

ADVANCED SEPARATION PROCESSES



Main Researcher: PROF. INMACULADA ORTIZ



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<https://grupos.unican.es/pasep/>

RESEARCH INTERESTS

- High performance materials . Integration in Advanced Separation Processes.
- Energy sustainability and hydrogen economy
- Circular economy and environmental protection



Who are we?

Prof. Inmaculada Ortiz

Prof. Eugenio Daniel Gorri

Prof. Alfredo Ortiz

Dr. María José Rivero

Dr. Eugenio Bringas

Dr. Marcos Fallanza

Dr. Lucía Gómez

Dr. Pedro M. Gómez

Dr. Germán Santos

PhD. Students

Estela Abascal

Daniel Aragón

Carmen Barquín

Christian Fernández

Belén García

Cristina González

Gloria González

Daniel González

Carlota Guati

Jesús Nahum Hernández

Azizbek Kamolov

Víctor M. Maestre

M^a Ángeles Mantecón

Gonzalo Moral

Deva Pelayo

Laura Rancaño

Sophie Schröder

Carolina Tristán

Zafar Turakulov



Where are we?

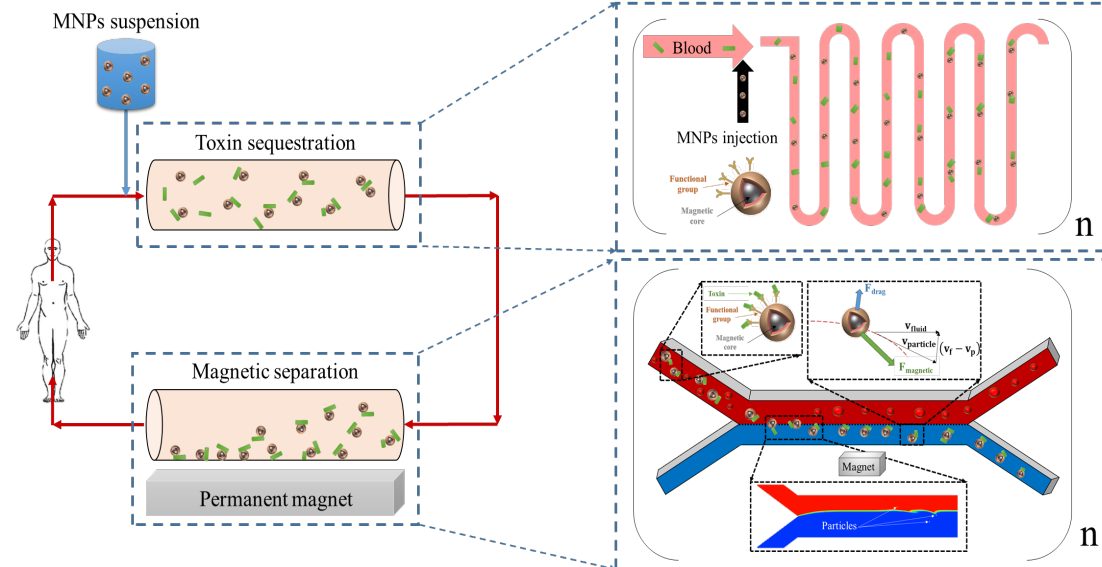
E.T.S Ingenieros Industriales y Telecomunicación
Avda. Los Castros s/n 39005 Santander (Cantabria) Spain



HIGH PERFORMANCE MATERIALS FOR MICROFLUIDIC AND MICRO-MAGNETOFORETIC SEPARATIONS

APPLICATIONS

- ✓ *Functionalized nanoparticles* *magnetic*
- ✓ *Synthesis of high selective lipid binding proteins*
- ✓ *High throughput separations*



RESEARCHERS

EUGENIO BRINGAS MARCOS FALLANZA
 CRISTINA GONZÁLEZ ARANTZA BASAURI
 BELÉN GARCÍA CARLOTA GUATI

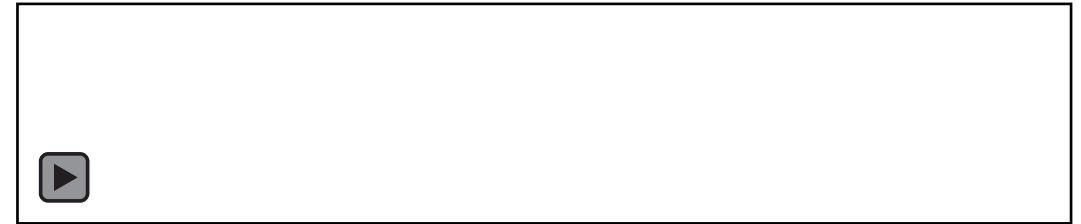
RESEARCH PROJECT

CTQ2015-72364-EXP and CTQ2015-66078-R.
 Main Researcher: INMACULADA ORTIZ
 MINECO RTI2018-093310-B-I00 , Co-IP: EUGENIO BRINGAS



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- ✓ Optimization of magnetophoretic microseparators
- ✓ Applications: purification, enrichment and isolation of cells or substances
- ✓ Process intensification



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RESEARCHERS

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BELÉN GARCÍA

RESEARCH PROJECT

CTQ2015-72364-EXP and CTQ2015-66078-R.
Main Researcher: INMACULADA ORTIZ
MINECO RTI2018-093310-B-I00 , Co-IP: EUGENIO BRINGAS

STATE UNIVERSITY OF
NEW YORK
BUFFALO



**COLORADO STATE
UNIVERSITY**

PROTEIN-LIPID BINDING THROUGH MOLECULAR DYNAMICS SIMULATIONS

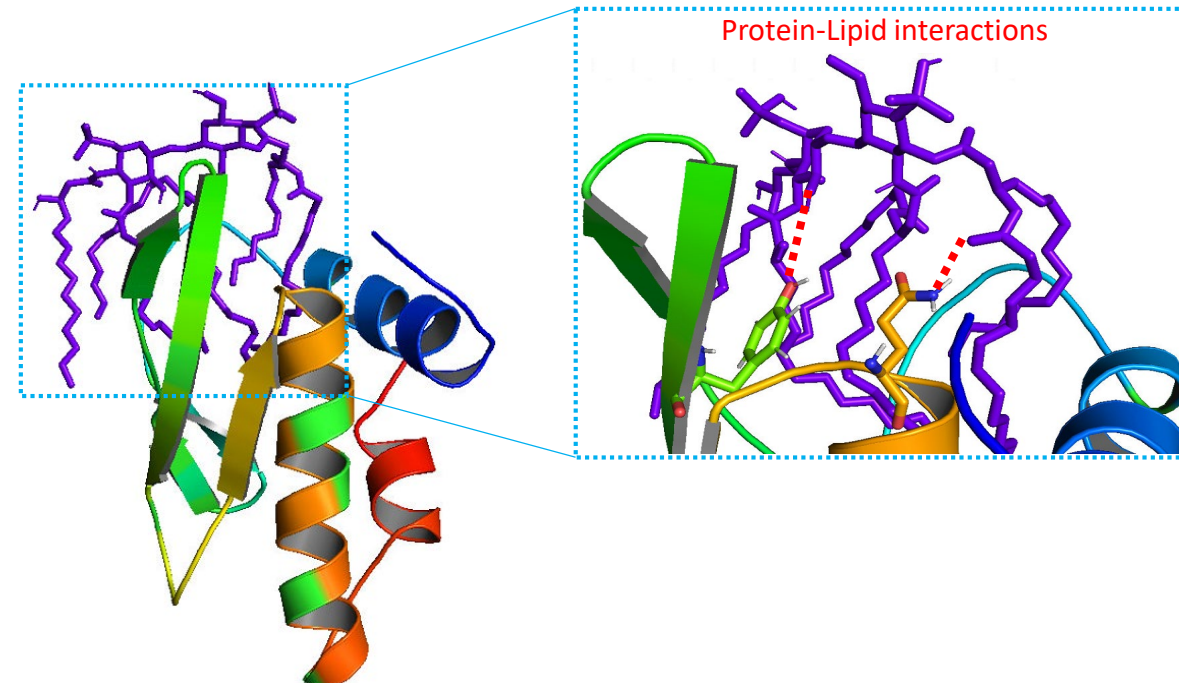
APPLICATIONS

- ✓ *Design of therapeutic proteins and peptides*
- ✓ *Understanding biological phenomena*
- ✓ *Contribute to molecular modeling*

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RESEARCH PROJECT

MINECO RTI2018-093310-B-I00 ,
IP: INMACULADA ORTIZ URIBE
Co-IP: EUGENIO BRINGAS



University of Natural Resources
and Life Sciences, Vienna



Universidad
de Huelva

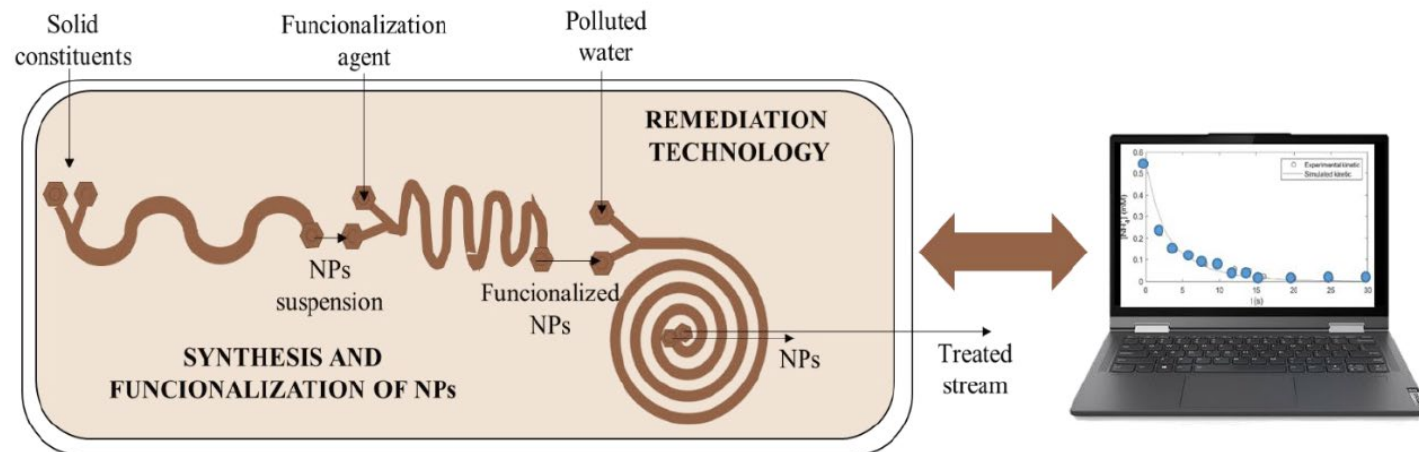
MICROFLUIDICS PLATFORM FOR COST-EFFECTIVE SCREENING OF ENVIRONMENTAL REMEDIATION TECHNOLOGIES (PLAT4REM)

APPLICATIONS

- ✓ *Fast, selective, and cost-effective screening of environmental remediation technologies*
- ✓ *Design of S/L remediation microdevices and further experimental validation*
- ✓ *PLAT4REM set-up assembly and commissioning for Cr(IV) capture and nitrates reduction*



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RESEARCHERS

ALFREDO ORTIZ
EUGENIO BRINGAS
LUCÍA GÓMEZ

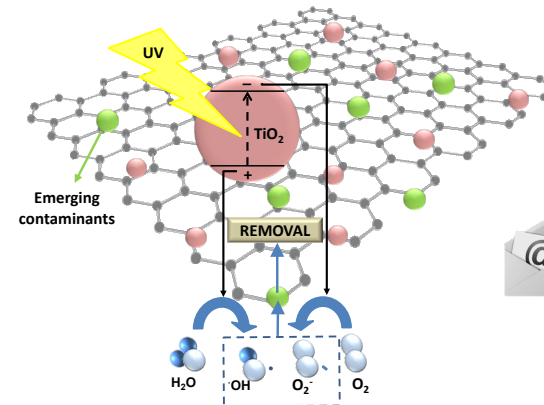
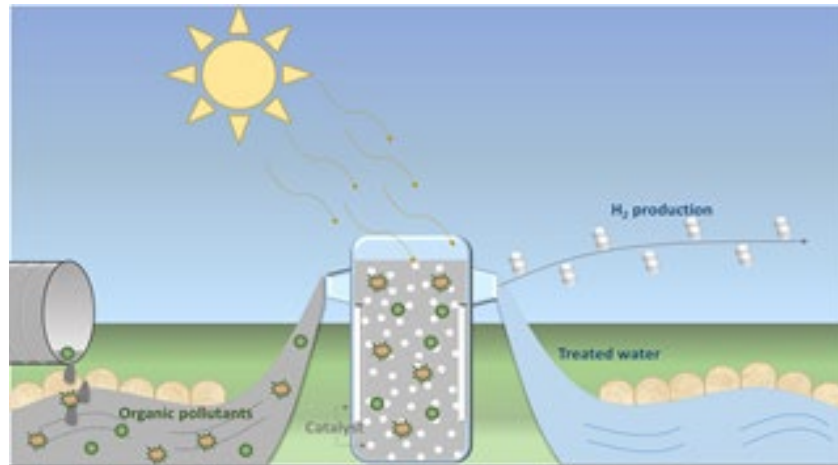
BELÉN GARCÍA
MARCOS FALLANZA

RESEARCH PROJECT

PDC2022-133122-I00
IP: INMACULADA ORTIZ URIBE

APPLICATIONS

- ✓ *Efficient & New composite materials based on GRAPHENE*
- ✓ *Wastewater treatment*
- ✓ *Hydrogen recovery*



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RESEARCH PROJECT

CTM2015-69845-R MINECO/FEDER, UE
Main Researcher: MARÍA JOSÉ RIVERO

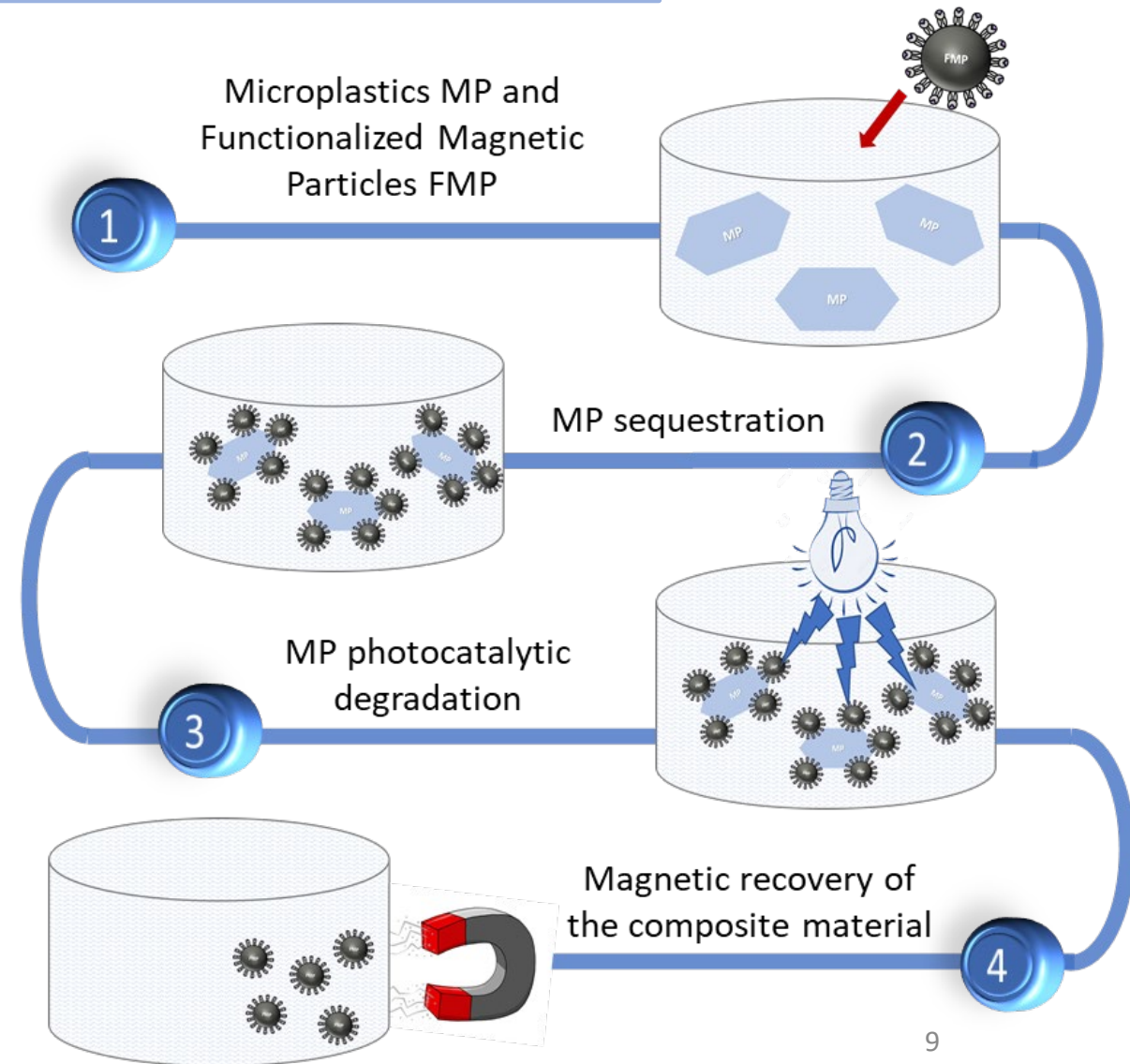
RESEARCHERS

JUAN CORREDOR
LAURA RANCAÑO
CARMEN BARQUÍN
DEVA PELAYO



INTEGRATED MICROPLASTICS REMEDIATION BY MAGNETIC-BASED PHOTOCATALYTIC MATERIALS (IMPRUV)

