

annual report
2021
www.energy.imdea.org

imdea **energy** institute



research for a **sustainable energy** development



EXCELENCIA
MARÍA
DE MAEZTU





David Serrano

Director of IMDEA Energy
Móstoles, October 2022

For second consecutive year, the activities of the IMDEA Energy Institute during 2021 have been strongly conditioned by the COVID19 pandemic. Depending on the pandemic situation, the share of telecommuting has been increased or decreased several times during the year. Even so, 2021 has been, in overall, a good year for IMDEA Energy as summarized below.

The total number of active projects and contracts has reached the record value of 94, with a significant increase in the number of international projects (as many as 22), whereas 33 personnel grants were also active during the year. As a consequence, the overall external funding executed during 2021 has been 4.56 M€, representing an increase of 39% over the previous year. Accordingly, the availability of additional economic resources and the commitments in the new projects and contracts has led to a significant increment in the staff, with 131 personnel working at the institute by the end of 2021.

Collaborations with other institutions have continued intensively along 2021 as denoted by the 26 visiting researchers being hosted. In the same way, a total of 50 students have been hosted in our facilities in the form of internships or performing their BSc/MSc projects. It is also worth to be highlighted the high level of scientific outputs that has been achieved with 105 publications in indexed journals and 105 congress communications, 15 of them as invited talks. In addition, a total of 7 PhD Thesis have been defended and 6 patent applications have been submitted.

The year 2021 has seen the full development of the prestigious Maria de Maeztu Program for Excellence Research Units, granted by the Spanish Ministry of Science and Innovation through the State Research Agency. A number of initiatives have been launched in the context of this program: establishment of an internal governance model, update of the scientific workprogram and of the technology transfer plan, elaboration of the mobility and visiting researchers plans and definition of a training program and a mentoring plan, both aimed at young researchers, among others. Likewise, an important achievement has been the Human Resources Excellence in Research award that is intended to improve all the aspects related with the recruitment and efficient supervision of the scientific personnel.

In summary, I must state that, although the pandemic has been still present, the IMDEA Energy Institute has recovered in great part its normal activities during 2021, being able to improve several key performance indicators thanks to the strong commitment of all personnel: researchers, technicians and management/administration staff.

A handwritten signature in white ink, appearing to read 'D. Ju.', with a long horizontal line extending from the end of the signature.

words from the director...

annual report
2021
www.energy.imdea.org

editor
imdea energy institute

graphic design
base 12 diseño y comunicación

D.L.
M-28927-2022

contents

6	about us	IMDEA Energy Unit of Excellence “María de Maeztu”	8
10	our structure		
		in figures	12
14	cooperation		
		networking	16
18	research lines		
		scientific facilities	20
22	research units		
		annex	72
		R&D projects, contracts and grants	73
		scientific results	98
		training and dissemination activities	123

about us



The IMDEA Energy Institute is a research centre created by the Regional Government of Comunidad de Madrid in the year 2006 that operates as a non-profit foundation. The Scientific Programme of the IMDEA Energy Institute aims at contributing to the future establishment of a sustainable and decarbonised energy system, economically competitive and securing energy supply.

The IMDEA Energy Institute is committed with having a significant impact on R&D energy challenges by bringing together high quality researchers, providing them with excellent infrastructures and resources, and promoting their close collaboration with the industrial sector.

strategic framework



The strategic framework guiding the R&D priorities of IMDEA Energy is based on goals and priorities established by energy plans and research programmes at regional, national and international levels; such as the UN's Sustainable Development Goals, the Green Deal for Europe, the Clean Energy Transition Partnership, new European Strategic Energy Technology (SET) Plan with the selected

targets for 2030 and 2050; the European Research Framework HORIZON EUROPE; the National Integrated Plan on Energy and Climate; the Spanish Strategy on Science, Technology and Innovation; technology roadmaps of recognized international institutions and associations and implementation agreements of the International Energy Agency.



laboratories

The building and laboratories of IMDEA Energy Institute are located at the Technological Park of Mostoles, Madrid, over a land of 10,000 m².

Research topics

Production of sustainable fuels

Concentrated solar power

Energy storage

Smart management
of electricity demand

Energy systems with
enhanced efficiency

Valorization of CO₂ emissions

Techno-economic evaluation
of energy systems

The excellent R&D capabilities and the first class research facilities make IMDEA Energy the ideal partner for companies, research centres and universities

The building has been awarded with the prestigious LEED Gold Certificate and the A Energy Efficiency Certificate.



building

IMDEA Energy

Unit of Excellence

“María de Maeztu”

The sustained policy of IMDEA Energy, since its creation, for the excellence in the recruitment of talented researchers, the selection of cutting edge lines of research and the acquisition of worldclass scientific equipment was awarded in 2020 with the accreditation as Unit of Excellence “María de Maeztu” by the Spanish Ministry of Science and Innovation.



The funding raised has made it possible to strengthen the strategic research program at IMDEA Energy, designed for the period 2020-2023, in the field of sustainable transport:

- sustainable transport through electromobility,
 - the production of hydrogen and solar fuels,
 - the production of fourth-generation fuels from waste,
- and contributed to the consolidation of scientific capacities, leadership and the attraction of talent.

In 2021, the following achievements should be highlighted, associated with the development of the program planned in the María de Maeztu IMDEA Energy Unit of Excellence:

- The establishment of a governance model composed of the Executive Committee (ExCo) and Committees for Training and Mobility, Exploitation and Outreach, Internationalization and Human Resources has been realized and it has been operating efficiently on a routine basis.
- An update of the Scientific Workprogramme has been issued considering the current situation worldwide in energy sustainability in transport.
- A draft of the Professional Career Development Plan of researchers in the Institute has been elaborated.
- The HR (Human Resources) Excellence in Research award has been received.
- Recruitment process of new postdoctoral and predoctoral positions and FPI contracts has been launched and oriented to the reinforcement of the strategic research lines.
- New staff responsible for internationalization and another one for communication were hired.
- It has been issued a plan for visiting researchers from foreign centres.
- It was issued the plan for the supervision and organization of the participation of the institute in working groups, task forces and actions at national and international associations/networks.
- It has been approved a knowledge transfer plan.
- It has been issued a mobility programme.
- A training programme focused on young researchers has been established.
- A mentoring plan developed with external support of a consultancy company.
- Flexibility measures have been implemented to improve work-personal life balance.

our structure



Responsible of managing and dealing with the main business administration and scientific activities of the Institute.

RESEARCH UNITS

THERMOCHEMICAL PROCESSES UNIT

ELECTROCHEMICAL PROCESSES UNIT

BIOTECHNOLOGICAL PROCESSES UNIT

HIGH TEMPERATURE PROCESSES UNIT

ELECTRICAL SYSTEMS UNIT

PHOTOACTIVATED PROCESSES UNIT

SYSTEM ANALYSIS UNIT

ADVANCED POROUS MATERIALS UNIT

MANAGEMENT, ADMINISTRATION AND TECHNICAL SUPPORT UNIT

- Financial management and human resources.
- Project management.
- External relationships and technology transfer.
- Infrastructure and facilities management.
- Health and safety.
- Central research laboratories and resources.
- Dissemination and communication.

BOARD OF TRUSTEES

The highest decision-making body responsible of the government, representation and administration, aiming to ensure the achievement of the established goals.

Prof. Dr. Martin Kaltschmitt

President of the Foundation
Full Professor of the Institute for Environmental Engineering and Energy Economics
Hamburg University of Technology, Germany

Mr. Enrique Ossorio

Regional Minister of Education, Universities, Science and Spokesman
Comunidad de Madrid, Spain

REGIONAL ADMINISTRATION REPRESENTATIVES

Mr. Fidel Rodríguez

Vice Regional Minister of Education, Universities, Science and Spokesman, Comunidad de Madrid, Spain

Mr. Ana Cremades

General Director of Research and Technological Innovation
Comunidad de Madrid, Spain

Mrs. Ricardo Díaz

General Director of Universities and Artistic Education
Comunidad de Madrid, Spain

Mr. Mariano González

Vice Regional Minister of Environment and Agriculture, Comunidad de Madrid, Spain

Mrs. Bárbara Fernández-Revuelta

Deputy General Director for Research
Comunidad de Madrid, Spain

Mr. José de la Sota

Scientific and Technical Coordinator
Fundación para el Conocimiento madri+d
Comunidad de Madrid, Spain

INSTITUTIONAL TRUSTEES

Prof. Dr. Juan Antonio Melero

Vice-Rector of Innovation and Technology Transfer
Rey Juan Carlos University, Spain

Prof. Dr. Carlos del Cañizo

Director of the Solar Energy Institute
Polytechnic University of Madrid, Spain

Prof. Dr. José Ramón Ares

Autónoma University of Madrid, Spain

Dr. Carlos Alejalde

General Director
Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas – CIEMAT
Spain

IMDEAS TRUSTEES

Prof. Dr. Arturo Romero

Emeritus Professor of Chemical Engineering
Complutense University of Madrid, Spain
(appointed by IMDEA Water)

Prof. Dr. Paula Sánchez

Full Professor of Chemical Engineering
Castilla – La Mancha University, Spain
(appointed by IMDEA Materials)

SCIENTIFIC TRUSTEES

Prof. Dr. Manuel Berenguel

Full Professor of the Department of Computing Sciences
University of Almería, Spain

Dr. Francisco Gírio

Coordinator of the Bioenergy Unit
National Laboratory of Energy and Geology
Portugal

Prof. Dr. Antonio Monzón

Director of the Chemical Engineering and Environmental Technologies Department
University of Zaragoza, Spain

Dr. Rufino Navarro

Scientist
Institute of Catalysis and Petrochemistry, CSIC
Spain

EXPERT TRUSTEES

Dr. José Jacinto Monge

Rey Juan Carlos University, Spain

Mr. Juan Manuel García

AENOR, Spain

COMPANIES TRUSTEES

Ms. Adriana Orejas

Repsol, S.A.
Director of Downstream Technology Projects
Spain

Mr. Agustín Delgado

Iberdrola España, S.A.U.
Director of Innovation and Sustainability
Spain

Mr. Vicente Alvarado

Empresarios Agrupados Internacional S.A.
Director of Engineering
Spain

SECRETARY

Mr. Alejandro Blázquez

Consultalia
Spain

SCIENTIFIC COUNCIL

Advisory body responsible of the elaboration of the scientific programme and of the establishment of the goals to be achieved by periods of four years as well as of the assessment of the annual performance.

