Presentation	As "emitter: The organization and synthesis of the presented material, the clarity in the exposition, and the answer to the questions will be evaluated. As "receptor": Participation in classmates presentations will be evaluated, taking into account the comments / questions realized	35	A1		C1	D1 D3 D4 D7 D8 D11
Mentored work	To be valuated: the attitude and aptitude, the skills in the use of the required software tools (spreadsheet, chromatographic analysis software), and the elaborated material.	30	A1		C1 C8 C10	D1 D4 D6 D8 D9 D11
Lecturing	Realization of an exam of the subject. It Will include relative questions to theoretical concepts, production methodologies, analytical methods and practical cases	35	A1	B4	C1 C8 C10	D3 D5 D8

Other comments on the Evaluation

1. It is necessary to obtain a minimum qualification of 4.0 (base 10) in every part to pass the subject (Exam, laboratory practices, oral presentations and seminars).
2. Students that can not attend in person must demonstrate that they have the necessary knowledge of the matter and laboratory skills. They will have to do the exam of the subject, to elaborate a homework whose oral presentation can be video recorded and uploaded to the e-learning platform, to solve some of the cases dealed in seminars, and to

realize a exam about laboratory aspects. However, respect to laboratory practices, you are kindly requested to attend in person if possible.

3. In July the student can opt for examining of the exam or the methodologies not surpassed in the previous opportunity, or of those that wish to improve the previous qualification. The assigned qualification will be the best of that obtained in June or July for exam or every methodology.
4. The communication with the students will be made through the e-learning platform of the University of Vigo.
5. Examination dates: March, 16th 2021 at 11.00 and July, 7th 2021 at 11.00

Sources of information

Basic Bibliography

Robert-Jan Van Putten et al, **Hydroxymethylfurfural, a versatile platform chemical made from renewable resources**, 113, ACS, 2013

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Jean-Paul Lange et al., **Furfural- A promising platform for lignocellulosic biofuels**, 5, Willey-VCH, 2012

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A. Morone, M. Apte, R.A. Pandey, **Levulinic acid production from renewable waste resources: Bottlenecks, potential remedies, advancements and applications**, 51, 548-565, Elsevier, 2015

Complementary Bibliography

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Yomaira J. Pagán-Torres et al., **Production of 5-Hydroxymethylfurfural from Glucose Using a Combination of Lewis and Brønsted Acid Catalysts in Water in a biphasic reactor ...**, 2, ACS, 2012

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S. Dutta, S.De, B. Saha, I. Alam, **Advances in conversion of hemicellulosic biomass to furfural and upgrading to biofuels**, Catal. Sci. Technol., 2, 2025-2036, R. Society of Chemistry, 2012

J. Cui, J. Tan, T. Deng et al., **Conversion of carbohydrates to furfural via selective cleavage of the carbon carbon bond**, Green Chem., 18(6), R. Society of Chemistry, 2015

A.M. Raspolli Galletti, C. Antonetti, V. de Luise et al., **Levulinic acid production from waste biomass**, BioResources 7(2), Carolina State University, 2012

J. Sadhukhan, K. Siew, E. Martínez-Hernández, **Novel integrated mechanical biological treatment systems for the production of levulinic acid from fraction of municipal waste**, BRT 215, 131-143, Elsevier, 2016

Peleteiro, S.; Santos, V.; Garrote, G.; Parajó, J. C, **Furfural production from Eucalyptus wood using an acidic ionic liquid**, Carbh. Polym., 1, 20-25, Elsevier, 2016

Rivas, S.; Galletti, A.M.R.; Antonetti, C.; Licursi, D.; Santos, V.; Parajó, J. C., **A biorefinery cascade conversion of hemicellulose-free Eucalyptus globulus wood: Production of concentrated levulinic acid solutions for gamma-valerolactone sustainable preparation products**, Catalysts 8(4):169, MDPI, 2018

Zhanrong Zhang, Jinliang Song, e Buxing Han, **Catalytic Transformation of Lignocellulose into Chemicals and Fuel Products in Ionic Liquids**, Chem. Rev., 117, 6834-6880, ACS, 2017

Recommendations

Subjects that are recommended to be taken simultaneously

Instrumental Techniques for Agri-Food and Environmental Analyses/O01M142V01109