- ✓ *Development of efficient strategies for microplastics (MP) remediation*
- ✓ *Boosting challenging applications that integrate separation and degradation technologies*



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RESEARCHERS

MARTA RUMAYOR
ALEKSANDRA PACULA
JENIFER GÓMEZ

RESEARCH PROJECT

PID2021-122563OB-I00

Main Researchers: MARÍA JOSÉ RIVERO and EUGENIO BRINGAS

PROOF OF CONCEPT TOWARDS THE HETEROGENEOUS PHOTOCATALYSIS IMPLEMENTATION (PHOTOCONCEPT)

✓ *Development of heterogeneous photocatalysis technology to the level of a pilot plant that can be transferred to a user or marketer for validation and/or demonstration in a relevant environment.*

RESEARCHERS

MARTA RUMAYOR

JESÚS COLLADO

HECTOR SAN MARTÍN

RESEARCH PROJECT

PDC2022-133563-I00

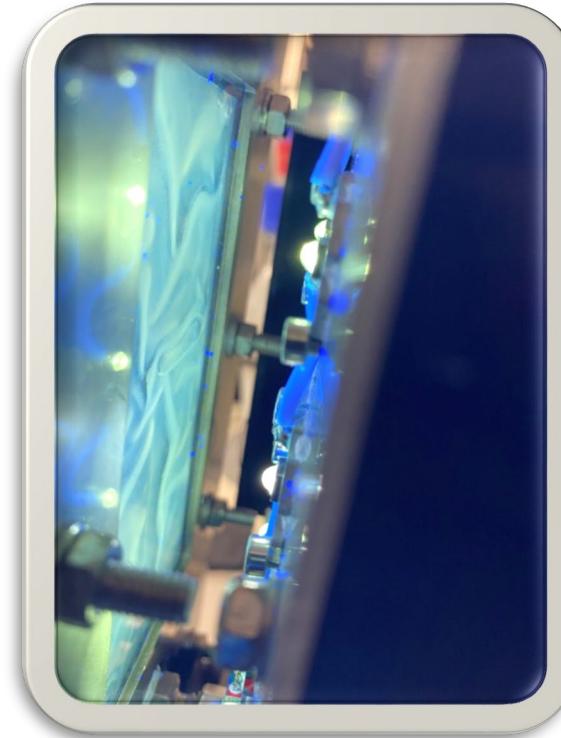
MCIN/AEI/10.13039/501100011033 y UE Next

GenerationEU/PRTR

Main Researcher: MARÍA JOSÉ RIVERO



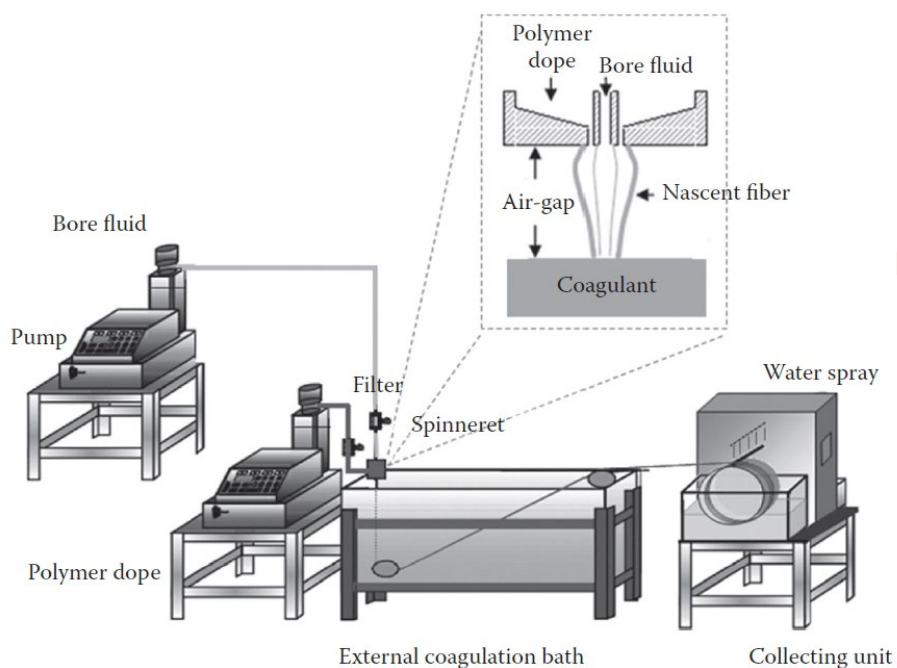
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SELECTIVE FUNCTIONALIZED MEMBRANES WITH HOLLOW FIBER CONFIGURATION FOR FLUID PHASE MOLECULAR SEPARATIONS

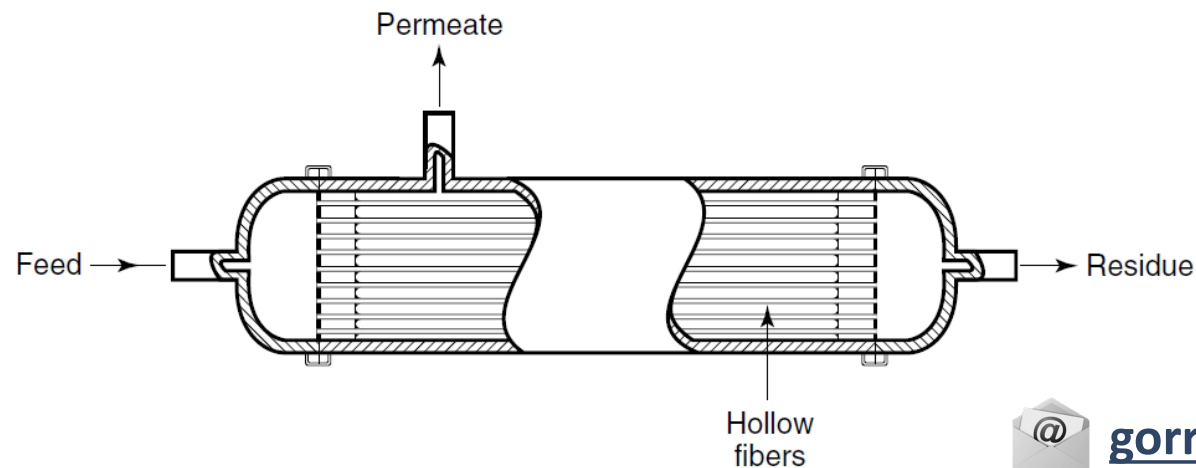
APPLICATIONS

- ✓ Composite membranes for the selective separation of bio-alcohols by pervaporation
- ✓ Functionalized membranes for separation of industrial gas mixtures



RESEARCH PROJECTS

CTQ2016-75158-R; PID2019-104369RB-I00
MICINN/FEDER, UE
Main Researcher: DANIEL GORRI



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RESEARCHERS

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ÁLVARO MARTIN



ADVANCED SEPARATION PROCESSES



Main Researcher: PROF. INMACULADA ORTIZ



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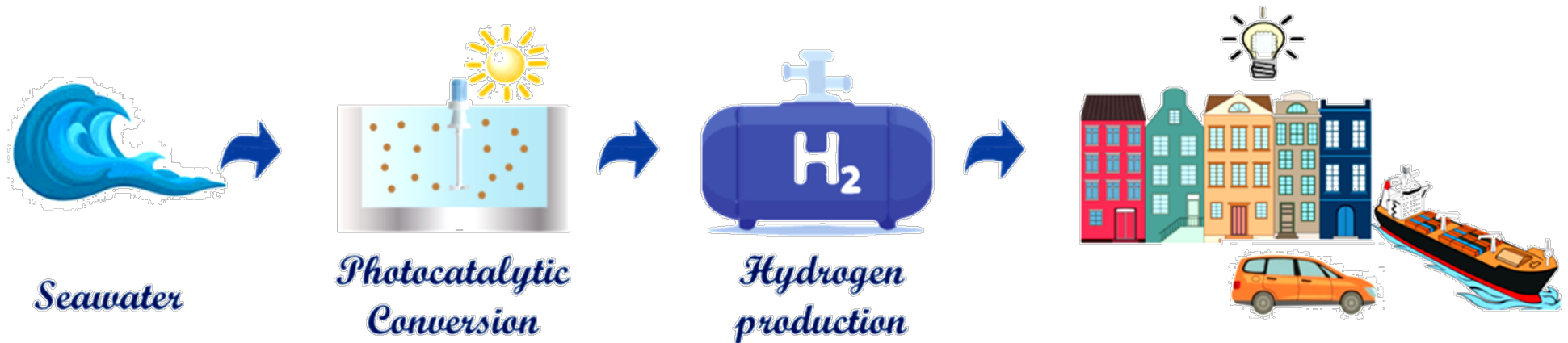
RESEARCH INTERESTS

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- **Energy sustainability and hydrogen economy**
- Circular economy and environmental protection



SOLAR TO HYDROGEN ENERGY CONVERSION EFFICIENCY USING SEAWATER (S2H)

- ✓ *Technical evaluation of photocatalytic materials for in the H₂ generation from seawater*
- ✓ *Energy efficiency evaluation of an integrated process including RED technology using WWTP effluent*
- ✓ *Environmental impact assessment using LCA tools*



RESEARCH PROJECT

PLEC2021-007718

financiado por MCIN/AEI/10.13039/501100011033
y por la Unión Europea Next GenerationEU/PRTR

Main Researcher: INMACULADA ORTIZ

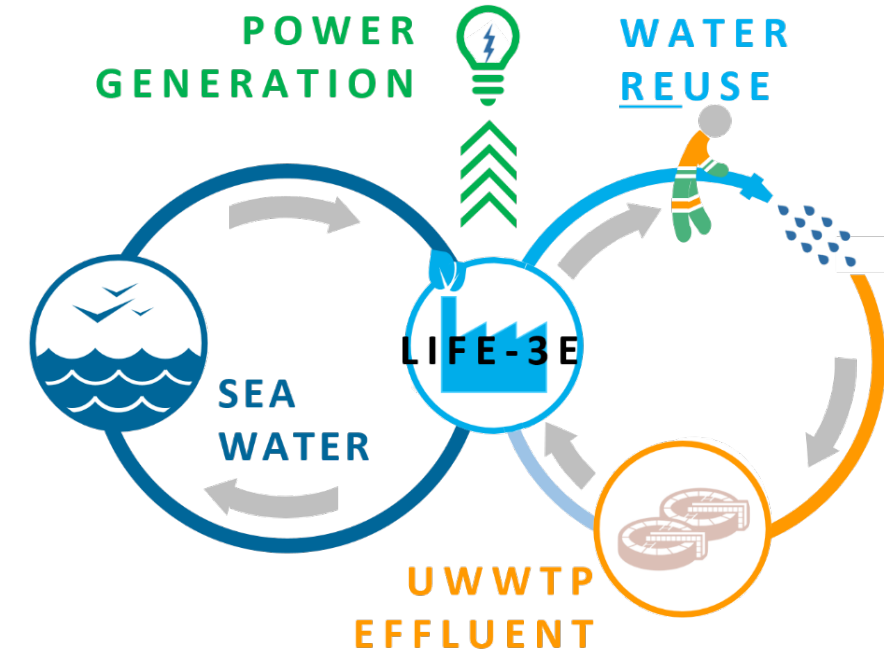
RESEARCHERS

ALFREDO ORTIZ LUCÍA GÓMEZ
RAQUEL IBÁÑEZ EDUARDO PÉREZ
MARÍA JOSÉ RIVERO



LIFE-3E - ENVIRONMENT-ENERGY-ECONOMY

- ✓ Reverse electrodialysis (RED) for the recovery of saline gradient energy
- ✓ Optimum design of RED
- ✓ Selection criteria for the recovery of saline gradient energy: Techno-economic assessment and LCA
- ✓ Applications: Wastewater Treatment Plant
- ✓ Energy Sustainability



RESEARCHERS

RAQUEL IBÁÑEZ ALFREDO ORTIZ
 MARCOS FALLANZA LUCÍA GÓMEZ
 TAMARA SAMPEDRO

RESEARCH PROJECT

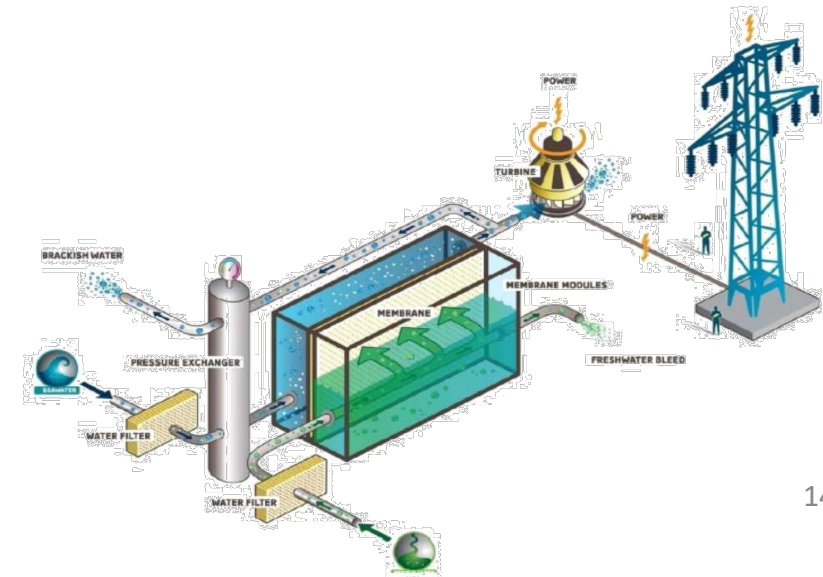
LIFE19-ENV_ES_000143
 Main researcher: INMACULADA ORTIZ URIBE