Prof. Dr. Martin Kaltschmitt

President of the Scientific Council
Full Professor of the Institute for Environmental Engineering and Energy Economics
Hamburg University of Technology, Germany

Prof. Dr. Antonio Monzón

Director of the Chemical Engineering and Environmental Technologies Department
University of Zaragoza, Spain

Dr. Carmen M. Rangel

Research Coordinator
National Laboratory of Energy and Geology, Portugal

Prof. Dr. Aldo Steinfeld

Full Professor of Renewable Energy Carriers, ETH Zurich, Switzerland

Dr. Francisco Gírio

Coordinator of the Bioenergy Unit
National Laboratory of Energy and Geology, Portugal

Prof. Dr. Michael Froeba

Full Professor
Department of Applied Inorganic Chemistry
University of Hamburg, Germany

Prof. Dr. Manuel Berenguel

Full Professor
Department of Computing Sciences
University of Almería, Spain

Dr. José A. Olivares

Los Alamos National Laboratory, USA

Dr. Rufino Navarro

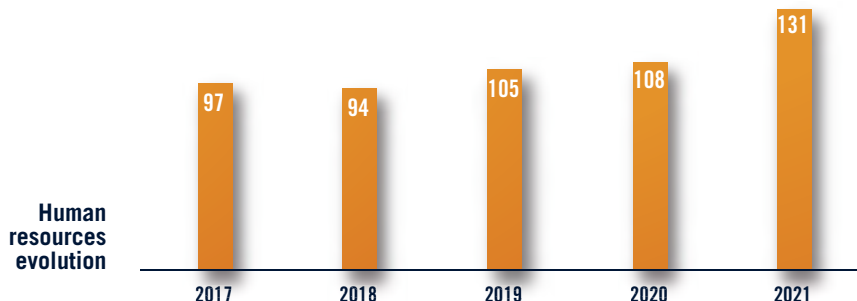
Scientist
Institute of Catalysis and Petrochemistry, CSIC, Spain

Prof. Dr. Gonzalo Guillén-Gosálbez

Professor of the Chemical and Bioengineering Institute
ETH Zurich, Switzerland

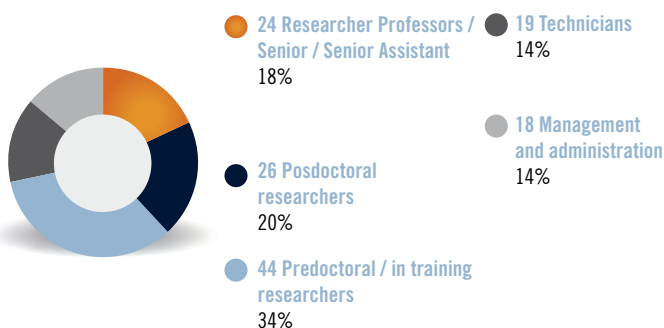
in figures

IMDEA Energy is firmly committed to the objective of providing the Institute with a world-class staff and prestigious researchers. Accordingly, the Institute is developing from the beginning a selective process for the recruitment of scientists.



human
resources

**Human resources distribution
by the 31st of December of 2021**

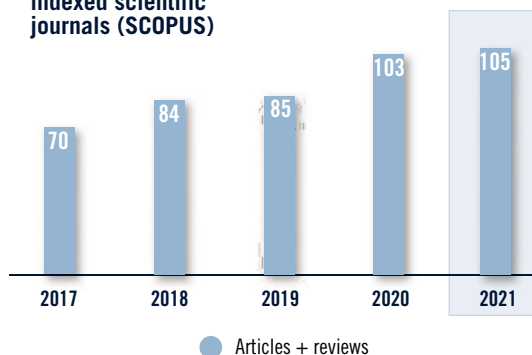


**57 students in connection
with the IMDEA Energy Institute in 2021
within the framework of educational
cooperation agreements**

Mobility actions in 2021

8 Secondments of IMDEA Energy researchers
26 visiting researchers

**Publications in
indexed scientific
journals (SCOPUS)**



2021

73 oral congress communications,
15 invited conferences
and 17 poster communications.

33 Ph.D. thesis under development
and 7 Ph. D. thesis defended.

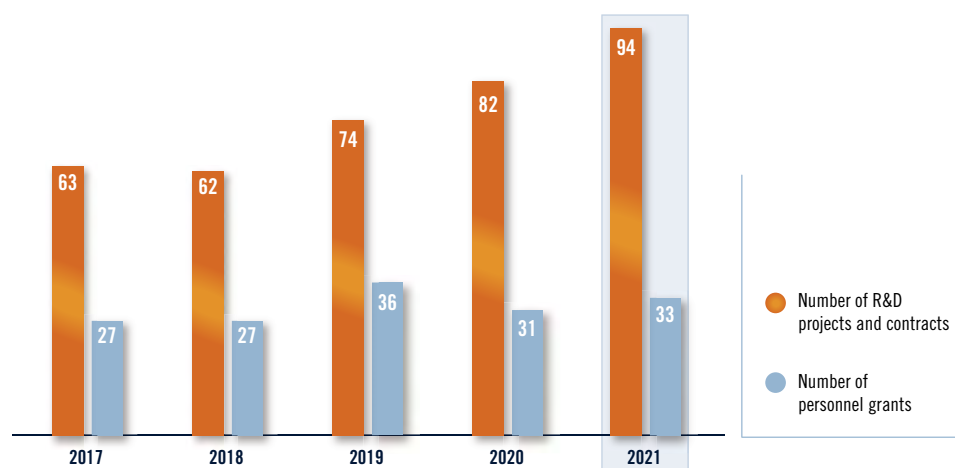
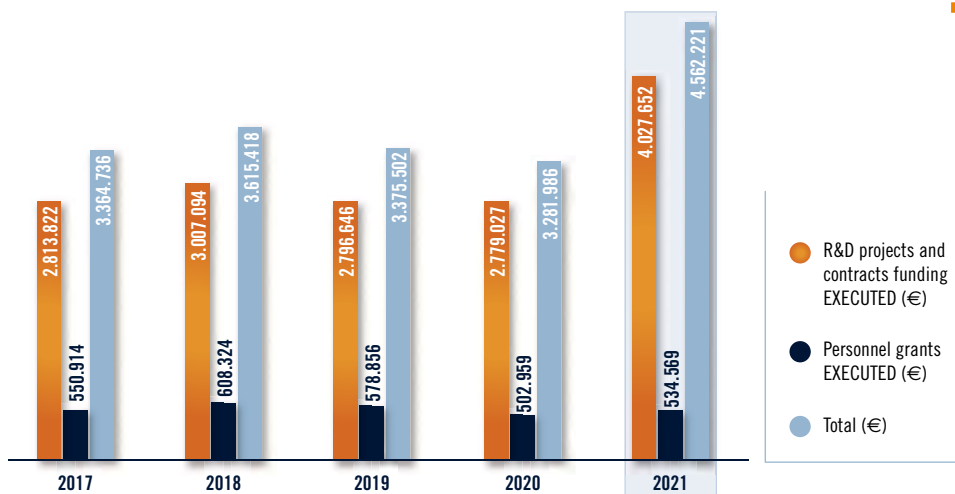
6 submitted patents.

R&D
results

The portfolio of the Institute research projects is characterized by its diversity in terms of funding source, being remarkable the high degree of collaboration with industries and research institutions of the energy sector.

Along the year 2021 the Institute was hosting two Consolidator Grants and one Advanced Grant awarded by the European Research Council with a total budget of 7 M€.

external funding

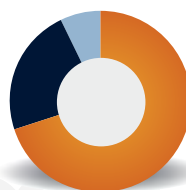


2021



- 7 Regional R&D Projects
450.424 €
11%
- 11 Industrial Projects
284.741 €
7%
- 19 National R&D Projects
732.852 €
18%
- 35 Contracts with companies
487.594 €
12%
- 22 International R&D Projects
2.072.041 €
52%

2021



- 19 National personnel grants
373.723 €
70%
- 12 Regional personnel grants
122.055 €
23%
- 2 International personnel grants
38.791 €
7%

cooperation

Cooperation with industry in R&D and innovation is one of the key objectives of the IMDEA Energy Institute. Because of that, the Institute has maintained an intense activity with the aim to promote collaboration with industrial partners and a strong presence in networks and international plat-

forms with participation of companies. In 2021, a Technology Transfer Plan has been approved that allows the development of the objectives and commitments established in terms of technology transfer, protection of research results and relationship with companies in a four-year time frame.

COOPERATION WITH COMPANIES 2021



COOPERATION WITH RESEARCH INSTITUTIONS 2021



COOPERATION WITH UNIVERSITIES 2021



networking and awards

IMDEA Energy Institute considers as a relevant activity the participation in associations, technology platforms, expert groups and alliances of the energy sector. This is also a means of increasing the external visibility of IMDEA Energy Institute, establishing new links with companies and research institutions and to gain updated information on the initiatives being planned and launched related to the different energy topics.

IMDEA Energy received in November 2021 the 22nd Energy Globe World Award for the first synthesis of solar kerosene demonstrated with a solar reactor driven by concentrated sunlight in its solar tower, in collaboration with partners of the EU H2020 SUN-to-LIQUID project. The finalists and winners were presented in the ceremony celebrated on November 8th, 2021, during the COP26 Conference in Glasgow.



The following lists summarizes the main associations in which IMDEA Energy Institute has participated in 2021:

NATIONAL



INTERNATIONAL





research lines

Energy storage coupled to renewable energy and transport



Technologies and systems for the storage of energy enabling the increased penetration of renewable energies and the distributed generation of electricity.

Electrochemical energy storage

- Nanostructured materials for electrochemical capacitors and advanced batteries.
- Electrochemical capacitors with high energy density.
- Low-cost redox flow batteries.
- Development of testing protocols for batteries and super-capacitors.

Thermal and thermochemical energy storage

- Phase change materials (PCM) with macro-encapsulated structures and storage systems for solar thermal power plants and industrial waste heat recovery.
- Thermal energy storage with gas/solid systems in thermoclines and moving bed exchangers.
- Thermochemical storage systems making use of high temperature redox reactions.

Production of sustainable fuels



Biofuels, alternative fuels and bioproducts aiming at the decarbonisation of the transport sector.

- Biofuels and bio-products from microalgae carbohydrates.
- Biofuels via fast pyrolysis or catalytic pyrolysis of lignocellulose biomass and residues.
- Upgrading of bio-oils by catalytic hydrodeoxygenation processes.
- Development of CO₂-free fuels by solar driven thermochemical cycles.
- Solar fuels production by artificial photosynthesis.
- Valorization and dehalogenation of plastic wastes.

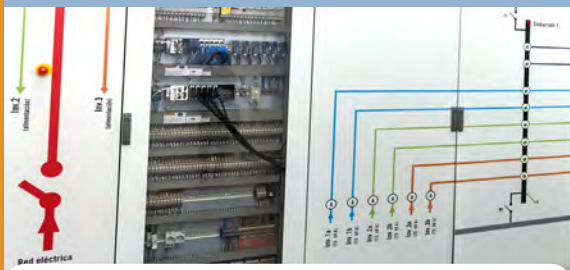
Concentrated solar power



Efficient and dispatchable solar concentrating technologies for power generation, industrial process heat and production of solar fuels and chemicals.

- Optical design of modular schemes for solar thermal power plants.
- Solar receivers and reactors for new heat transfer fluids.
- Solar technologies for fuels and chemicals production with CSP.
- Increasing solar-to-electricity conversion efficiency and dispatchability.

Smart management of electricity demand



Management, reliability and stability aspects of future electricity networks and new algorithms for demand management and renewable integration.

- Demand forecasting and network management algorithms.
- Reliability of power systems with high penetration of renewables.
- Building and residential demand modelling.
- Distribution network applications and services.
- Power electronics and power interfaces.

Energy systems with enhanced efficiency



Technologies and strategies for efficient end-use of energy in buildings, industrial processes and environmental applications.

- Control systems and algorithms for energy efficiency in industrial applications.
- Capacitive deionization for energy efficient water treatment.
- Solar heat for medium and high temperature industrial processes.
- Integration of renewable energy technologies in buildings.

Valorization of CO₂ emissions



CO₂ valorization routes by its transformation into high-demand valuable products.

- CO₂ photoreduction for energy storage and fuels production.
- Multifunctional materials and solar reactors for photoactivated processes.
- Thermo-catalytic routes for CO₂ transformation in industrial processes.

Techno-economic evaluation of energy systems



Sustainability assessment, optimisation of processes and modelling for energy planning.

- Process simulation and optimization.
- Life cycle management, sustainability and social aspects.
- System modelling and technology roadmapping.

research lines

scientific facilities

Instrumental Techniques

- Chemical characterization techniques: mass spectrometry; gas/mass chromatography; NO_x chemiluminescence analyzer; pyrolyzer / gas chromatography- mass spectrometry (Py/GC-MS); elemental analysis ICP – OES; AOD decomposition system (calorimetric pump) and CHONS.
- Thermogravimetric analysis (TG-DTA) in an oxidising (air), inert (Ar) or reductive (10% H₂/Ar) atmosphere.
- Properties of solids: textural and chemisorption.
- X-ray diffraction with PDF structural analysis and controlled atmosphere chamber up to 900 °C and 10 bar.
- Spectroscopy: IR (DRIFT, ATR and VEEMAX), UV-vis-NIR, Raman and fluorescence.
- Thermal diffusivity determination.
- Microscopy: atomic force, SEM, FEG-SEM.
- Biotechnological characterisation techniques: GC, HPLC equipped with different columns and detectors (IR, MS, UV-VIS, HPAEC-PAD). Electrophoresis instrumentation for recombinant DNA technology, protein purification and analysis.
- Near-ambient pressure (NAP) XPS which allows the in-situ characterisation of photocatalytic processes under illumination at different gas atmospheres and pressures up to 25 mbar.



scientific facilities



Pilot Plants Facilities

- High Flux Solar Simulator Kiran-42 with an electrical power of 42 kW that with the use of seven 6- kWe short-arc Xenon lamps is able to reach irradiances at the focal point near 4,000 kW/m² and a total power of 12 kW.
- Test bench of batteries for the programming of different test procedures and charge and discharge cycles. It allows analyzing the electrochemical devices performance, cyclability, aging and failure modes.
- Smart Grids Laboratory for the simulation of electrical systems operation, including the integration of renewable energies, storage systems and electric vehicle in order to get an efficient management of the energy resources.
- Pilot plant for the production of advanced biofuels via thermochemical transformations of biomass: catalytic pyrolysis and hydrodeoxygenation.

- Photobioreactors pilot plant which has been designed in order to compare and optimise the most common algae cultivation systems.
- Solar fuels photoreactor formed by a compound parabolic concentrator (CPC) coupled to a gas chromatograph.

Solar Field

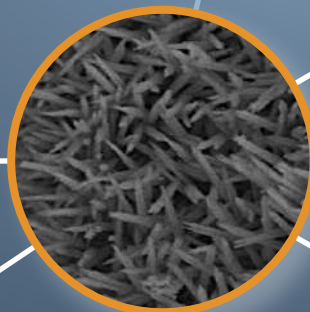
- Consisting of 169 heliostats, 3 m² each, with an experimental platform located on top of an 18 m height tower. This facility allows testing receivers, reactors and materials up to 250 kW thermal power under irradiances above 2000 kW/m².

research units

**Thermochemical
Processes Unit**



**Electrochemical
Processes Unit**



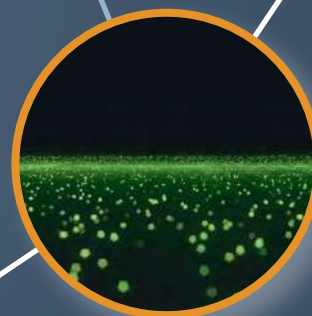
**High Temperature
Processes Unit**



**System Analysis
Unit**



**Biotechnological
Processes Unit**



**Photoactivated
Processes Unit**



**Advanced Porous
Materials Unit**



**Electrical Systems
Unit**



Thermochemical Processes Unit

annual report
2021



Prof. Dr. David P. Serrano
Research Professor
Head of the Unit



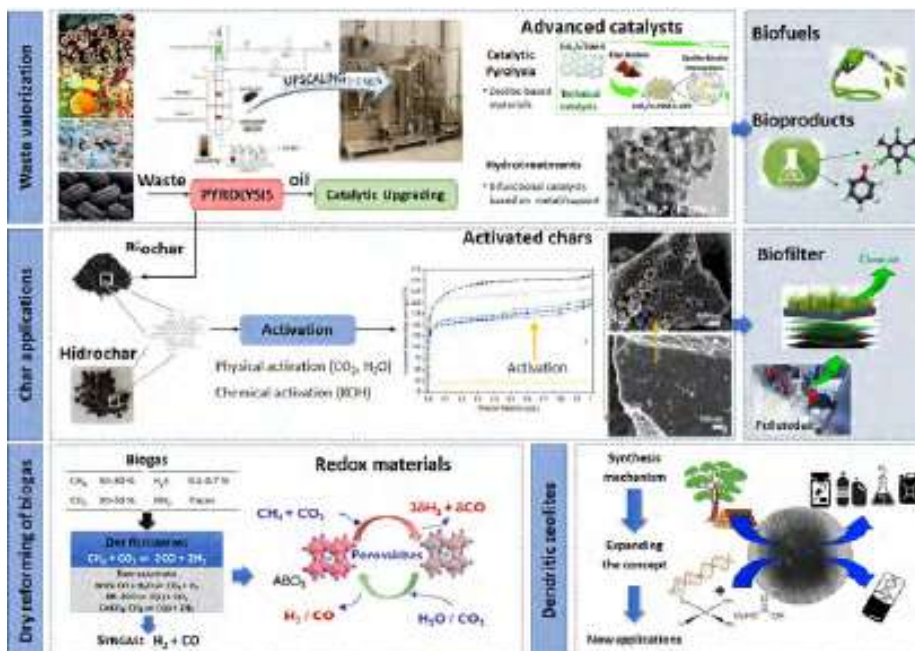
Dr. Patricia Pizarro
Senior Researcher
(Associated)



Dr. Javier Feroso
Senior Assistant
Researcher



Dr. Inés Moreno
Senior Assistant
Researcher
(Associated)



Relevant projects and networking

In 2021 the TCPU has participated in 12 research projects distributed in the following research lines: 9 about organic waste valorization; 2 about biofilters development from biochars and hydrochars, 1 about the synthesis and applications of dendritic zeolites. The Regional Government of Madrid supports 4 projects: BIOCHARFILT (Grant to attract young research talent), BIO3 (Program for R&D Activity between Research Groups of the Community of Madrid) and 2 industrial doctorates. The national government supports 6 research projects: BIO-CASCHEM, REDEFINERY, 0-EMISION and the 2021-started projects MADRID + CIRCULAR, ADBIOCAP and UPGRES. In addition, the TCPU participates in the

H2020 European project titled NONTOX and Prof. David P. Serrano was awarded in 2021 with an ERC Advanced Grant for project TODENZE.

In addition, the Thermochemical Processes Unit (TCPU) participates in the Spanish Technological Platform of Biomass (BIOPLAT) and the Spanish Platform of Sustainable Chemistry (SUSCHEM). Likewise, the TCPU keeps contact with several universities and research centres in Spain and Europe. In 2021, the TCPU has maintained a cooperation agreement for mobility actions with the University of Calabria (Italy).

Facilities

Raw materials conditioning

- Milling and sieving of biomass, plastics and other residues.
- Oven for feestock drying.