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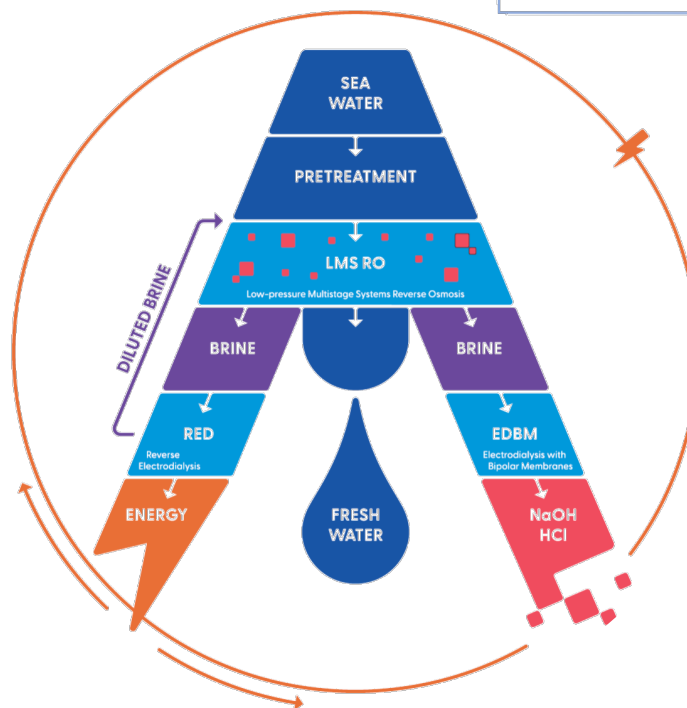
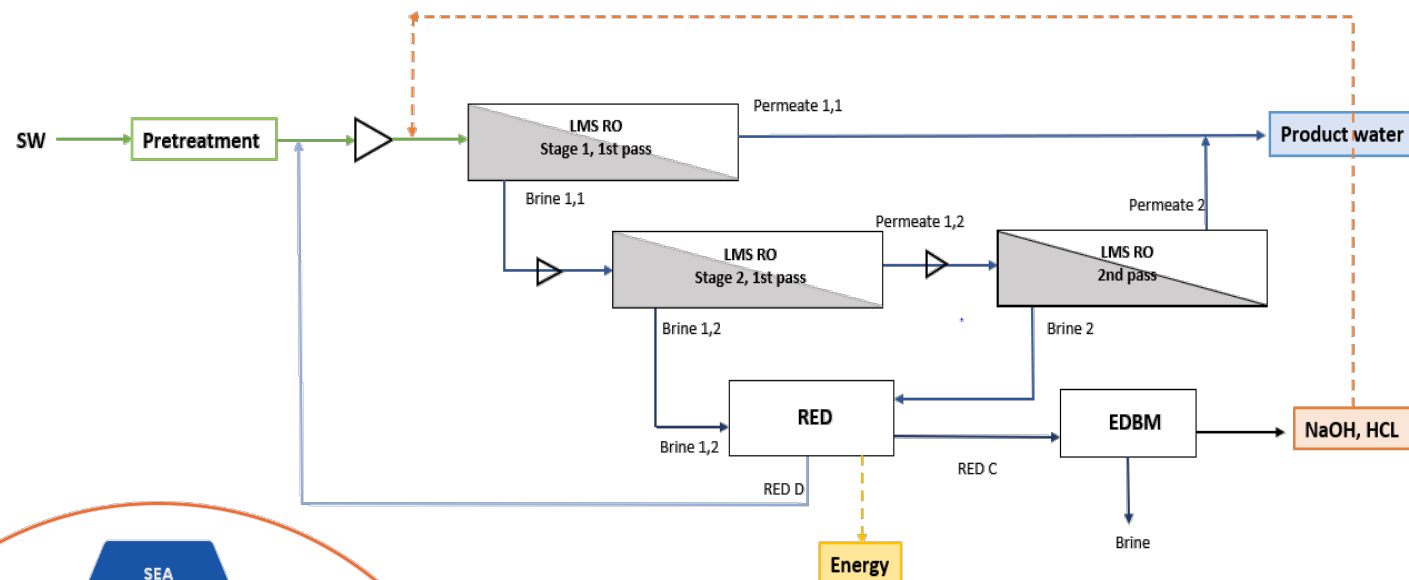
TECHNISCHE
UNIVERSITÄT
DARMSTADT



INTEGRATED WATER, ENERGY AND RESOURCES PRODUCTION FOR SUSTAINABLE SEAWATER DESALINATION



- ✓ Integration of RO, EDBM and RED technologies in a pilot plant
- ✓ Energy, water and resources sustainability
- ✓ Techno-economic assessment and LCA
- ✓ Applications: Desalination plants



RESEARCHERS

RAQUEL IBÁÑEZ

ALFREDO ORTIZ

MARCOS FALLANZA

LUCÍA GÓMEZ

DANIEL GORRI

MARTA RUMAYOR

ANGEL IRABIEN

RESEARCH PROJECT

LIFE21-ENV-ES-LIFE INDESAL- 10

Main researcher: INMACULADA ORTIZ URIBE



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HYDROGEN ECONOMY: HIGH PERFORMANCE MEMBRANES FOR PEMFC

- ✓ *Hydrogen recovery and purification*
- ✓ *Innovative and safe hydrogen storage systems*
- ✓ *Competitive implementation of advanced fuel cell and H₂ combustion engines for energy efficiency*
- ✓ *Socio-economic impact assessment and exploitation strategies for the new integral approaches*



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RESEARCHERS

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INMACULADA ORTIZ
VÍCTOR MAESTRE

LUCÍA GÓMEZ

RESEARCH PROJECTS

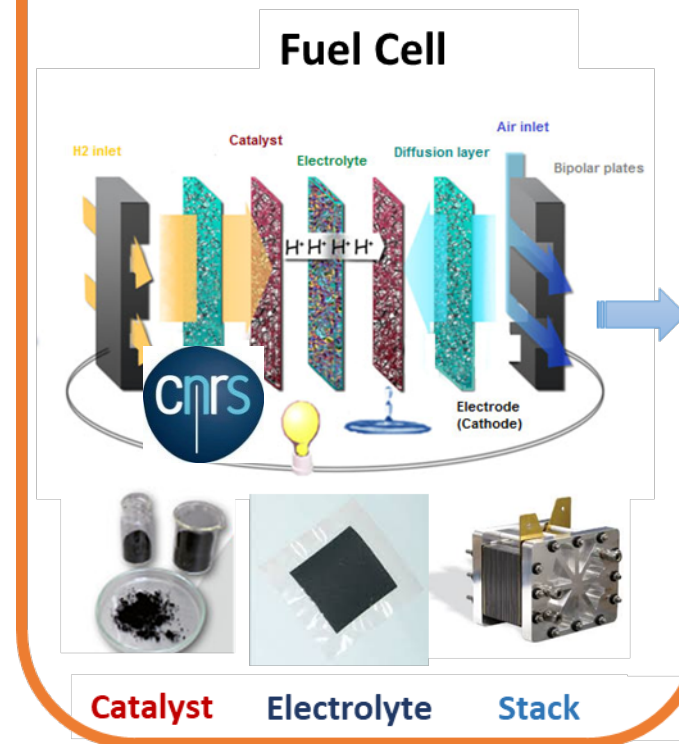
SOE1/P1/E0293 – Interreg SUDOE

EAPA_204/2016 – Interreg Atlantic Area

SOE3/P3/E0865- ENERGY PUSH

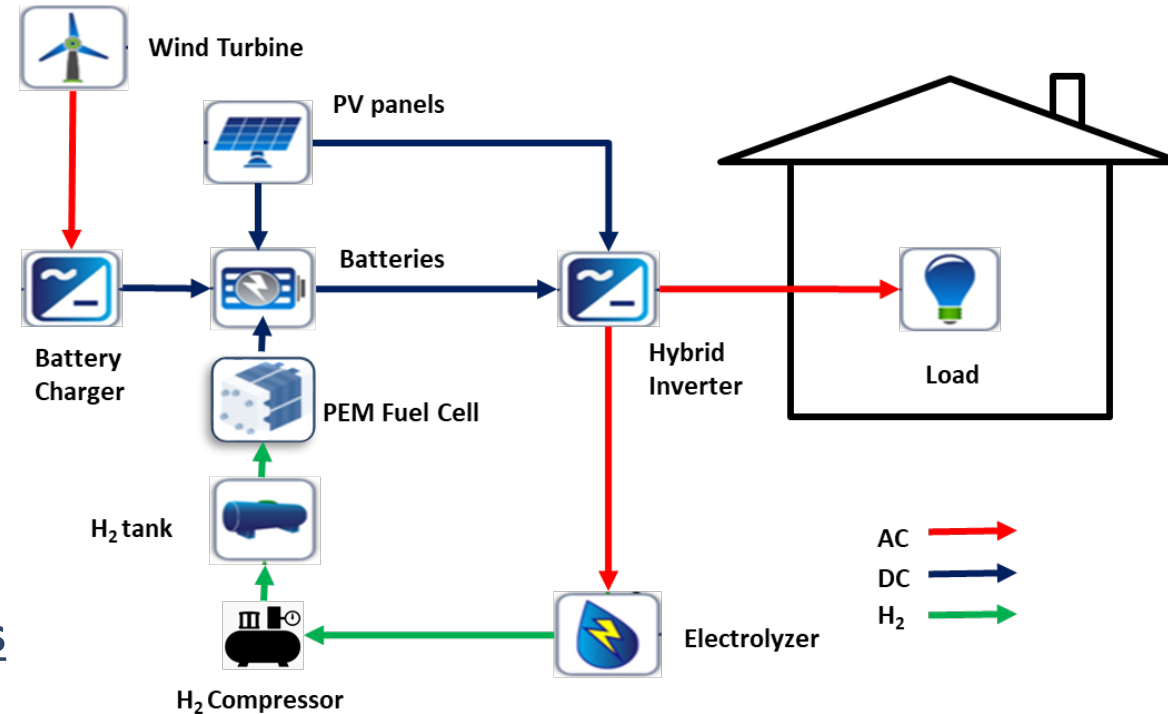
Coordinator: ALFREDO ORTIZ

2. INNOVATIVE PEMFC DESIGN



HYDROGEN-BASED INTEGRATED SYSTEM FOR POWER SUPPLY TO SOCIAL HOUSING

- ✓ System design based on renewable energy and hydrogen to supply electricity and get a 100% self-sufficient and sustainable housing.
- ✓ Control, monitoring and follow-up of the installed system



RESEARCHERS



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VÍCTOR MAESTRE

RAFAEL ORTIZ

RESEARCH PROJECTS

SOE3/P3/E0865-

ENERGY

PUSH

Main Research: ALFREDO ORTIZ



HYDROGEN CIRCULARITY: FROM INDUSTRIAL WASTE GAS STREAMS TO ELECTRICITY (HYDROCIR)

- ✓ Optimum process design for hydrogen recovery from waste gas streams
- ✓ Technical assessment of energy production using the purified H_2 streams
- ✓ Environmental impact of hydrogen recovery via LCA tools