Synthesis and characterization of catalysts

- Lab equipment for catalyst and materials preparation by different routes such as sol-gel, hydrothermal and coprecipitation.
- Methods for dispersing active phases on porous supports.
- Tubular muffle furnace for thermal treatment under controlled atmosphere.
- Characterization techniques: 2 TRI-FLEX gas physisorption analysers, 1 high accuracy gravimetric sorption analyser (IGA), 2 pyridine-FTIR.

Lab scale reactors for testing catalytic activity

- 2 Stirred tank high pressure batch reactors (P_{\max} 220 bar).
- 1 High pressure continuous fixed-bed reactor, Microactivity (P_{\max} 50 bar).
- 1 High temperature fixed-bed reactor (T_{\max} 1500 °C).
- 3 Downdraft fixed-bed pyrolysis reactors.
- 2 Upward-flow fixed-bed pyrolysis reactors.
- 1 Continuous solids feeding systems to be coupled in pyrolysis reactors.
- Liquid-feeding systems to be coupled into the fixed-bed reactors.
- 1 micro-pyrolyzer with ex-situ catalytic reactor coupled to GC-MS.
- 2 setup for monitoring NO_x adsorption in fixed-bed biofilters.

Pilot scale reactor

- Continuous feeding fluidized bed pyrolysis reactor (max. 1.5 kg/h).
- Fixed bed continuous flow high pressure reactor (P_{\max} 50 bar).
- Possibility to operate with both fluidized bed and fixed bed reactors connected in series or in independent modes.
- 1 Large-scale vertical furnace for carbons activation.

Analysis of raw materials and reactions products

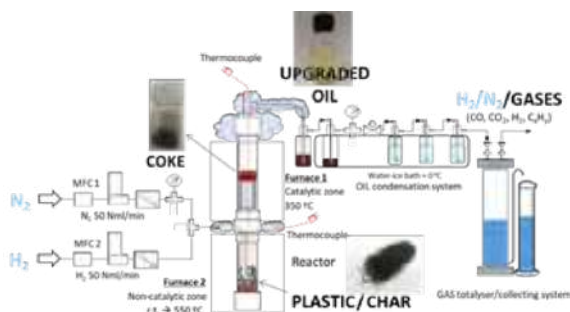
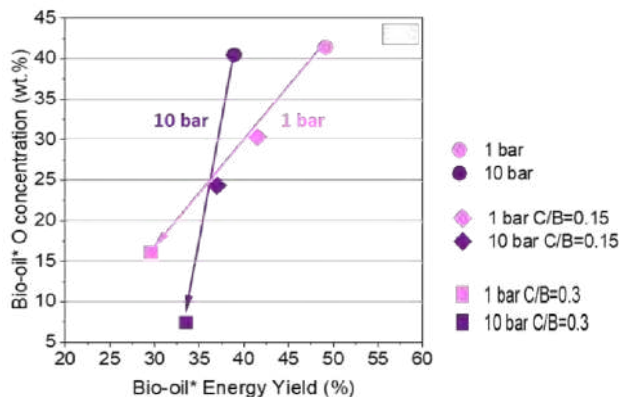
- Karl Fischer titration, potentiometric titration.
- AOD decomposition system.
- NOx chemiluminescence analyzer.
- Gas chromatography: 2 GC-MS, 2 GC (FID, TCD), 2 μ GC, Py-GC-MS.
- Columns and software for PIONA and paraffins GC analysis.
- Ionic chromatography (IC).



Scientific and technical results

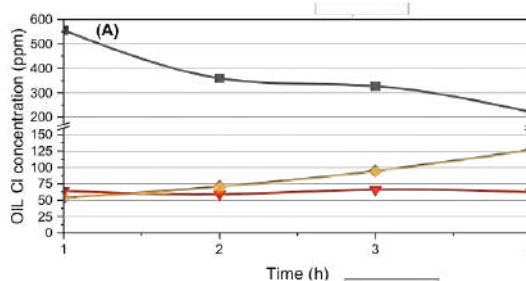
Conversion of biomass-derived wastes

- Systems for continuous feeding of solids or liquids to the fixed-bed reactors have been built and installed. A new up-flow configuration of lab-scale pyrolysis reactors has been designed and installed to carry out thermal and catalytic pyrolysis with feeds that are particularly difficult to handle and/or with condensation problems.
- Reactions of pressurized (up to 10 bar) thermal and catalytic pyrolysis of biomass have been completed. The beneficial effect of pressure on the aromatics production has been demonstrated.
- The effect of catalyst type (Beta & ZSM-5 zeolite, KOH-activated carbon, FCC) and configurations in single or dual catalytic-bed have been studied in the co-pyrolysis of FORSU and garden pruning residues. Beta zeolite yields the largest selectivity to aromatics while AC/KOH to phenolics.
- Different catalytic systems for HDO of guaiacol based on metals (Ni, Co and Ni-Co) and their phosphides have been evaluated. The best results were attained with the catalytic systems based on Ni and Co supported on ZSM-5 zeolite.
- Staged pyrolysis has been explored for bio-oil speciation into holocellulose- and lignin-derived compounds.



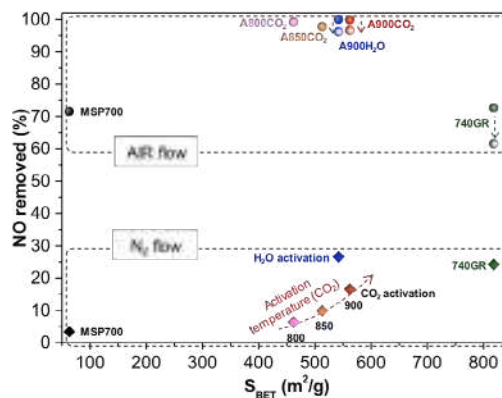
Conversion of other types of wastes

- Catalysts based on Fe_2O_3 supported on ZSM-5 or USY zeolites were assessed for the catalytic pyrolysis of plastic wastes from the electric and electronic sector. They were tested at continuous bench-scale, yielding >70 wt.% oils with halogen contents <100 ppm and proving to be resistant to deactivation in a 4 h on stream.
- Additionally, HDH catalysts based on Pd- and Ni- over different porous supports have been tested in vapour phase HDH, producing oils with halogen concentrations <10 ppm.
- Catalytic pyrolysis of SRF residues has been carried out over different zeolites (13X, 4A, ZSM-5, USY) with different Si/Al ratios and clays as catalysts/adsorbents, reaching an oil dehalogenation of 98 wt.% in the best scenarios.



Valorization of hydrochars and/or pyrolysis biochars and their application in biofilters to decontaminate (NO_x , CO) gaseous streams

- Additional activation methods to increase the textural properties of biochars have been applied.
- Activated carbons produced from MSP700 biochar have shown very promising results as NO_x filters in presence of O_2 in comparison with reference carbon materials (e.g 740GR).
- Hydrochars from the hydrothermal carbonisation (HTC) of organic residues (OFMSW, gardening wastes, etc.) have been physically activated to produce active carbons to be used in biofilters with the aim of decontaminating (PM , NO_x , CO , CO_2) flue gases of biomass combustion boilers. The main goal of these activated hydrochars is to remove/oxidize NO and CO from the flue gases.
- A lab-scale setup has been built to evaluate the activated hydrochars performance removing/oxidizing NO and CO from the flue gases of biomass combustion boilers.





High Temperature Processes Unit



Dr. José González-Aguilar
Senior Researcher
Head of the Unit



Dr. Manuel Romero
Research Professor

high temperature



R&D Objectives

- Modular, efficient, dispatchable and cost-effective high temperature solar concentrating technologies for production of solar fuels and chemicals, industrial process heat and power generation.

Research lines

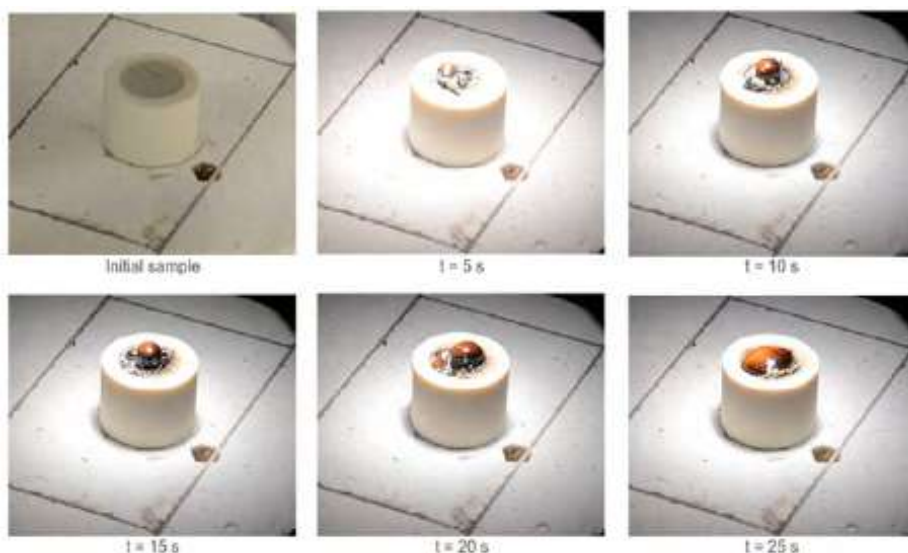
- Modular schemes for solar thermal facilities, with high efficiency, dispatchability and urban integration.
- Solar receivers and reactors (volumetric, pressurized and particle).
- High-T thermal energy storage (sensible, PCM, chemical), materials, modelling and test bed for characterization.
- Solar fuels and chemicals production using metal oxides, organic residues or high-temperature steam electrolyzers.



Relevant projects and networking

The High Temperature Processes Unit (HTPU) focuses its research on solar thermal technologies with special emphasis on applications involving high temperature and very high concentrated sunlight. In 2021, HTPU maintained the coordination of this topic in the Comunidad de Madrid by the regional research programme ACES2030-CM (2019-2023). Additionally, it developed solar tower concentrating research at the national R&D project HECTOR. In terms of industrial cooperation, good examples are the solar water and salt recovery from brines with SEENSO Renoval; solar tailings transformation for copper mining with SMI-ICE-Chile and corona discharge devices for cooling in solar power plants and in vehicles with the company CEDRION. Worth noting has been the continued collaboration with Synhelion for the dry reforming of methane and the production of the first solar clinker. Within the Repsol HUB-MADRID+CIRCULAR, the HTPU started the development of new concepts for H_2 production via solar-driven dry reforming of biogas and high temperature electrolysis.

EU collaborations continued on new heat transfer fluids and solar receivers (EU H2020 NEXT-CSP), solar thermal industrial process heat (EU H2020 INSHIP) and the new project FCH/JU PROMETEO on solar heat and power for SOE. Besides, HTPU participated in the H2020 SFERA III project (Solar Facilities for the European Research Area – Third Phase). Besides HTPU participates in the Joint Programme on Concentrated Solar Power (EERA JP-CSP). In the national arena, HTPU is also involved in the Spanish technological platform on CSP (SolarConcentra) and the Working Group on Energy Storage (GIA), an initiative of the Spanish Ministry of Economy and Competitiveness, and participates in the IEA SolarPACES Task II. Dr. José González is member of the International Solar Energy Society (ISES) Board of Directors.



Facilities

Laboratory for material synthesis and characterization in extreme conditions (high solar irradiance and/or temperature)

- Material synthesis by ball milling and wet-chemical routes.
- Material characterization (1600 °C sintering furnace, thermal diffusivity by laser flash technique, automatic sieve, Chantillon gauge, pHmeters).
- 7 kW_e high-flux solar simulator equipped with three-axis positioning system.
- Specific instruments for temperature, radiation flux and gas composition measurements: infrared, CCD and CMOS cameras, radiometers, pyrometers, gas analyzers and micro-chromatograph.
- Portable reflectometer for surveillance of cleanliness of heliostats.
- Vertical solar furnace with three independent heating zones (up to 1500 °C).

Singular facilities for components and prototypes testing

- 42 kW_e high-flux solar simulator equipped with a three-axis position-

ing system with a static load capacity of 250 kg.

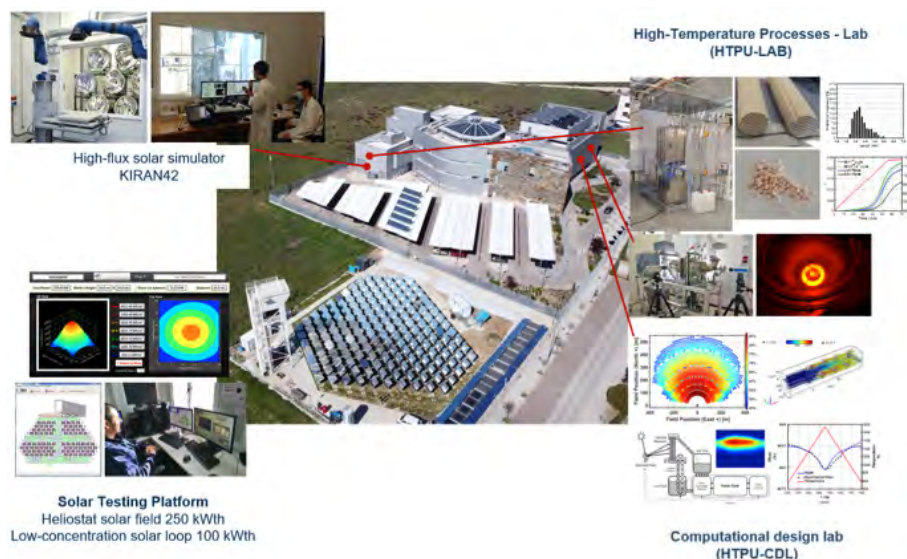
- 250 kW solar tower facility composed of 169 heliostats and two testing platforms.

Specific test rigs

- Aerothermal characterization of volumetric and pressurized absorbers at 1 and 10 kW scale.
- Small wind tunnel for testing cooling in corona discharge devices.
- Thermal storage in packed and fluidized beds.
- Outdoor test rig for small heliostats qualification.

Computational design lab for high temperature processes

- Workstations.
- Specific software for computer-aided design, computational fluid dynamic modelling, illumination design & optical analysis, data treatment and process control and monitoring, chemical process and power plant design.



Scientific and technical results

Innovative modular concepts with minimum environmental impact

- Analysis on soiling in solar systems using the heliostat facets of the solar field as well as specific samples (solar quality glass and mirrors) installed at IMDEA Energy is on-going. The study currently covers 18 months and it is representative of the environmental conditions in urban areas. This study combines daily measurements of the reflectivity on the facets and the soiling characterization (weight, optical and scanning microscopy, reflectivity and transmissivity) of small samples.
- A digital twin of the solar field has been developed that incorporates the real characteristics of the optics of the facets and the operation of the heliostats. It is planned to use the digital twin to model the dynamic behaviour of the solar field in order to implement pointing and calibration strategies.
- The implementation of an improved solar field control system capable of managing the heliostats autonomously (without the need for human supervision) and in real time has been completed. The regular examination of the solar field calibration is currently done automatically without the need for an operator.



Energy storage & solar thermo-chemistry

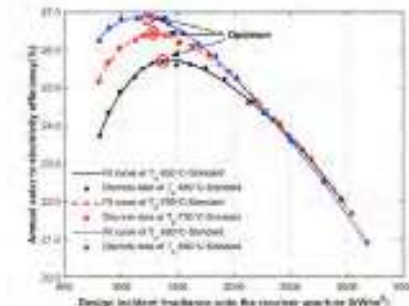
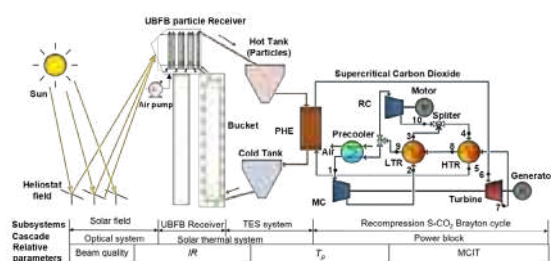
- Solar clinkering has been demonstrated for the first time in a central receiver facility using technologies developed by CEMEX and Synhelion.
- The development of materials for thermochemical storage based on encapsulated perovskites and CaO continues.
- Tests have been carried out on a prototype of the recovery of water from tailings and its subsequent inerting by means of concentrated solar radiation in a high-flow solar simulator.

Solar receivers & new heat transfer fluid

- The capture, concentration and transmission of concentrated solar radiation in a 7 meter long and 14 mm diameter fiber optic cable in the solar field has been demonstrated. The fiber optic cable showed a transmissivity greater than 50% (95%) when the angle of incidence of the incoming concentrated solar radiation was less than 14.7° (4.5°). The acceptance angle of the cable limited the maximum incident flux density to 145 kW/m^2 .
- The exergetic analysis and the optimization of typical geometric structures of compact exchangers for their use in pressurized receivers have been completed. Analysis indicates that flat rectangular fin structures offer the best performance.
- A test bench for aerothermal characterization of advanced heat exchangers has been commissioned. With this, several geometries for air pumps without moving parts based on corona-type electrical discharges have been studied.

Solar thermal processes integration & environmental impact

- The dynamic analysis of the annual behavior of multitower solar thermal power plants based on suspensions of particles and supercritical fluids (mainly, sCO_2) as working fluids has been performed.
- Study on the dynamic behavior of solar thermal power plants equipped with microturbines for electricity production and polygeneration in sites isolated from the grid is being continued.
- The analysis of integration of high-temperature electrolyzers with parabolic trough collectors and thermal storage using molten salts and renewable electricity has been started. Different components (electrolysers, thermal storage systems) and schemes have been implemented within the EcoSimpro software.
- Continuation of analysis of integration of solar systems in processes for water recovery and desalination as well as salt extraction from brines.





Electrochemical Processes Unit

annual report
2021



Dr. Jesús Palma
Senior Researcher
Head of the Unit



Dr. Rebeca Marcilla
Senior Researcher



**Dr. Enrique
García - Quismondo**
Senior Assistant
Researcher



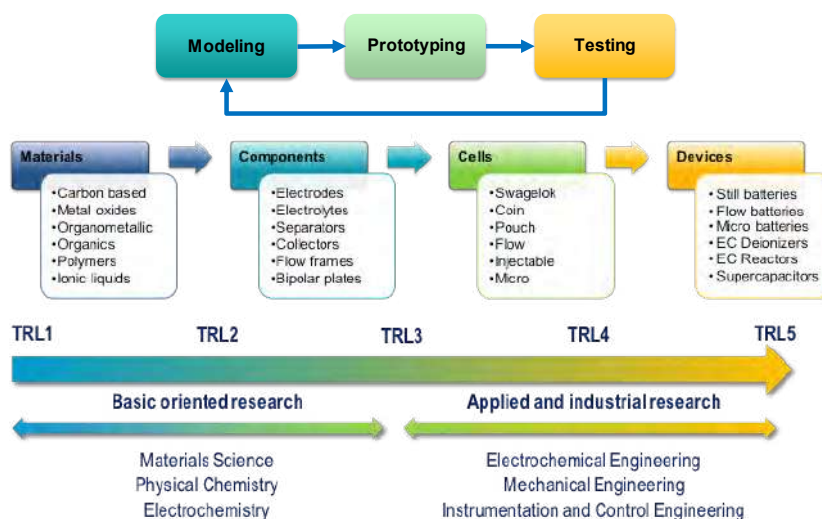
**Dr. Andreas
Mavrantoukakis**
Senior Assistant
Researcher

R&D Objectives

- Electrochemical energy storage devices and systems for stationary and transport applications.
- Electrochemical energy-efficient devices and processes for energy and environmental applications.