RESEARCHERS



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IGNACIO GROSSMANN
ADÉLIO MENDES
LUCÍA GÓMEZ

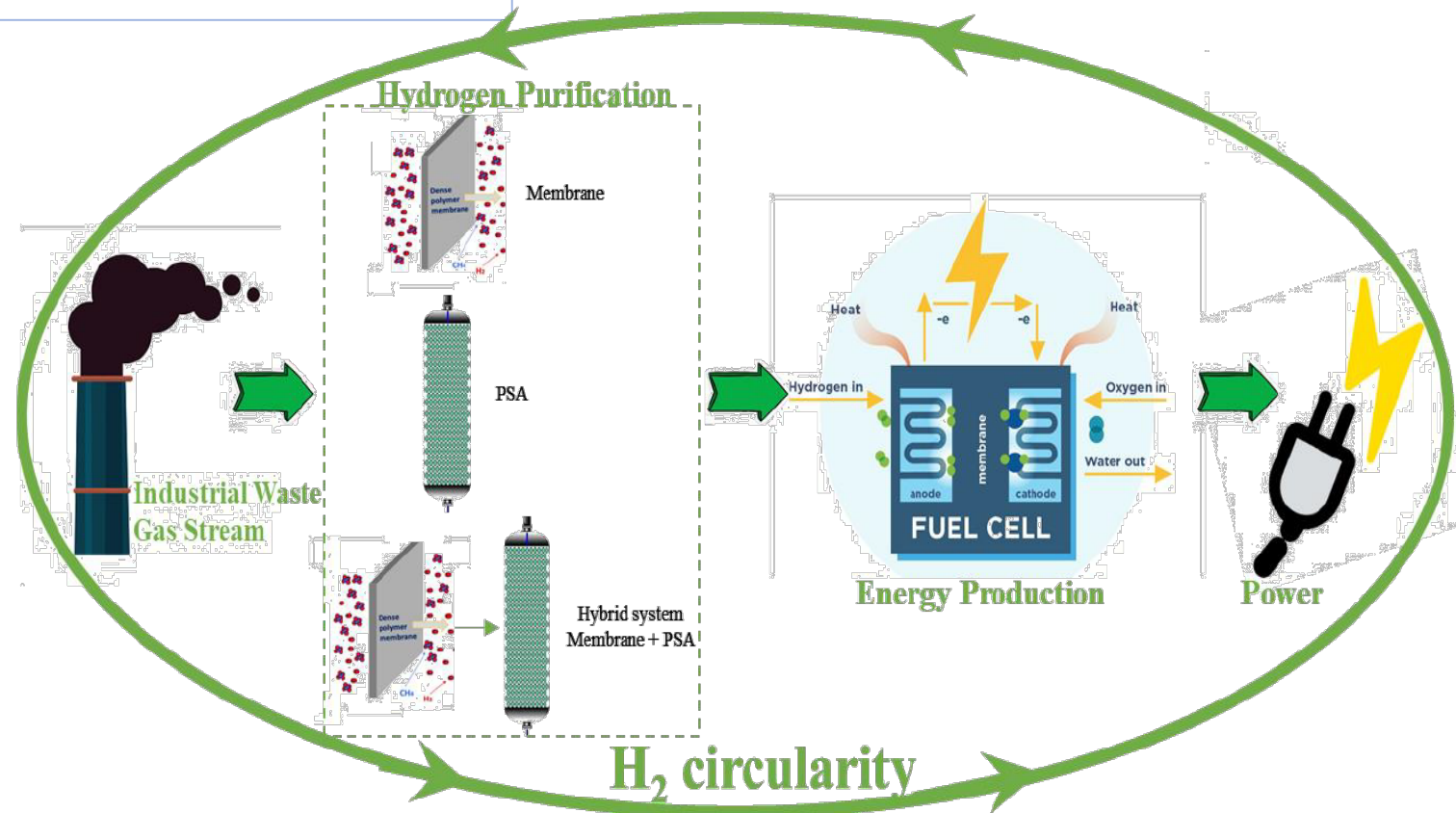
GUILLERMO DIAZ
CARLOTA GUATI
GEMA PÉREZ

RESEARCH PROJECT

PID2021-123120OB-I00

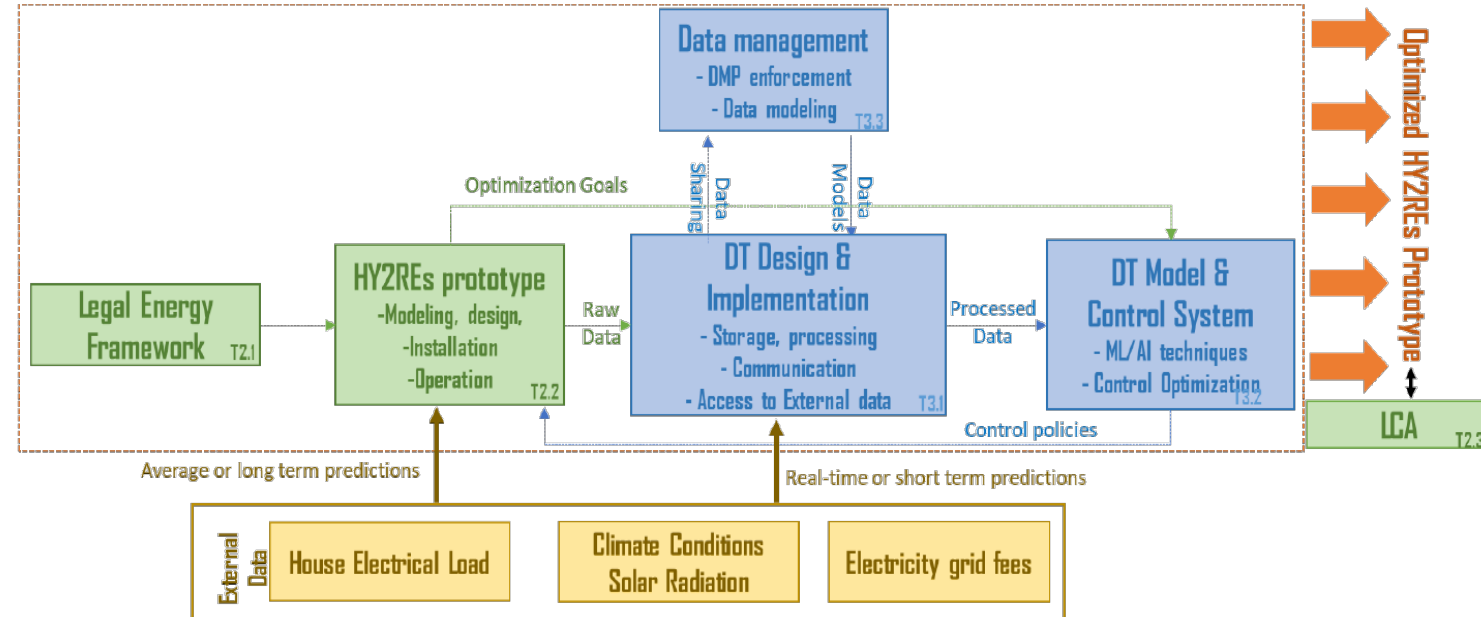
financiado por MCIN/AEI/10.13039/501100011033/ FEDER, EU

Main Researchers: INMACULADA ORTIZ and ALFREDO ORTIZ



HYDROGEN-BASED POWER SYSTEMS IN THE ENERGY TRANSITION WITHIN THE RESIDENTIAL SECTOR: DEMONSTRATIVE PILOT AND DIGITAL TWIN (HY2RES)

- ✓ *Technical and environmental assessment of the energy performance of a pilot demonstrative system designed to meet the energy demands of a family apartment using PV panels for energy consumption coupled with a hydrogen-based storage system.*
- ✓ *Optimization of the energy efficiency through the design and development of the Digital Twin physical-system.*



RESEARCH PROJECT

TED2021-129951B-C21

financiado por MCIN/ AEI /10.13039/501100011033 y por la Unión Europea ?NextGenerationEU?/PRTR

Main Researchers: INMACULADA ORTIZ and ALFREDO ORTIZ

RESEARCHERS

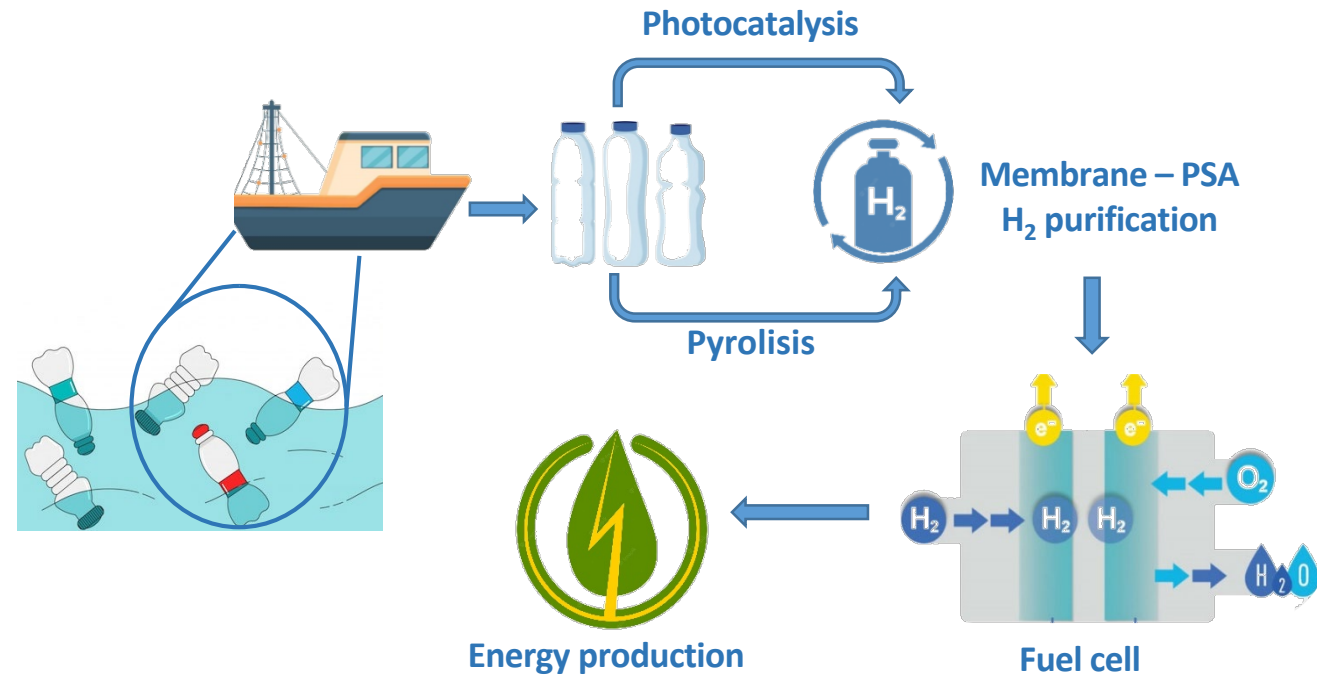
DANIEL GORRI
LUCÍA GÓMEZ
VICTOR MAESTRE
CARLOS SANCHEZ



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PLASTIC CIRCULARITY THROUGH AN EFFICIENT DETECTION, COLLECTION, AND VALORIZATION INTO HYDROGEN AND VALUE-ADDED PRODUCTS (PLAST4H2)

- ✓ Conversion of plastic waste into high-value products like hydrogen
- ✓ Development of advanced tools to assess and handle ocean pollution.
- ✓ Demonstration methods for plastic-to-hydrogen conversion.



RESEARCHERS

LUCÍA GÓMEZ
VICTOR MAESTRE
INMACULADA ORTIZ

RESEARCH PROJECT

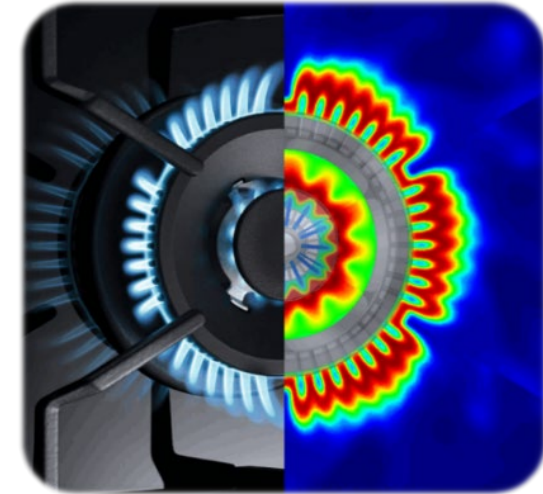
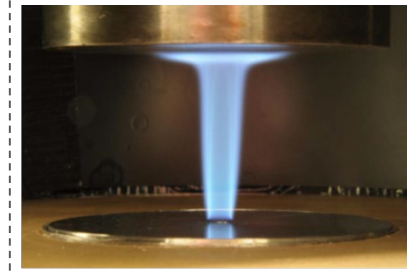
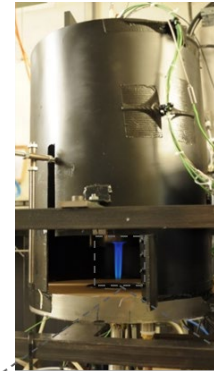
EAPA_0018/2022 Interreg Atlantic Area Co-funded by
European Union
Main Researcher: ALFREDO ORTIZ



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MODELING COMBUSTION REACTIONS IN GAS COOKING BURNERS

✓ *Providing rigorous guidelines for the optimal design of a domestic gas cooking burner and extending the understanding of the main physical phenomena behind the carbon monoxide formation in this type of systems.*



RESEARCHERS



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INMACULADA ORTIZ

SAUL LAGUILLO

RESEARCH PROJECTS

3735 & 3344- **BSH Home Appliances**
Main Research : ALFREDO ORTIZ



Universidad de Cantabria
Chemical and Biomolecular
Engineering Department
Advanced Separation Processes Group



Apria Systems, S.L.

In collaboration with

BSH Home Appliances

B/S/H/

ON GOING RESEARCH





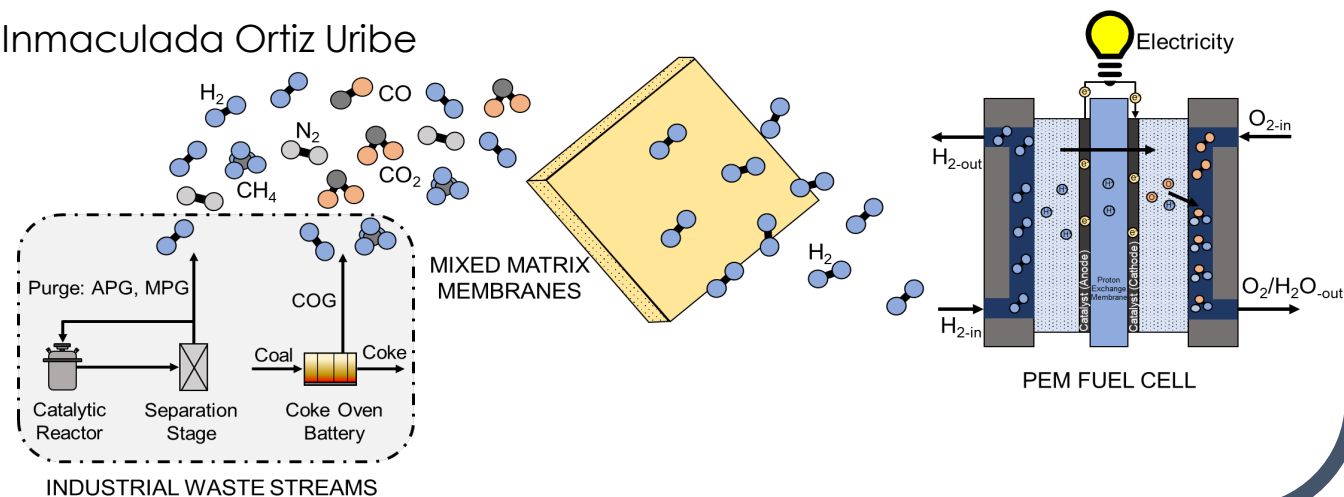
High performance membranes for hydrogen recovery and purification from industrial waste streams

PhD Student: Gonzalo Moral Real

Supervisors: Alfredo Ortiz Sainz de Aja and Inmaculada Ortiz Uribe

Keywords

- Hydrogen separation
- Mixed matrix membranes
- Coke oven gas
- Ammonia purge gas
- Methanol purge gas



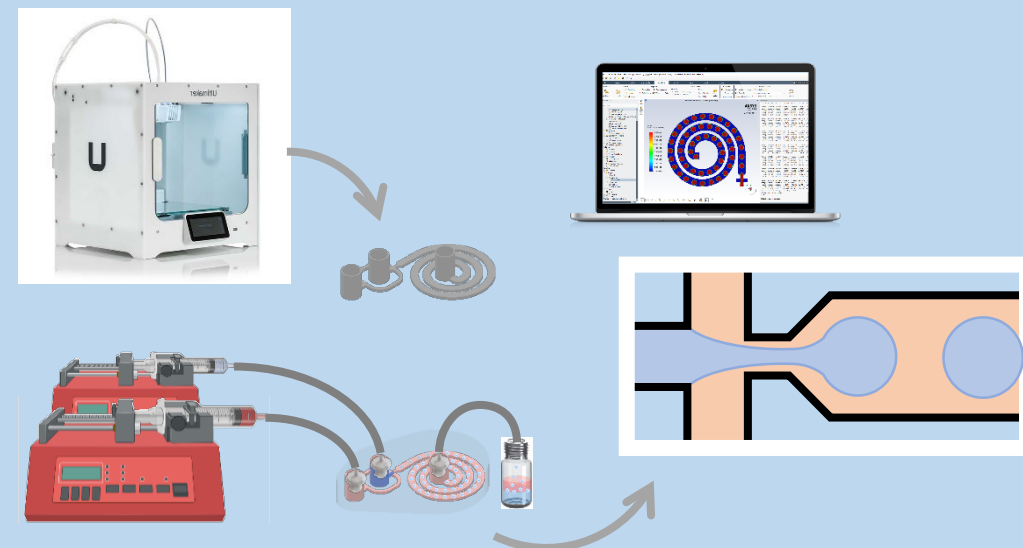
Design and application of microfluidic devices to liquid phase reagent systems.