Research lines

- **Electrochemical Capacitors:** Develop advanced electrochemical capacitors with improved performance maintaining power density, cycle life and charge-discharge efficiency. Design of hybrid devices containing organic redox couples dissolved in the electrolyte.
- **Water Deionization:** Search for faradaic materials for selective ion capture and separation. Application to control the salinity and sodicity of water, recovery of valuable metal ions dissolved in natural water or in effluents from mining or recycling activities.
- **Redox Flow Batteries:** Design and build flow batteries with novel chemistries to improve the technology by increasing energy density and by reducing costs per kWh stored. Exploration of redox active molecules by computational chemistry. Investigation on the use of solid boosters and liquid mediators. Conception and design of membrane-free cells using immiscible electrolytes. Injectable electrodes.
- **Metal-ion Batteries:** Research on materials and components to improve their performance, sustainability and recyclability. Investigation on conductive polymers and redox active polymers for electrodes and electrolytes in Me-ion batteries, including Li-ion, Na-ion, Zn-ion and others.
- **Testing Protocols:** Establish new testing methodologies for evaluating the quality, performance and accelerated aging of Li-ion batteries, redox flow batteries and supercapacitors. Production of data-driven models.



Relevant projects and networking

In 2021 the Electrochemical Processes Unit (ECPU) has been involved in 19 research projects. There were 7 direct contracts with companies such as Securitas Direct, Aqualia, Master Battery, B5Tec and HFC Company. The Regional Government of Madrid has supported 2 grants to attract young research talent and 2 industrial doctorates. The national government supports 2 research projects. Finally, the Unit has participated in 5 European projects: MFreeB (ERC-Consolidator), Polystorage (ITN-Marie Curie), NanoBat (NMBP), HySolChem (FETOPEN) and Light-Cap (FETOPEN). Finally, 1 industrial research project has been signed with the company Aqualia under the umbrella of the European project REWAISE.

The ECPU has participated in associations such as the European technology platforms on Smart Grids (ETIP-SNET) and Batteries (Batteries Europe), the Spanish Technology Platform on Energy Storage (BatteryPlat) and the Spanish Association of Batteries and Storage (AEPIBAL). Likewise, the ECPU keeps contact with several universities and research centres in Spain and abroad. In 2021, the ECPU has maintained cooperation agreements for mobility actions with the Federal University of Sao Carlos (Brazil), Chalmers University of Technology (Sweden), Wageningen University (Netherlands), University of Southampton (UK), University of Tartu (Estonia) and Technical University of Denmark.

Facilities

Components & cell manufacturing lab

- Light scattering for particle size and Z-potential analysis.
- Schlenk line for polymer synthesis, hydrothermal synthesis, ultrasonic synthesis and sol-gel synthesis.
- 3 Glove boxes for activities in controlled atmosphere.
- Electrode inks manufacturing: grinding, mixing, shaping and consolidating.

Electrochemical characterization lab

- Potentiostats (50 channels).
- Lab. cell cyclers (112 channels x 0,05 W, 5V – 10mA max).
- Impedance spectroscopy (20 channels), rotating ring-disk (RRDE), quartz crystal microbalance (EQCM).
- Ion chromatography and semiautomatic titration.

- Physicochemical characterization: viscosity, density, conductivity, pH and ORP meters.
- 300 W Arc lamp source (Xe) to perform fotoelectrochemical characterization.

Modelling facilities

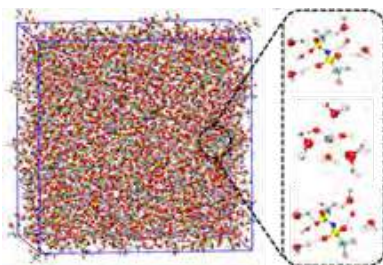
- 6 Workstations (136 processors, 872 GBs RAM, 28 TBs storage capacity).
- Computational chemistry: electronic structure calculations (density functional theory, wave function theory, molecular dynamics), ChemCraft ®, ChemAxon®, Gromacs®, ORCA®, GAUSSIAN ® and VASP ®.
- Computer fluid dynamics: COMSOL Multiphysics ®.
- Dynamic modelling: Matlab-Simulink ®.

Prototyping facilities

- 3D Design: SolidWorks ®.
- 3D Printers: FDM technology (1 x 4 L + 1 x 600 L), SLA (1 x 5 L).
- CNC Micro-milling machine.
- Cell prototypes: coin cells up to 2 cm²; pouch cells from 10 to 100 cm² electrodes; flow cells (10, 25, 300, 1200 and 2400 cm² electrodes) and flow modules up to 20 cells; Micro-flow cells; Injectable cells.
- High pressure battery cyclers: 3 channels x 12 kW, 120V – 200A max.
- Mid pressure battery cycler: 4 channels x 300W, 18V – 50A max.
- Low pressure cell cyclers: 104 channels x 30 W, 5V – 6A max.
- 5 Climatic chambers (20, 100, 220, 250 and 4800 L). From -40 to +180°C and 10 to 98%RH.
- Flow reactor test bed with controlled flow, temperature, pressure and measurement of pH, ORP and conductivity.

Electrochemical devices test lab & pilot plant

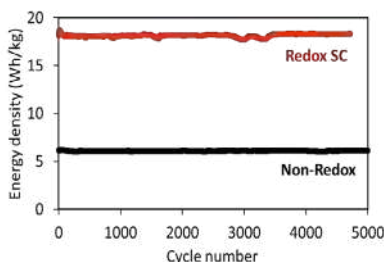
- Test beds with monitoring of flow, level, temperature, pressure, pH, ORP, Conductivity.
- LabView ® programmable control system.



Scientific and technical results

Supercapacitors

- Functional prototypes of a new type of hybrid supercapacitor were built and tested in 2021 with excellent power and energy densities. A European patent application was filed and a commercial license agreement was signed with a company.



Metal-ion batteries

- Development of high performing electrolytes based on superconcentrated solutions.
- Research on organic batteries based on redox active polymers.
- Development of high performance zinc-polymer battery using poly(catechol)s in concentrated aqueous electrolytes.
- Development of conjugated microporous redox polymers with wide variety of redox functionalities (anthraquinone, phenazines, etc).
- Synthesis of graphene/ sulphide hybrids by electrochemical techniques for batteries and electrocatalysis.



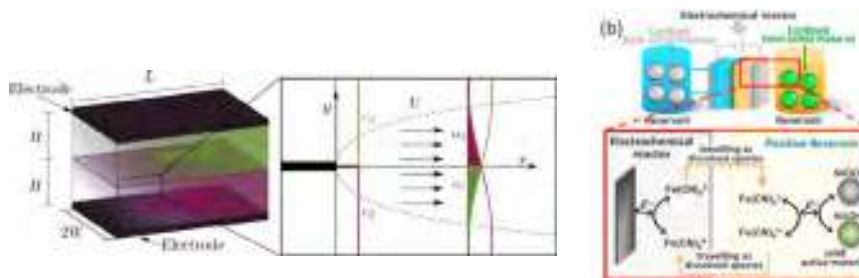
Water deionization

- Different Faradaic deionization reactors have been designed, built and tested to proof the concept of selective separation and recovery of metals. Lithium recovery in solutions containing, copper, cobalt, nickel and manganese has been demonstrated.
- Deionization prototypes with regenerative injectable electrodes have been tested and validated.
- A hybrid reactor that combines a photoelectrochemical cathode with capacitive deionization and electrochemical oxidation in the anode has been investigated to produce fuels from CO_2 and simultaneously oxidize organic pollutants.



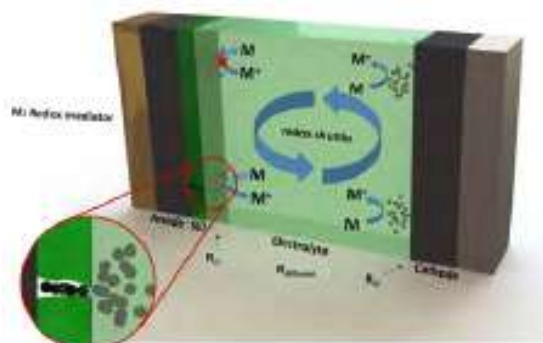
Flow batteries

- Investigation on novel redox active immiscible electrolytes with adequate partition coefficients and electrochemistry, as well as on the self-discharge phenomena in membrane-free batteries.
- Fluid dynamic modelling of new reactors for membrane-free approaches (immiscible technology and microfluidics). An international PCT patent application has been published in the design of a flow-through reactor for immiscible membrane free RFBs.
- Development of flow batteries with enhanced energy densities making use of solid boosters and liquid electrochemical mediators. Application to organic and vanadium flow batteries.
- Searched new organic molecules and redox polymers as active species in flow batteries through computational modelling. Computational prediction of stability and performance.



Battery testing protocols

- The mediator-enhanced coulometry method for accelerated evaluation of the SEI quality in commercial Li-ion batteries has been optimised in readiness and sensitivity by adjusting the type and concentration of the mediator.
- A new non-destructive test method based on micro charge-discharge cycles has been developed to assess the quality of fresh commercial Li-ion batteries.





Biotechnological Processes Unit



Dr. Cristina González
Senior Researcher
Head of the Unit



Dr. Elia Tomás
Senior Assistant
Researcher

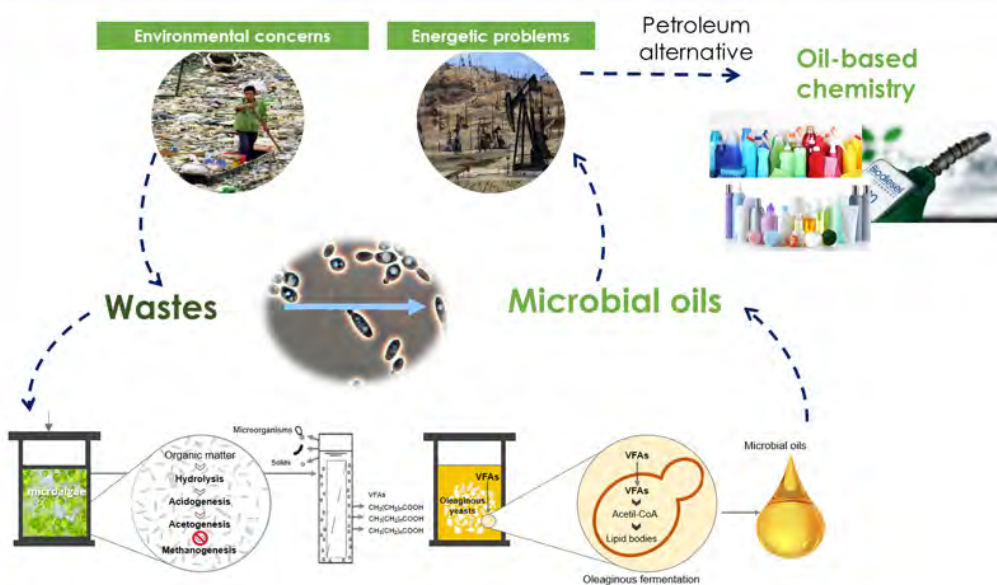


R&D Objectives

- Recovery of C (N and P) from wastes to produce biofuels and bioproducts.