PhD Student: Gloria González Lavín

Supervisors: Inmaculada Ortiz and Marcos Fallanza

Keywords

- Microfluidics
- Micro-devices design
- Fluid phase reactions
- Computational Fluid Dynamic (CFD)

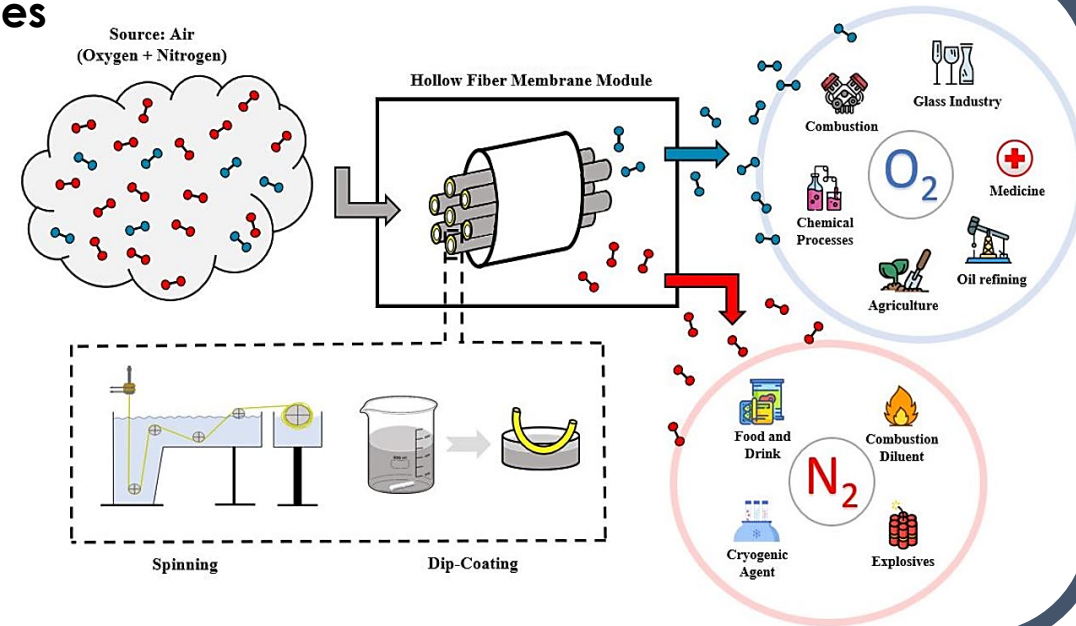




Selective functionalized hollow-fiber membranes for fluid-phase molecular separation

PhD Student: Daniel Gonzalez Revuelta
Supervisors: Eugenio Daniel Gorri and Marcos Fallanza

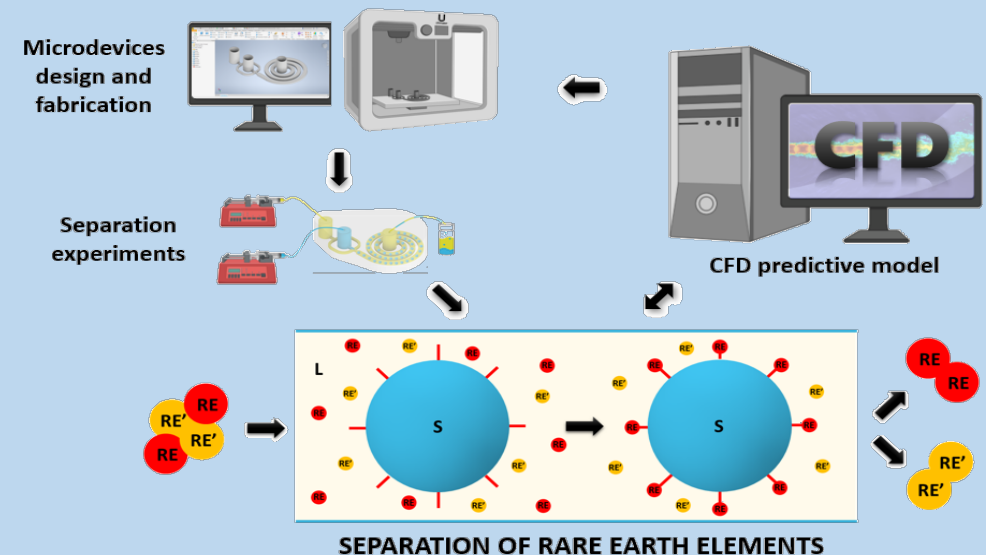
Keywords Gas separation
Nitrogen
Oxygen
Hollow fiber membranes
Dual-layer
Selective membranes



Separation of rare earth elements using microdevices. Theoretical design and experimental evaluation

PhD Student: Gloria González Lavín
Supervisors: Inmaculada Ortiz and Marcos Fallanza

Keywords Computational Fluid Dynamics
Microdevices
Microfluidics
Separation process
Rare earth elements





High performance electro-materials for fast detection of biomolecules

PhD. Student: Carlota Guati

Supervisors: Prof. Inmaculada Ortiz and Dr. Marcos Fallanza

Keywords:

Diabetes, Glucose detection, electrooxidation, electrode.

Development of new techniques for organic molecules detection, such as glucose in patients with Diabetes type I and II.



LUV2INNOVATE: Sistemas innovadores para el tratamiento de corrientes acuosas mediante procesos fotoquímicos con LED UV-C

PhD. student: Deva Pelayo

Supervisors: Dr. María José Rivero and Prof. Inmaculada Ortiz Uribe

Keywords:

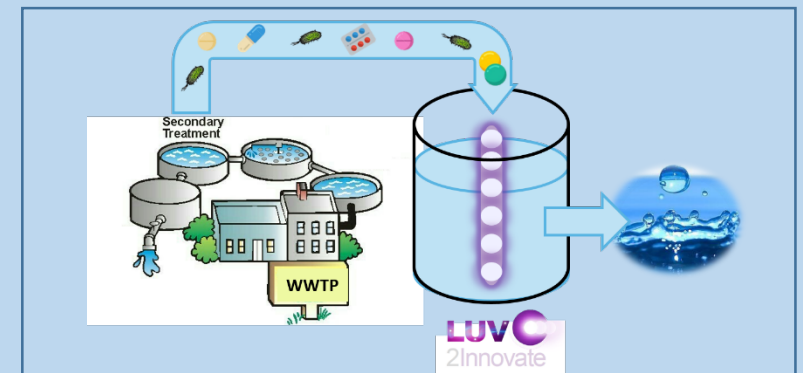
UV-C LED

Photochemical AOPs

Disinfection

Emerging contaminants

Photo-oxidation



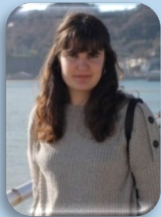
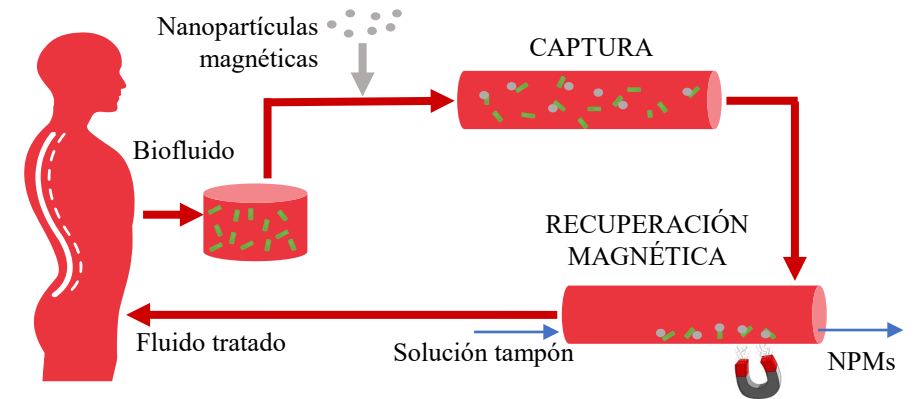


Contribution to the design of microfluidic systems for the capture and separation of biomolecules from biofluids.

PhD. student: Belén García Merino

Supervisors: Inmaculada Ortiz Uribe and Eugenio Bringas Elizalde

Keywords: Magnetic nanoparticles
Magnetite
Functionalization
Microfluidics
Separation processes

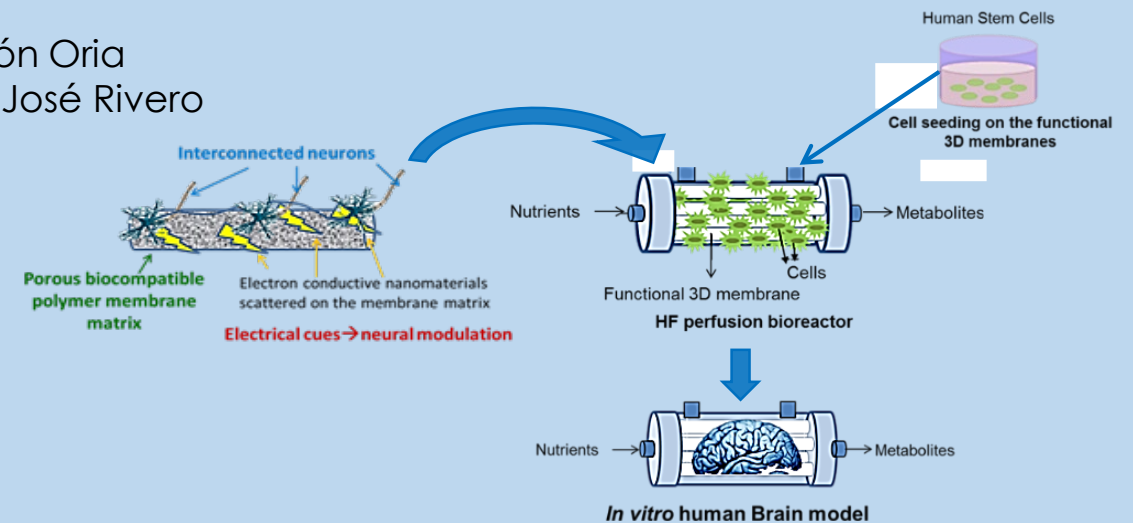


Development and characterization of 3D biopolymeric membranes functionalized with graphene-based nanomaterials and their integration in perfusion bioreactors for in vitro neural models

PhD. Student: María de los Ángeles Mantecón Oria

Supervisors: Dr. Nazely Diban and Dr. María José Rivero

Keywords: Mixed-matrix hollow fibers
Graphene
Poly(ϵ -caprolactone)
3D cell cultures
Neuronal models





Synthesis and validation of new photocatalysts for organic pollutants removal

PhD. student: Carmen Barquín

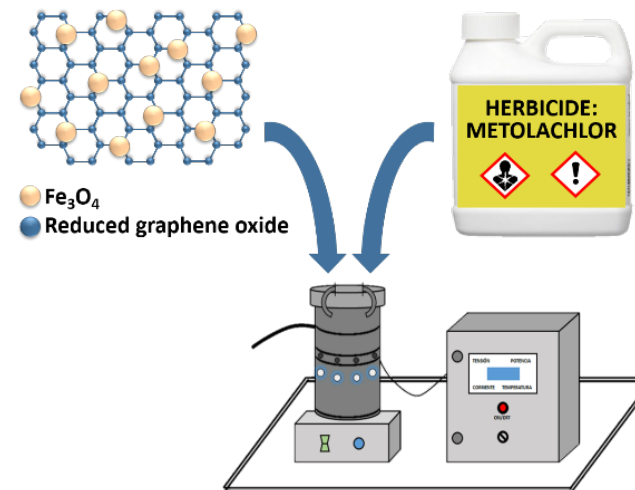
Supervisors: Prof. Inmaculada Ortiz and Dra. María J. Rivero

Keywords: Contaminants of Emerging Concern

Advanced Oxidation Processes

Heterogeneous photocatalysis

$\text{Fe}_3\text{O}_4/\text{rGO}$



Implementation of decarbonization strategies in Turakurgan (Uzbekistan) natural gas-fired combined cycle power plant as case study

PhD student: Azizbek Bakhtiyor ugli, Kamolov

Supervisors: Marcos Fallanza and Adham Norkobilov

Keywords

Decarbonization

Combined cycle power plant

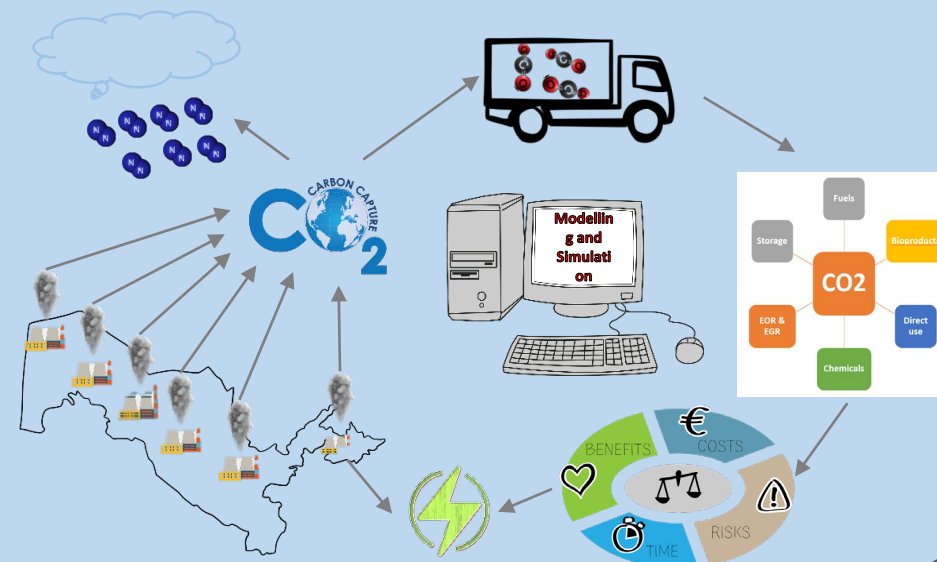
CO_2 capture

CO_2 utilization

Absorption

Membrane separation

Uzbekistan

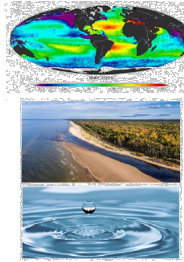




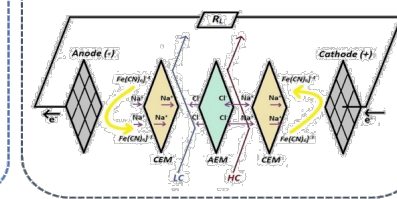
Development of nanostructured electrodes and nanocomposite cation exchange membranes for their integration into a reverse electrodialysis device

PhD Student: Jesús Nahum Hernández Pérez
Supervisors: Alfredo Ortiz Sainz de Aja (UC, Spain) and Rosa de Guadalupe González Huerta (IPN, Mexico)

Salinity Gradient Energy



Reverse Electrodialysis (RED)

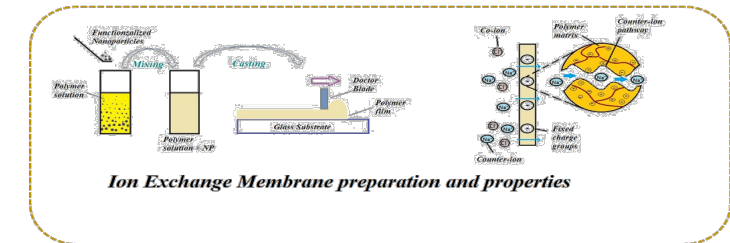


Sustainable energy production without CO2 emissions



Keywords

Marine Renewable Energies
Salinity Gradient Energy
Ion Exchange Membranes
Sustainable Power Generation



Ion Exchange Membrane preparation and properties

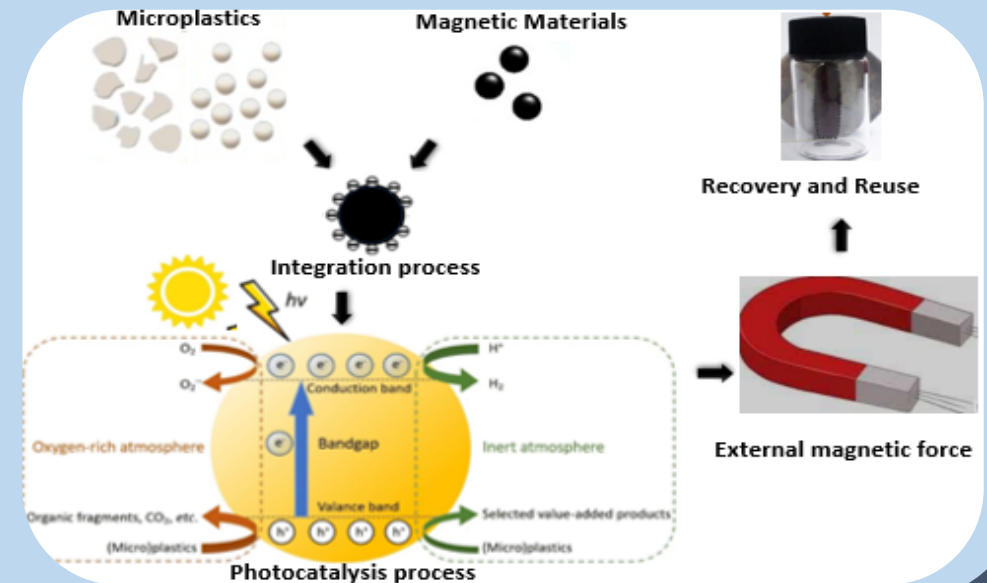


Integrated remediation of microplastics by magnetic photocatalytic materials

PhD Student: Daniel Aragón Mora
Supervisors: María José Rivero and Eugenio Bringas

Keywords

Separation process
Magnetic materials
Microplastics
Photocatalysis





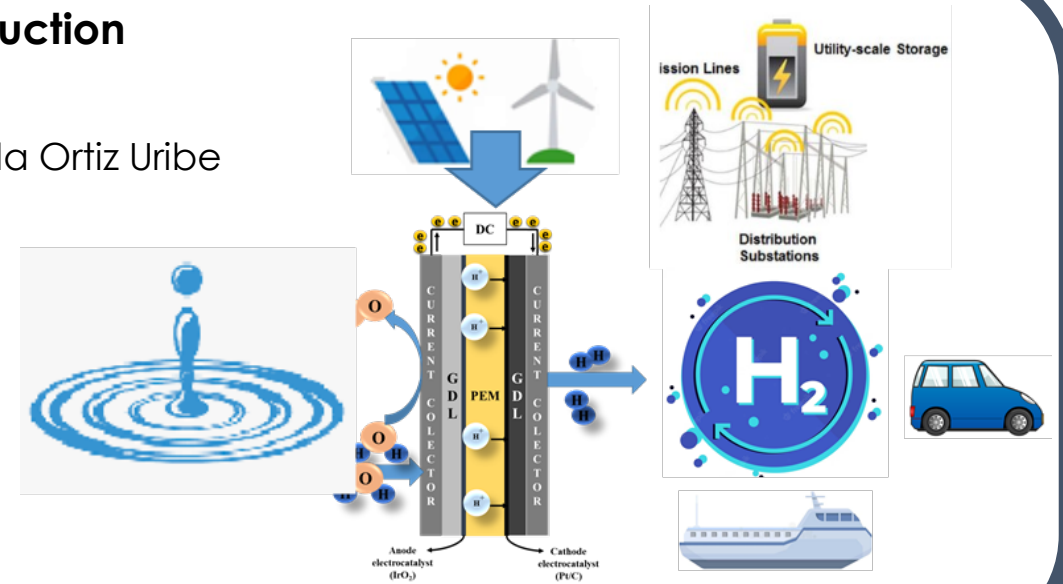
Seawater electrolysis for green hydrogen production

Researcher: Eric Alfredo Norman Ayllón

Supervisors: Alfredo Ortiz Sainz de Aja and Inmaculada Ortiz Uribe

Keywords

Water electrolysis
Hydrogen production
Polymer electrolyte membrane
electrocatalyst



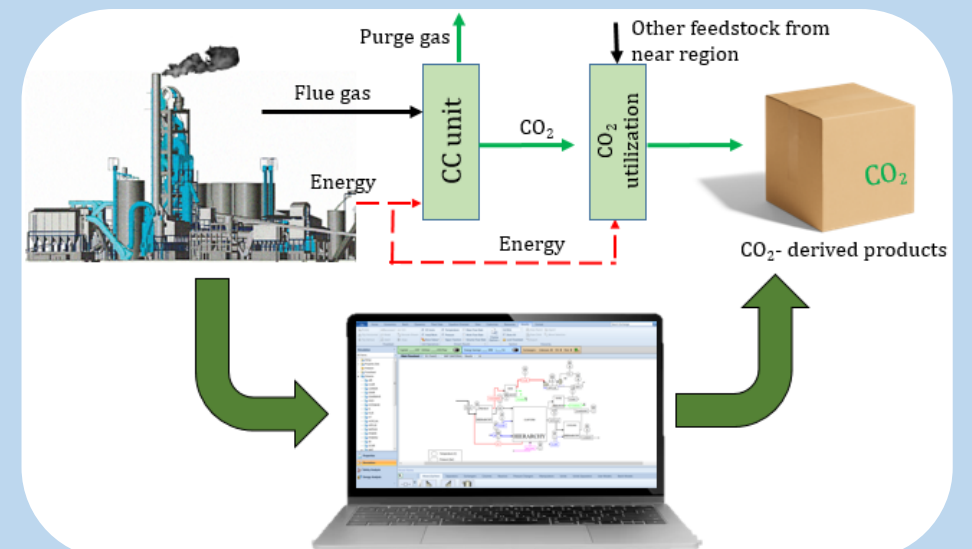
Moving towards a more sustainable cement industry in Uzbekistan: implementation of carbon capture and utilization technology

PhD Student: Zafar Turakulov

Supervisors: Marcos Fallanza and Adham Norkobilov

Keywords

Cement production
Decarbonization
CO₂ capture and utilization
Energy efficiency
Flue gas pre-treatment
Modeling and simulation

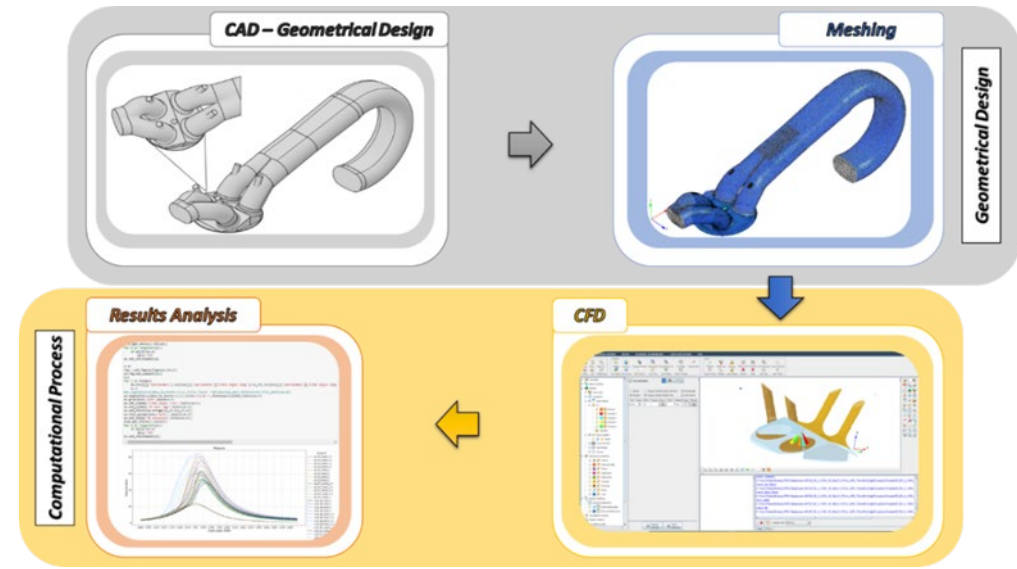




Design and Simulation of carbon fuels performance in an internal combustion engine based on direct and port fuel injection systems.

Researcher : Fabián Musy Palacio
Supervisors: Alfredo Ortiz Sainz de Aja

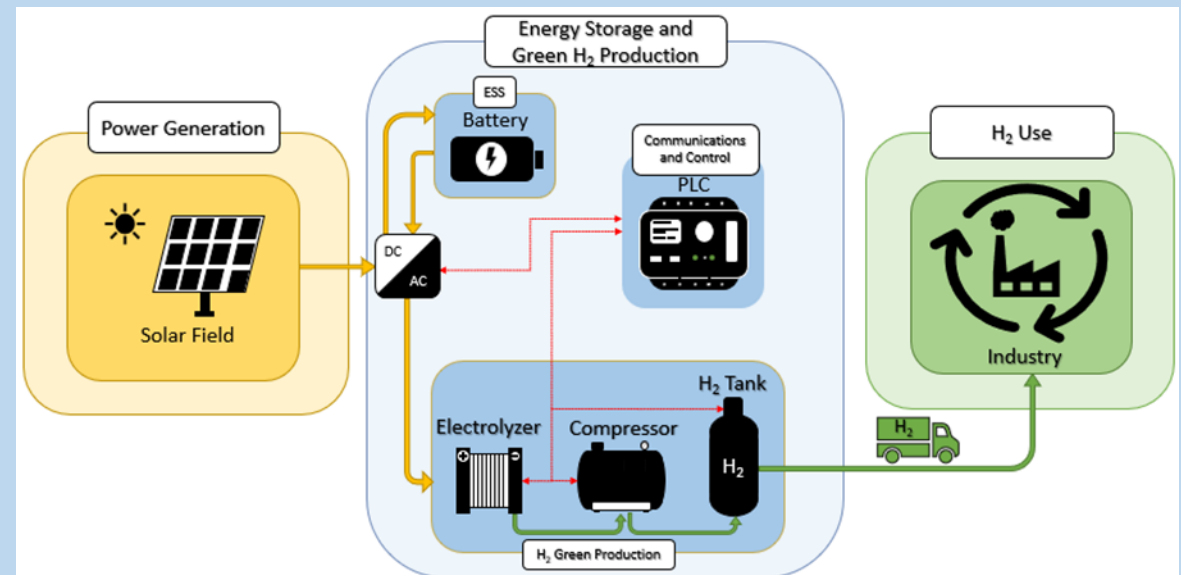
Keywords Hydrogen
Methane
Coke Oven Gas
Internal Combustion Engines
CFD simulation
Clean mobility



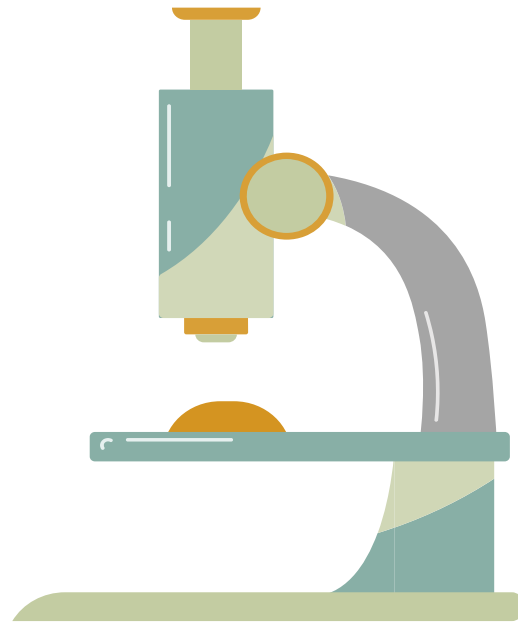
Design and simulation of a hybrid power system PV-Hydrogen to industrial applications.

Researcher: Carlos Sánchez Narbona
Supervisors: Alfredo Ortiz Sainz de Aja

Keywords Green Hydrogen
Photovoltaic
Electrolysis
Industrial processes
Production systems
Generation



PHD. THESIS (2008 – 2023)



2023 – PhD. Dissertations

Carolina Tristán

Advancing sustainability in the water-energy nexus. Optimization of reverse electro dialysis energy recovery from salinity gradients.

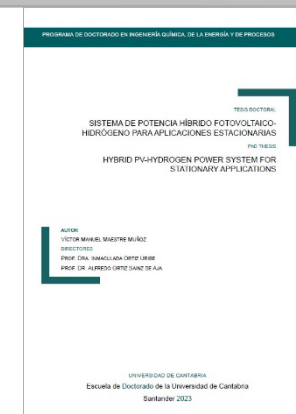
Supervisors: Prof. Raquel Ibáñez and Dr. Marcos Fallanza



Victor Manuel Maestre

Hybrid PV-Hydrogen power system for stationary applications

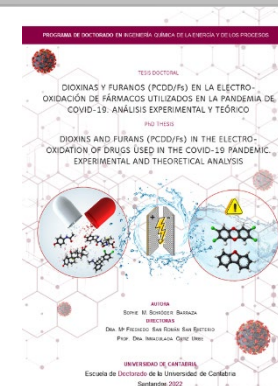
Supervisors: Prof. Alfredo Ortiz and Prof. Inmaculada Ortiz



Sophie Schröder

Dioxins and furans (PCDD/Fs) in the electro-oxidation of drugs used in the Covid-19 pandemic. Experimental and theoretical analysis

Supervisors: Prof. Inmaculada Ortiz and Dr. María Fresnedo San Román



Laura Rancaño

Avances en la Degradación Fotocatalítica de los Contaminantes Emergentes Halogenados: s-Metolacoloro y Ácido Perfluorooctanoico

Supervisors: Prof. Inmaculada Ortiz and Dr. María José Rivero



2022 – PhD. Dissertations

Rafael Ortiz

Performance of Low Carbon Fuels in Internal Combustion

Supervisors: Prof. Inmaculada Ortiz and Dr. Alfredo Ortiz



Cristina González

Magnetophoretic microdevices for lipopolysaccharide removal from blood: Design through advanced simulation techniques

Supervisors: Prof. Inmaculada Ortiz and Dr. Eugenio Bringas



Carla Arregoitia

Development and characterization of composite membranes for the selective separation of bioalcohols by pervaporation

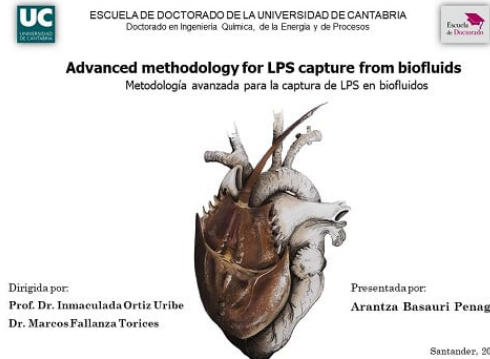
Supervisors: Prof. Daniel Gorri and Dr. Marcos Fallanza



Arantza Basauri

Advanced methodology for LPS capture from biofluids

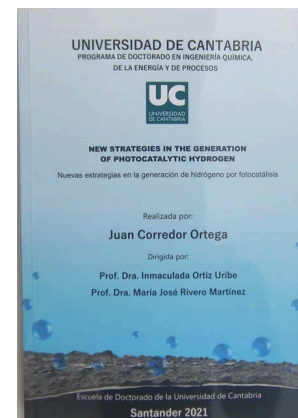
Supervisors: Prof. Inmaculada Ortiz and Dr. Marcos Fallanza



Juan Corredor

New strategies in the generation of photocatalytic hydrogen

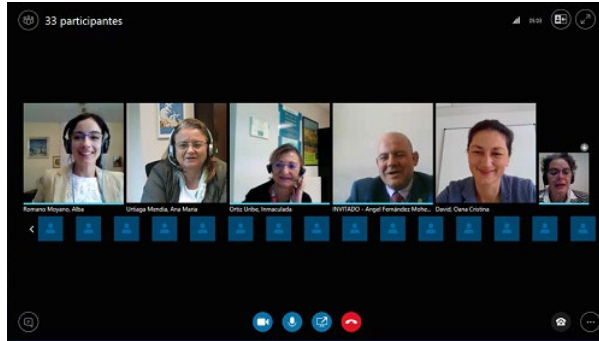
Supervisors: Prof. Inmaculada Ortiz and Dr. María José Rivero



Alba Romano

Electrochemical water regeneration in intensive marine aquaculture systems

Supervisors: Prof. Inmaculada Ortiz and Prof. Ane Urtiaga



Saúl Laguillo

Numerical modeling of chemical reaction processes describing methane combustion in gas cooking burners

Supervisors: Dr. Alfredo Ortiz and Dr. Jose Salvador Ochoa

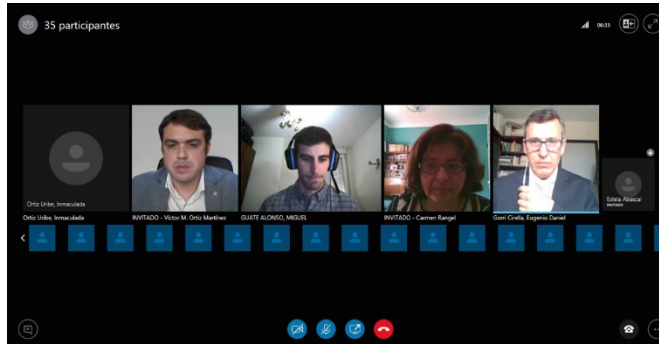


2020 – PhD. Dissertations

Miguel Guate

Catalytic reduction of nitrates on polymeric membranes. Modelling and experimental validation