Research lines

- Anaerobic digestion of waste streams for biogas production.
- Anaerobic fermentation of waste streams for SCFAs production.
- Use of the carboxylic platform (SCFAs): microbial oils and hydrogen production.
- Lignocellulose-based biofuels.



Relevant projects and networking

The BTPU has participated in several national and international projects related with the use of different residual streams for the production of alternative compounds (short chain fatty acids and microbial oils) as well as energy products (ethanol and biogas). In this period, BTPU has participated in 6 projects, 2 European (PRODIGIO and OLEO-FERM), 2 national (ACMIBIO and UPGRES), 2 regional (ALGATEC and Madrid + Circular) and enjoyed 6 personnel grants. Acknowledging the importance of gaining international visibility and stablishing key collaboration, BTPU is actively participating in several networking COST Actions (Greenering and

Euromicroph). In this sense, BTPU leads the European YEAST4BIO (2019-2023), supported COST Action of H2020, which involves more than 150 researchers from 34 countries. Also, at international level, the Unit participates in RENUWAL (2019-2022), a Latin-American network focused on microalgae cultivated in wastewater. As a result of the participation in the above-mentioned projects, BTPU actively collaborates with leading research groups and companies along Europe. Besides, BTPU is member of the Biobased Industries Consortia (BIC) and BIOPLAT.



Facilities

Biotechnology and microbiology lab

- Laminar flow hood, PCR cabinet.
- Orbital shakers.
- Cell counter.
- Flow gas meters.
- Anaerobic reactors, fermenters and photobioreactors.
- Oven, muffle, balances and centrifuges.

Chemical analytics lab

- Gas and liquid chromatographs with different detectors (FID, TCD, DAD, RI).
- Ionic chromatography.
- Equipment for routine analysis; TS/VS, pH, TNK, COD.

- Spectrophotometers: microplate and cuvette type.

Molecular biology lab

- Polymerase chain reaction: traditional and real-time.
- RNA-ase free cabinet.
- Denaturing gradient gel electrophoresis.
- Agarose electrophoresis.

Pilot plants

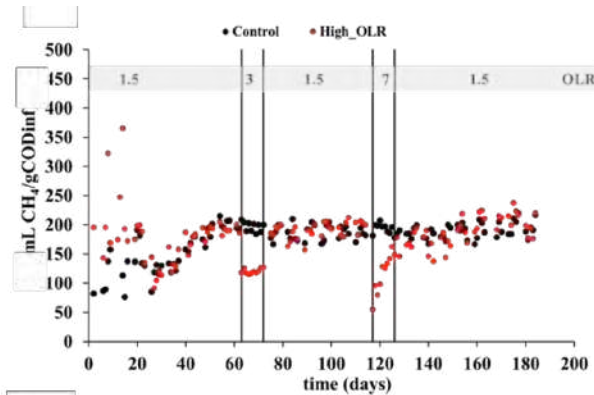
- Bioreactors.
- 3 modules of 4 bubbled columns each (1 m³ in total).
- 2 open raceways (1 m³ in total).



Scientific and technical results

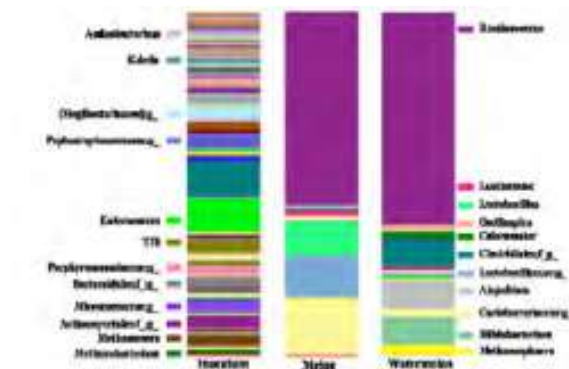
Anaerobic digestion of microalgae and waste streams for biogas production

- Provoked failure experiments in anaerobic reactors revealed acetic, propionic and caproic acids as well as ethanol as the main warning metabolites when anaerobic digestion (AD) of microalgae biomass was subjected to high organic loading rates disturbances.
- A balanced microbiome consisting of W5 (*Cloacimonadota*), *Methanotherx* (*Halobacterota*) and *Syntrophomonas* (*Firmicutes*) has been identified as key consortia for anaerobic digestion using microalgae as feedstock.
- The solid spent coming from the anaerobic fermentation of carbohydrate-rich food waste (FWs) was a suitable substrate to efficiently produce biogas via AD.



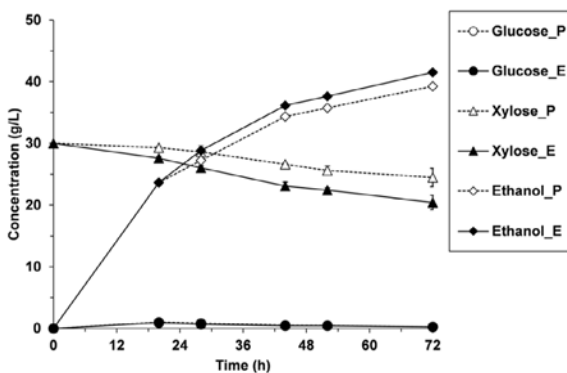
Anaerobic fermentation of microalgae and waste streams for SCFAs production

- High SCFAs and H_2 yields were produced in a single-stage anaerobic fermentation. SCFAs specificity (butyric and caproic acid > 90 %) could simplify the downstream steps, increasing the cost-effectiveness of industrial processes.
- pH was identified as a key factor to maximize product output since it provoked a microbial community enrichment in *Ruminococcus*, which played a significant role in carbohydrates metabolization.



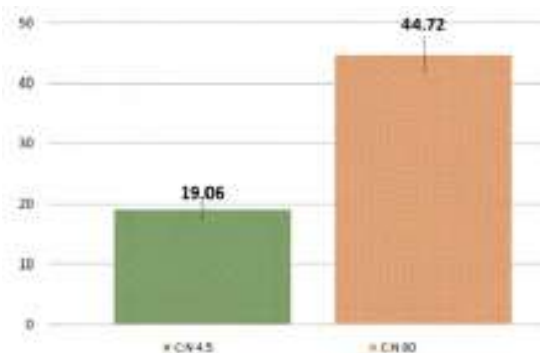
Lignocellulose based biofuels

- The ability of a xylose-fermenting *Saccharomyces cerevisiae* F12 to produce bioethanol was investigated in presence and absence of lignocellulosic insoluble solids and/or inhibitors to determine its tolerance towards these stressors.
- *S. cerevisiae* F12 was subjected to Adaptive Laboratory Evolution (ALE) to increase its robustness towards lignocellulose-derived inhibitors and insoluble solids. The evolved strain gave rise to a five-fold increase in bioethanol yield in fermentation experiments with high concentration of inhibitors and water insoluble solids.



Microbial oil production from the carboxylic platform (short chain fatty acids)

- *Cryptococcus curvatus* and *Rhodotorula toruloides* were screened to study their ability to grow in SCFAs-rich medium. *R. toruloides* was not able to grow in the medium containing 15 g/L or 5 g/L of SCFAs as the only carbon source. *C. curvatus* was not inhibited at the highest concentration of SCFAs (15 g/L).
- Two different carbon:nitrogen ratios (C:N 4.5 and C:N 80) were assessed with *C. curvatus* having great impact on the lipid production.
- Microbial electrolytic cells (MECs) have been set-up and inoculated for the production of hydrogen. The efficiency of this is only based on the hydrogen production but also on the ability of this bioelectrochemical system to uptake carboxylates as an innovative carbon source.





Electrical Systems Unit

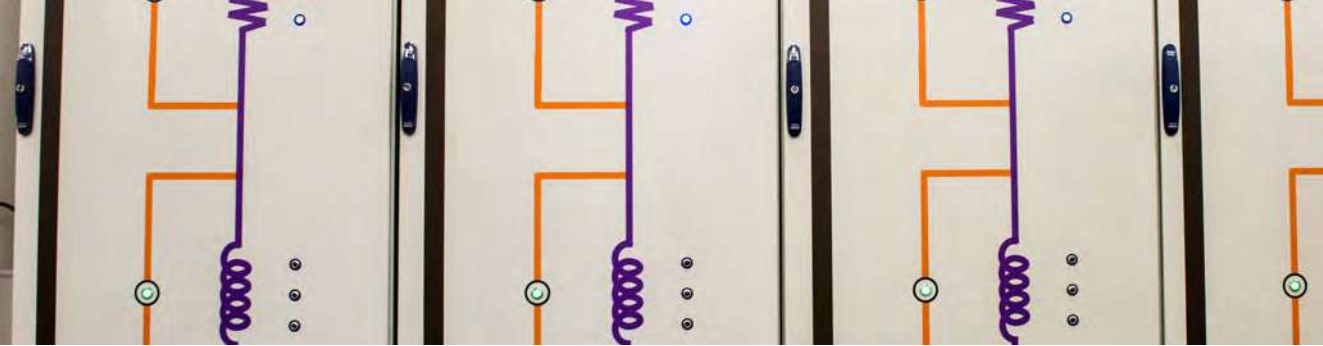
annual report
2021



Dr. Milan Prodanovic
Senior Researcher
Head of the Unit



Dr. Javier Roldán
Senior Assistant
Researcher



R&D Objectives

- Improved control and stability aspects of future electricity networks with high share of renewable and storage technologies.
- Optimisation based algorithms for demand management and renewable integration.
- Increased energy efficiency in industrial applications.