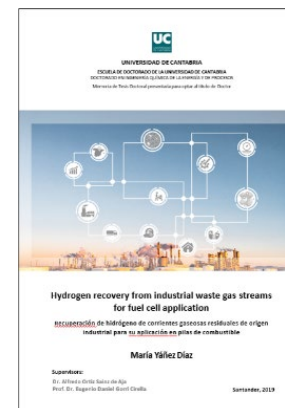
Supervisors: Prof. Inmaculada Ortiz and Dr. Alfredo Ortiz



María Yáñez

Hydrogen recovery from industrial waste gas streams for fuel cell application

Supervisors: Prof. Daniel Gorri and Dr. Alfredo Ortiz



Claudia Solá

Traceability of PCDD/FS formation in the advanced oxidation of triclosan in aqueous samples

Supervisors: Prof. Inmaculada Ortiz and Dr. M^a Fresnedo San Román



Álvaro Soriano

Process integration based on membrane preconcentration and electrochemical oxidation of poly- and perfluoroalkyl substances in industrial water treatment

Supervisors: Prof. Ane Urtiaga and Prof. Daniel Gorri

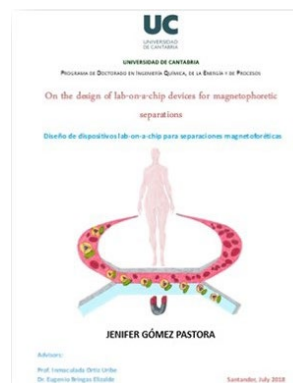
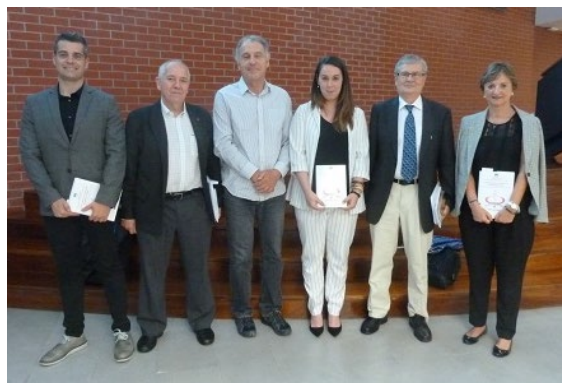


2018 – PhD. Dissertations

Jenifer Gómez

On the design of lab-on-a-chip devices for magnetophoresis separations

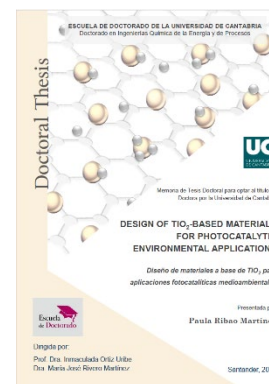
Supervisors: Prof. Inmaculada Ortiz and Dr. Eugenio Bringas



Paula Ribao

Design of TiO₂-based materials for photocatalytic environmental applications

Supervisors: Prof. Inmaculada Ortiz and Dr. María José Rivero



2017 – PhD. Dissertations

Albert Barceló

Contribución al proceso de industrialización de la tecnología de pertracción evaporativa para el ajuste del grado alcohólico de vinos blancos y tintos

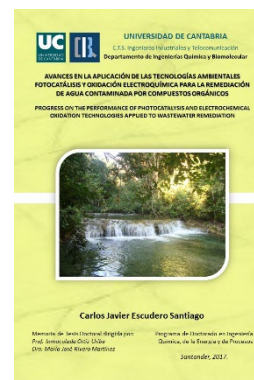
Supervisors: Prof. Inmaculada Ortiz and Dr. Nazely Diban



Carlos Javier Escudero

Progress on the performance of photocatalysis and electrochemical oxidation technologies applied to wastewater remediation

Supervisors: Prof. Inmaculada Ortiz and Dr. María José Rivero

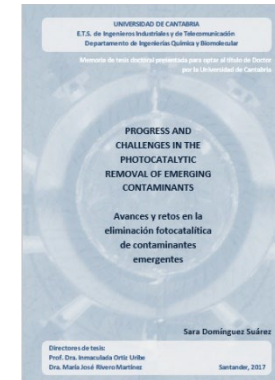


2017 – PhD. Dissertations

Sara Domínguez

Progress and challenges in the photocatalytic removal of emerging contaminants

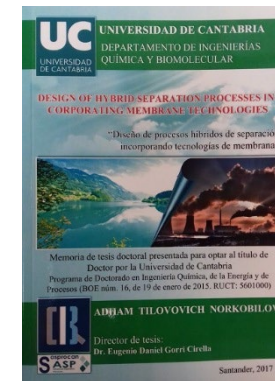
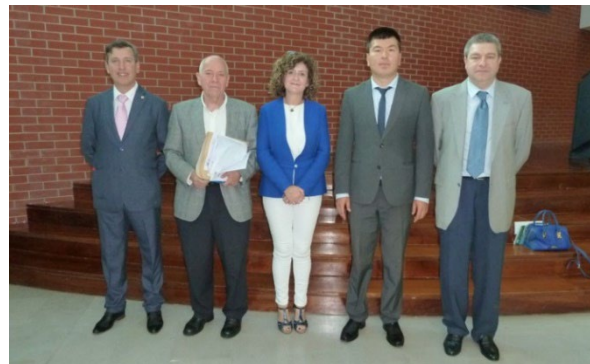
Supervisors: Prof. Inmaculada Ortiz and Dr. María José Rivero



Adham Norkobilov

Design of hybrid separation processes incorporating membrane technologies

Supervisor: Dr. Eugenio Daniel Gorri

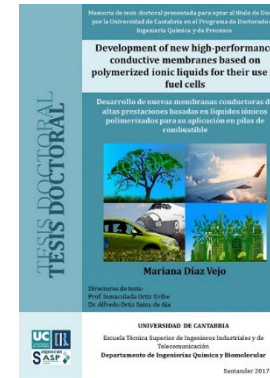


2017 – PhD. Dissertations

Mariana Díaz

Development of new high-performance conductive membranes based on polymerized ionic liquids for their use in fuel cells

Supervisors: Prof. Inmaculada Ortiz and Dr. Alfredo Ortiz



Pablo Fernández

Progress in the reactivity of advanced oxidation media. Application to the Fenton treatment of 2-chlorophenol solutions.

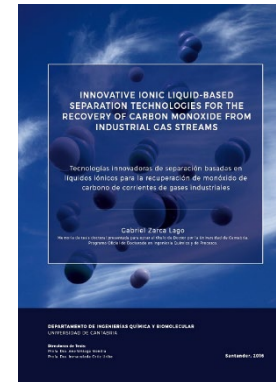
Supervisors: Prof. Inmaculada Ortiz and Dr. María Fresnedo San Román



Gabriel Zarca

Innovative ionic liquid-based separation technologies for the recovery of carbon monoxide from industrial gas streams

Supervisors: Prof. Inmaculada Ortiz and Prof. Ane Miren Urriaga



Isabel Ortiz

Recovery of HCl from galvanizing effluents by ion Exchange membranes

Supervisors: Prof. Inmaculada Ortiz and Dr. María Fresnedo San Román

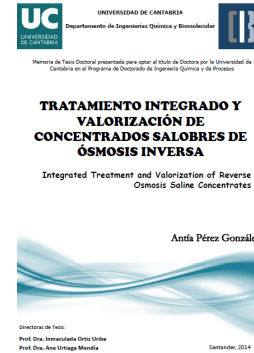


2015 – PhD. Dissertations

Antía Pérez

Integrated treatment and valorization of reverse osmosis saline concentrates

Supervisors: Prof. Inmaculada Ortiz and Prof. Ane Miren Urtiaga



Juan Saiz

Design of functionalized magnetic nanoadsorbents for the removal of arsenic from polluted groundwater

Supervisors: Prof. Inmaculada Ortiz and Dr. Eugenio Bringas

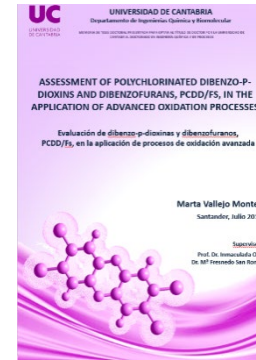


2014 – PhD. Dissertations

Marta Vallejo

Assessment of polychlorinated dibenzo-p-dioxins and dibenzofurans, PCDD/Fs in the application of advanced oxidation processes

Supervisors: Prof. Inmaculada Ortiz and Dr. María Fresnedo San Román

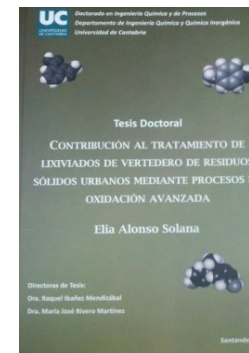


2013 – PhD. Dissertations

Elia Alonso

Breakthrough in the treatment of MSW landfill leachate using advanced oxidation processes

Supervisors: Dr. Raquel Ibáñez and Dr. María José Rivero

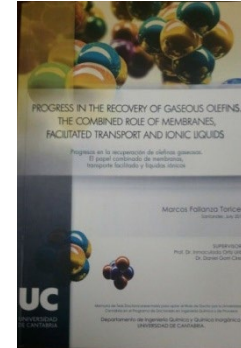


2013 – PhD. Dissertations

Marcos Fallanza

Progress in the recovery of gaseous olefins. The combined role of membranes, facilitated transport and ionic liquids

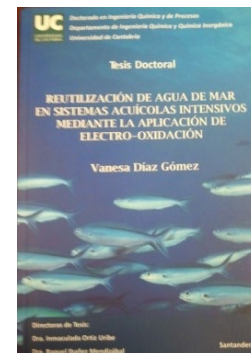
Supervisors: Prof. Inmaculada Ortiz and Dr. E.Daniel Gorri



Vanesa Díaz

Reuse of seawater in intensive aquaculture systems based on electrochemical oxidation

Supervisors: Prof. Inmaculada Ortiz and Dr. Raquel Ibáñez

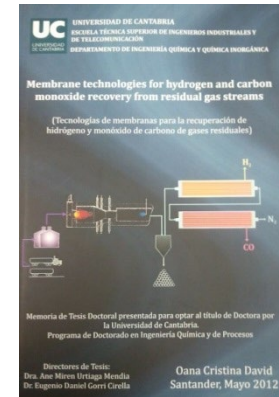


2012 – PhD. Dissertations

Oana Cristina David

Membrane technologies for hydrogen and carbon monoxide recovery from residual gas streams

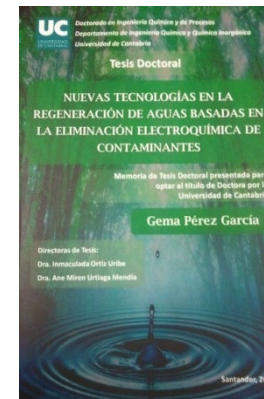
Supervisors: Prof. Ane Miren Urriaga and Prof. Eugenio Daniel Gorri



Gema Pérez

Electrochemical treatment based water reclamation technologies

Supervisors: Prof. Inmaculada Ortiz and Prof. Ane Miren Urriaga



Ángela Anglada

Electrooxidation on boron-doped diamond anodes of ammonia and organic pollutants in landfill leachate

Supervisors: Prof. Inmaculada Ortiz and Prof. Ane Miren Urtiaga



Doctor from the University of Cantabria - "European Doctorate Mention"
PhD programme: Chemical and Process Engineering

**ELECTRO-OXIDATION ON BORON-DOPED
DIAMOND ANODES OF AMMONIA AND ORGANIC
POLLUTANTS IN LANDFILL LEACHATE**

ÁNGELA ANGLADA MARTÍNEZ

Department of Chemical Engineering and Inorganic Chemistry
University of Cantabria, Spain
Advanced Separation Processes Research Group

Supervisors:
Inmaculada Ortiz Uribe
Ane Miren Urtiaga Mendia



2011, Santander

Rosa Mediavilla

Extracción selectiva de zinc y hierro de baños de pasivado de cromo trivalente usando contactores de membrana

Supervisors: Prof. Inmaculada Ortiz and Prof. Ane Miren Urtiaga

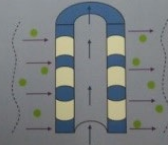


UC Doctorado en Ingeniería Química y de Procesos
Departamento de Ingeniería Química y Química Inorgánica
Universidad de Cantabria

Tesis Doctoral
**EXTRACCIÓN SELECTIVA DE ZINC Y
HIERRO DE BAÑOS DE PASIVADO
DE CROMO TRIVALENTE USANDO
CONTACTORES DE MEMBRANAS**

Rosa Mediavilla Martín

Directoras de Tesis:
Dra. Inmaculada Ortiz Uribe
Dra. Ane Miren Urtiaga Mendia



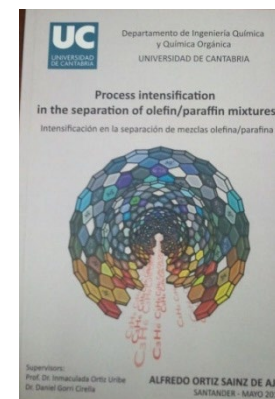
Santander, 2010

2010 – PhD. Dissertations

Alfredo Ortiz

Process intensification in the separation of olefin/paraffin mixtures

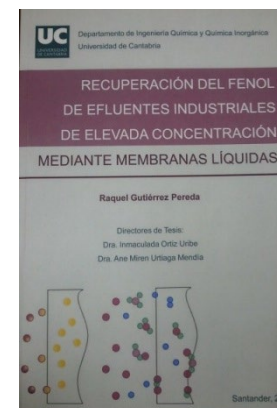
Supervisors: Prof. Inmaculada Ortiz and Dr, E. Daniel Gorri



Raquel Gutiérrez

Phenol recovery from highly concentrated industrial effluents

Supervisors: Prof. Inmaculada Ortiz and Prof. Ane Miren Urtiaga



2008 – PhD. Dissertations

Pilar Mier

Contribución a la investigación y desarrollo de la tecnología electrodiálisis con membranas bipolares

Supervisors: Prof. Inmaculada Ortiz and Dr. Raquel Ibáñez



Oscar Primo

Mejoras en el tratamiento de lixiviados de vertedero de RSU mediante procesos de oxidación avanzada

Supervisors: Prof. Inmaculada Ortiz and Dr. María José Rivero



2008 – PhD. Dissertations

Eugenio Bringas

Contribución al diseño de procesos de separación con membranas líquidas selectivas. Tratamiento de aguas subterráneas contaminadas con Cr (VI)

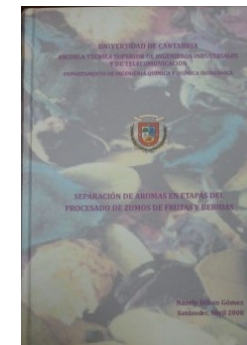
Supervisors: Prof. Inmaculada Ortiz and Dr. María Fresnedo San Román



Nazely Diban

Separación de aromas en etapas del procesado de zumos de frutas y bebidas

Supervisors: Prof. Inmaculada Ortiz and Prof. Ane Miren Urriaga





PUBLICATIONS

C. Barquín, A. Vital-Grappin, I. Kumakiri, N. Diban, M.J. Rivero, A. Urtiaga, I. Ortiz. **Performance of TiO₂-Based Tubular Membranes in the Photocatalytic Degradation of Organic Compounds.** *Membranes*, 13(4), 448, 2023.

C. González-Fernández, C. Öhlknecht, M. Diem, Y. Escalona, E. Bringas, G. Moncalián, C. Oostenbrink, I. Ortiz. **Insights into the Binding Mode of Lipid A to the Anti-lipopolysaccharide Factor ALFPm3 from *Penaeus monodon*: An In Silico Study through MD Simulations.** *Journal of Chemical Information and Modeling*, 63(8), 2495, 2023.

C. Guati, L. Gomez-Coma, M. Fallanza, I. Ortiz. **Progress on the influence of non-enzymatic electrodes characteristics on the response to glucose detection: a review (2016–2022).** *Reviews in Chemical Engineering*, 2023.

G. Moral, A. Ortiz, D. Gorri, I. Ortiz. **Hydrogen recovery from industrial waste streams using Matrimid®/ZIF mixed matrix membranes,** *International Journal of Hydrogen Energy*. 2023.

I. Ortiz, L. Rancaño, M.J. Rivero, A. Urtiaga. **Membrane-assisted Photocatalytic Degradation of Perfluorooctanoic Acid.** *Journal of Membrane Science and Research*, 9(2), 2023.

D. Pelayo, M.J. Rivero, G. Santos, P. Gómez, I. Ortiz. **Techno-economic evaluation of UV light technologies in water remediation.** *Science of The Total Environment*, 161376, 2023.

T. Sampedro, C. Tristán, L. Gómez-Coma, J. Rioyo, M. Sainz, I. Ortiz, R. Ibañez. **SWRO concentrates for more efficient wastewater reclamation.** *Desalination*, 545, 116156, 2023.

S. Schröder, M.F. San-Román, I. Ortiz. **Formation of polychlorinated dibenzo-p-dioxins and furans (PCDD/Fs) in the electrochemical oxidation of polluted waters with pharmaceuticals used against COVID-19.** *Journal of Environmental Chemical Engineering*, 109305, 2023.

Publications – 2023

C. Tristán, M. Fallanza, R. Ibáñez, I. Ortiz, I.E. Grossmann. **A generalized disjunctive programming model for the optimal design of reverse electrodialysis process for salinity gradient-based power generation**, Computers & Chemical Engineering, 174,108196,2023.

J. Veerman, L. Gómez-Coma, A. Ortiz, I. Ortiz. **Resistance of Ion Exchange Membranes in Aqueous Mixtures of Monovalent and Divalent Ions and the Effect on Reverse Electrodialysis**. Membranes, 13(3), 322, 2023.

- E. Abascal, L. Gómez-Coma, I. Ortiz, A. Ortiz. **Global diagnosis of nitrate pollution in groundwater and review of removal technologies.** Science of the total environment, 810, 152233, 2022.
- C. Barquín, M.J. Rivero, I. Ortiz. **Shedding light on the performance of magnetically recoverable TiO₂/Fe₃O₄/rGO-5 photocatalyst. Degradation of S-metolachlor as case study.** Chemosphere, 307, 135991, 2022
- C. Fernández-Maza, M. Fallanza, L. Gómez-Coma, I. Ortiz. **Performance of continuous-flow micro-reactors with curved geometries. Experimental and numerical analysis.** Chemical Engineering Journal, 437, 135192, 2022.
- B. García-Merino, E. Bringas, I. Ortiz. **Robust system for the regenerative capture of aqueous pollutants with continuously synthesized and functionalized magnetic nanoparticles,** Journal of Environmental Chemical Engineering 10(5), 108417, 2022
- B. García-Merino, E. Bringas, I. Ortiz, **Synthesis and applications of surface-modified magnetic nanoparticles: Progress and future prospects.** Reviews in Chemical Engineering, 38(7), 821-842.
- L. Gómez-Coma, J.A. Abarca, M. Fallanza, A. Ortiz, R. Ibáñez, I. Ortiz. **Optimum recovery of saline gradient power using reversal electro dialysis: Influence of the stack components.** Journal of Water Process Engineering, 48, 102816, 2022.
- C. González-Fernández, E. Bringas, C. Oostenbrink, I. Ortiz. **In silico investigation and surmounting of Lipopolysaccharide barrier in Gram-Negative Bacteria: How far has molecular dynamics Come?.** Computational and Structural Biotechnology Journal. 2022
- V.M. Maestre, A. Ortiz, I. Ortiz. **The role of hydrogen-based power systems in the energy transition of the residential sector.** Journal of Chemical Technology & Biotechnology, 97(3), 561-574, 2022.
- V. M. Maestre, A. Ortiz, I. Ortiz. **Implementation and Digitalization of a Renewable Hydrogen-based Power System for Social Housing Decarbonization.** Chemical Engineering Transactions, 96, 223-228, 2022.

V. M. Maestre, A. Ortiz, I. Ortiz. **Transition to a low-carbon building stock. Techno-economic and spatial optimization of renewables-hydrogen strategies in Spain.** *Journal of Energy Storage*, 56, 105889, 2022.

G. Moral, R. Ortiz-Imedio, A. Ortiz, D. Gorri, I. Ortiz. **Hydrogen recovery from coke oven gas. Comparative analysis of technical alternatives.** *Industrial & Engineering Chemistry Research*, 61(18), 6106-6124, 2022.

M. Rumayor, J. Corredor, M.J. Rivero, I. Ortiz. **Prospective life cycle assessment of hydrogen production by waste photoreforming.** *Journal of Cleaner Production*, 336, 130430, 2022.

C. Tristán, M. Fallanza, I. Grossmann, I. Ortiz, R. Ibáñez. **Generalized Disjunctive Programming Model for Optimization of Reverse Electrodialysis Process.** *IFAC-PapersOnLine*, 55(31), 154-159, 2022.

C. Arregoitia-Sarabia, D. González-Revuelta, M. Fallanza, A. Ortiz, D. Gorri. **PolyetherBlock-Amide Thin-Film Composite Hollow Fiber Membranes for the Recovery of Butanol from ABE Process by Pervaporation.** Separation and Purification Technology 279, 119758, 2021.

A. Basauri, M. Fallanza, L. Giner-Robles, R. Fernandez-Lopez, G. Moncalián, F. de la Cruz, I. Ortiz. **Integrated strategy for the separation of endotoxins from biofluids. LPS capture on newly synthesized protein.** Separation and Purification Technology, 255, 117689.

J. Corredor, M.J. Rivero, I. Ortiz. **New insights in the performance and reuse of rGO/TiO₂ composites for the photocatalytic hydrogen production.** International Journal of Hydrogen Energy, 46(33), 17500-17506, 2021.

J. Corredor, D. Harankahage, F. Gloaguen, M. J. Rivero, M. Zamkov, I. Ortiz. **Influence of QD photosensitizers in the photocatalytic production of hydrogen with biomimetic [FeFe]-hydrogenase. Comparative performance of CdSe and CdTe.** Chemosphere, 278, 130485, 2021.

B. García-Merino, E. Bringas, I. Ortiz. **Synthesis and applications of surface-modified magnetic nanoparticles: Progress and future prospects.** Reviews in Chemical Engineering, 2021.

C. González-Fernández, A. Basauri, M. Fallanza, E. Bringas, C. Oostenbrink, I. Ortiz. **Fighting against bacterial Lipopolysaccharide-caused infections through molecular dynamics simulations: a review.** Journal of Chemical Information and Modeling, 61(10), 4839-4851, 2021.

C. González-Fernández, J. Gómez-Pastora, E. Bringas, M. Zborowski, J.J. Chalmers, I. Ortiz. **Recovery of magnetic catalysts: advanced design for process intensification.** Industrial & Engineering Chemistry Research, 60(46), 16780-16790, 2021.

C. Guati, L. Gómez-Coma, M. Fallanza, I. Ortiz. **Non-enzymatic amperometric glucose screen-printed sensors based on copper and copper oxide particles.** Applied Sciences, 11(22), 10830, 2021.

V.M. Maestre, A. Ortiz, I. Ortiz. **Challenges and prospects of renewable hydrogen-based strategies for full decarbonization of stationary power applications.** Renewable and Sustainable Energy Reviews, 152, 111628, 2021.

R. Ortiz-Imedio, A. Ortiz, J.C. Urroz, P.M. Diéguez, D. Gorri, L.M. Gandía, I. Ortiz. **Comparative performance of coke oven gas, hydrogen and methane in a spark ignition engine.** International Journal of Hydrogen Energy, 46(33), 17572-17586, 2021.

R. Ortiz-Imedio, A. Ortiz, I. Ortiz. **Comprehensive analysis of the combustion of low carbon fuels (hydrogen, methane and coke oven gas) in a spark ignition engine through CFD modeling.** Energy Conversion and Management, 251, 114918, 2022.

R. Ortiz-Imedio, D.G. Caglayan, A. Ortiz, H. Heinrichs, M. Robinius, D. Stolten, I. Ortiz. **Power-to-Ships: Future electricity and hydrogen demands for shipping on the Atlantic coast of Europe in 2050.** Energy, 228, 120660, 2021.

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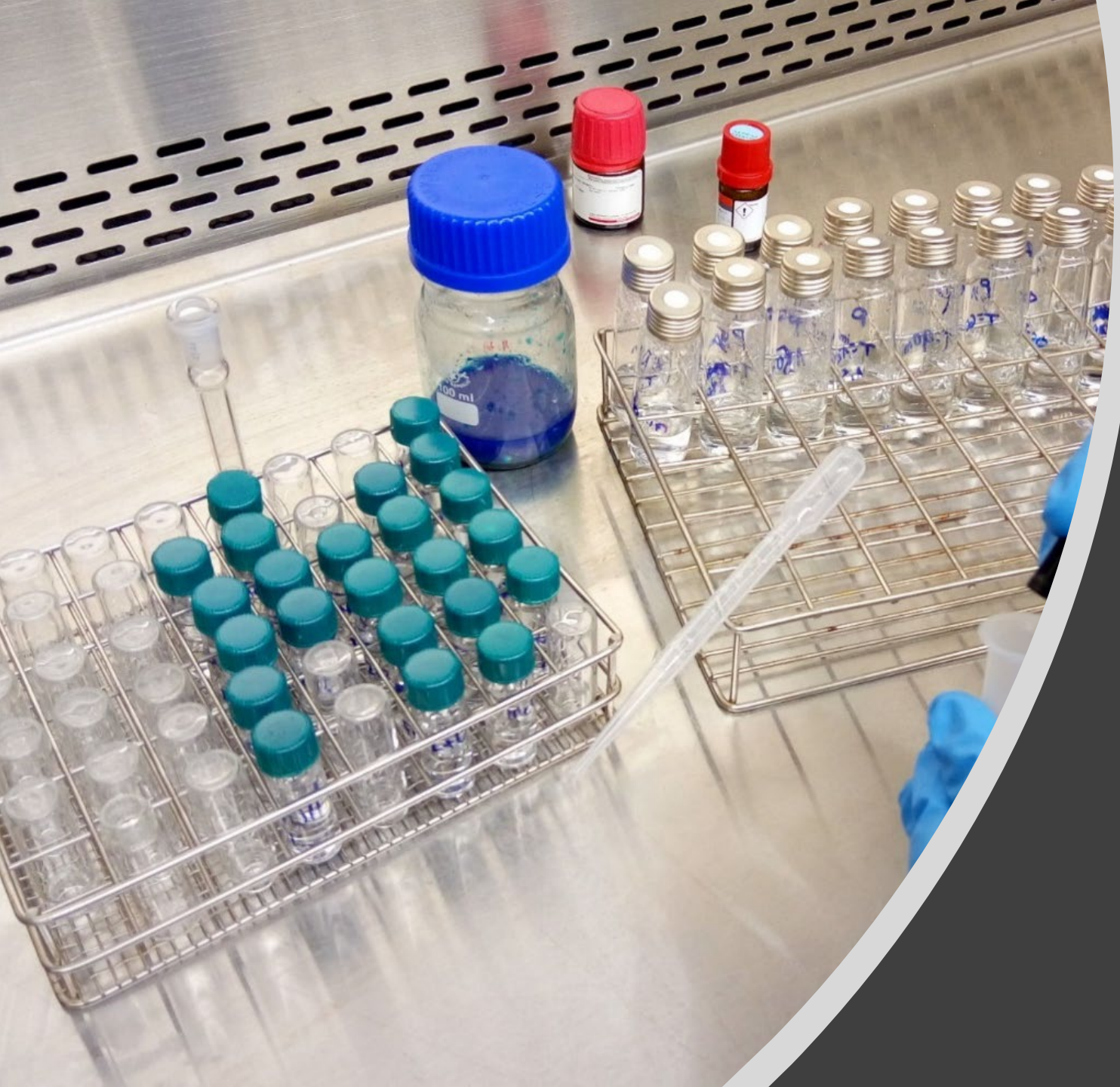
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ANALYTICAL FACILITIES

The **Analytical Services of the SOSPROCAN Unit** has a scientific and technological infrastructure and a set of last generation analytical techniques able to carry out a complete physico-chemical characterization of a wide range of samples.

The available equipment allows comprehensive control of a high number of environmental parameters as well as monitoring compliance.

The main aim of the Analytical Services of the SOSPROCAN Unit is to collaborate and make available to the productive sector and the administration, the extensive analytical capabilities of the available equipment, offering a high quality service.

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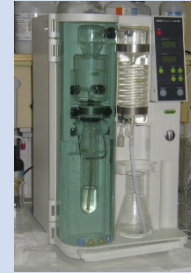


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ENVIRONMENTAL PARAMETERS AND WATER CHARACTERIZATION

TOC
COD
BOD
Biodegradation

Ecotoxicity
E. Coli and Total Coliforms
Analysis of N-NH_4^+
pH, conductivity...



CHROMATOGRAPHIC TECHNIQUES

Sample preparation techniques:

Digestion/Extraction

Clean-up

Concentration

Liofilization

Filtration

...

Liquid Chromatography:

HPLC-UV-vis

HPLC/MS/MS

Ionic chromatograph with chemical suppression

Gas Chromatography:

HRGC-HRMS

GC MS + HS + MSPE

GC MS + P&T + HS

GC FID



PLASMA MASS SPECTROMETRY

Spectrophotometer UV/vis Spectroquant Nova 400

FT-IR spectrometer

Emission spectrometer Plasma 400

Atomic absorption spectrometer, ICP/MS



SOLID CHARACTERIZATION

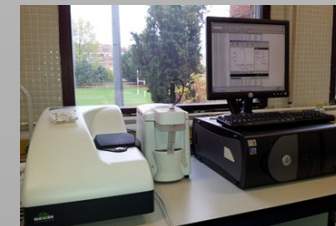
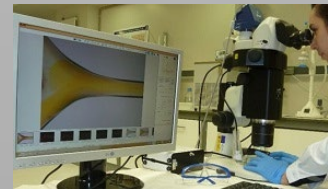
Thermobalance

BET Surface Area Analyzer

Zeta-sizer Nano Particle Analyzer

Osmometer

Optical Epi-fluorescence microscope 130 x



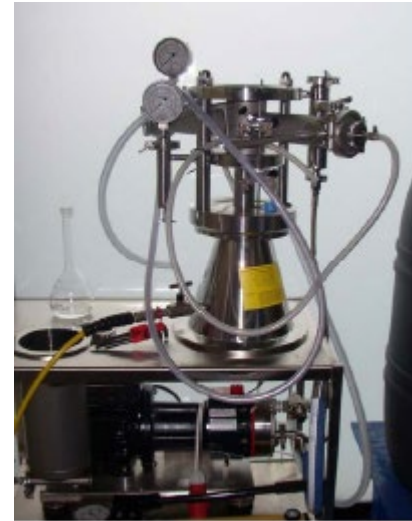
PILOT PLANTS



MICROFILTRATION + ULTRAFILTRATION



REVERSE OSMOSIS



REVERSE OSMOSIS



ELECTROOXIDATION



FENTON + ULTRAFILTRATION



ION EXCHANGE



PERTRACTION



DIALYSIS