Research lines

- Renewable and energy storage integration.
- Control of power converters for applications in electricity networks.
- Stability of power networks with high penetration of renewables.
- Energy management and energy efficiency applications.



Description:

A* includes:

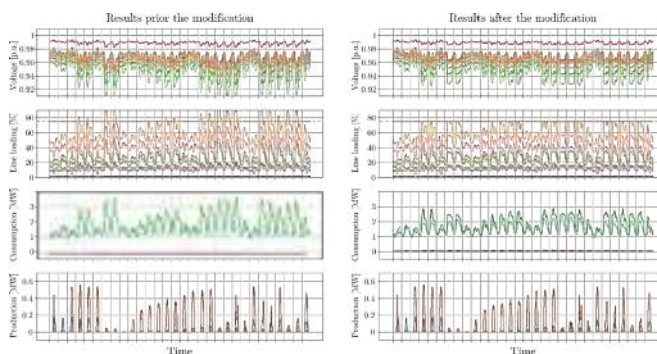
- Alcorcón
- Fuenlabrada
- Getafe
- Leganes
- Mostoles
- Parla
- Pinto
- Pozuelo de Alarcon
- Valdemorillo
- Valdemoro

B* includes:

- Torrelodones
- Galapagar

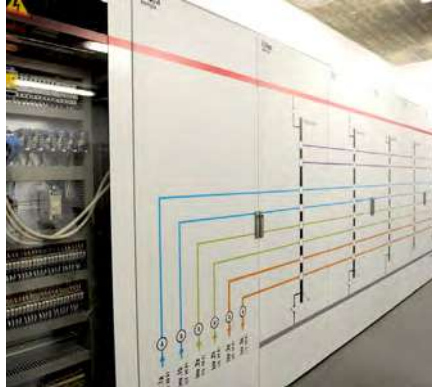
Notes:

Some loads from Galapagar, Pinto and Valdemoro are used twice.

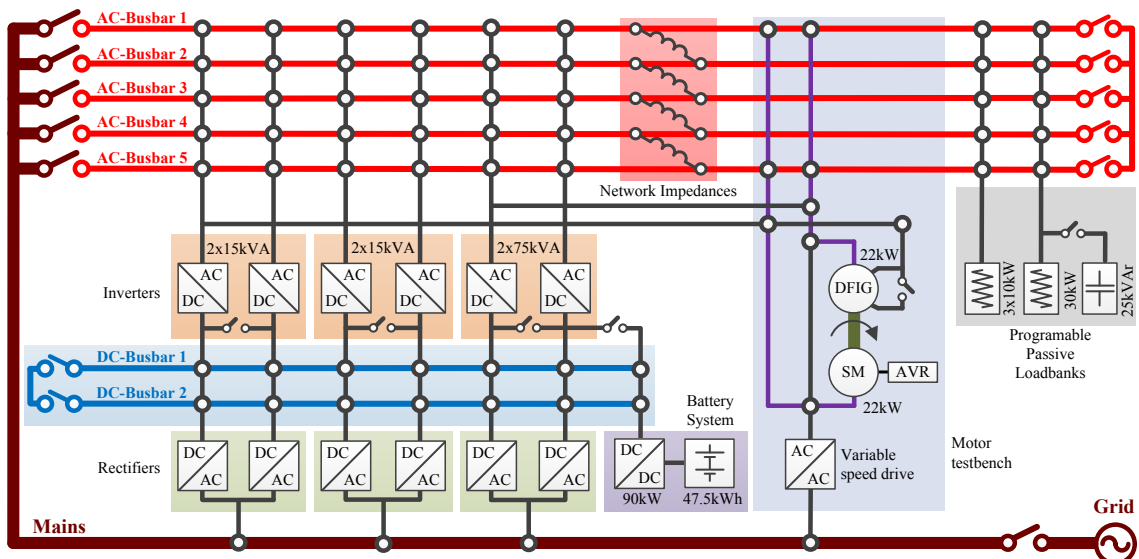


Relevant projects and networking

In 2021, Electrical Systems Unit (ESU) participated in several research and development projects. Principal research activities were performed within the frameworks of regional project PROMINT, European project DRES2MARKET and national project FLEXENER led by Iberdrola. These projects addressed control, stability and flexibility aspects of renewable and storage integration to power networks as well as control of power electronics interfaces in grid applications. There was also a collaboration project with Lithuanian Energy Institute regarding the analysis of power quality in distribution network. With respect to industrial collaborations, the main projects were Microgrid-On-Chip with NORVENTO for developing control of battery interfaces for microgrids and NextFactory and COPOWCO with Genesal and IMV Corporation, respectively, addressing energy saving in industrial applications.



ESU participated in activities of the Spanish Platform for Power Networks (FUTURED). In 2021 ESU continued its role in the Spanish Platform on ICT applications in Energy Efficiency (EnerTIC) as an associated member. In addition, contacts were established with the national platform for development of railway services (PTFE).



Facilities

Smart energy integration lab (SEIL)

- 4 x 15 kVA and 2 x 75 kVA converters.
- 2 x 30 kW and 25kVA remotely control-able and programmable loads.
- 47.5 kWh battery system.
- 90 kW bidirectional battery interface.
- 22kW configurable DFIG and synchronous motor-generator testbench.
- Remotely configurable distribution panels for AC and DC networks.
- Configurable network impedances.
- Integrated measurement and SCADA control system.
- Flexible programming platform.

Smart buildings management lab

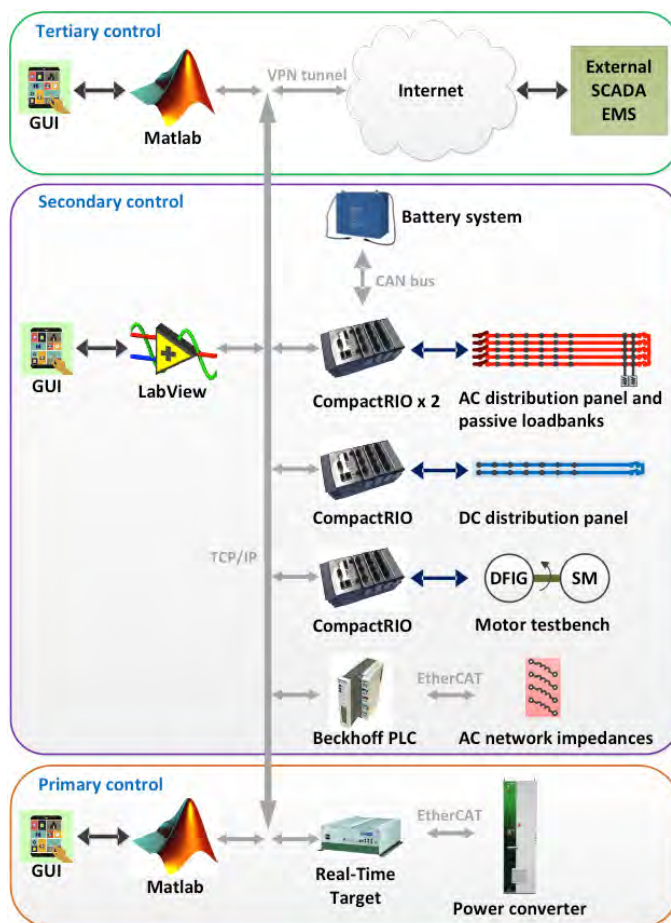
- KNX (Siemens) based technology.
- Sensors and actuators.

Modelling and simulation tools

- Matlab, PowerWorld, IPSA, PLECS, Digsilent PowerFactory.

Acquisition and control platforms

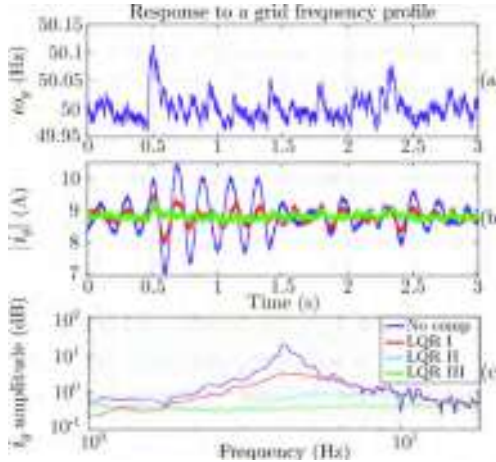
- LabView (NI), Beckhoff, Texas Instruments etc.
- Oscilloscopes, bench power supplies, function generators etc.



Scientific and technical results

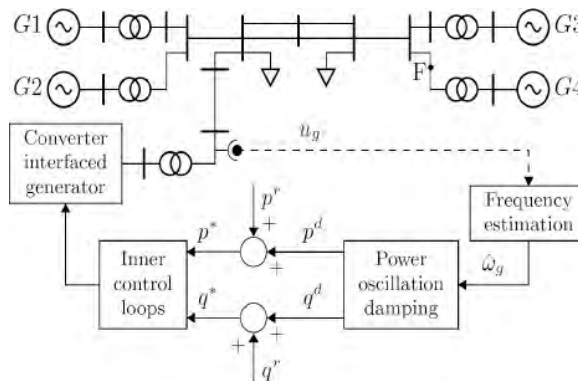
Renewable and energy storage integration

- Distribution networks for massive deployment of renewable energy: analyzed the hosting capacity, line and voltage congestions.
- Grid-Forming and Grid-Following control methods for renewable and energy storage interfaces in power systems and microgrids. Achieved voltage stability improvement and frequency control.
- Coordinated management of aggregated and distributed storage applications. Used the storage in solving network congestions and providing flexibility.
- Battery sizing for inertial services in power systems. Developed optimisation based algorithms for battery sizing taking into account both technical and economic constraints.



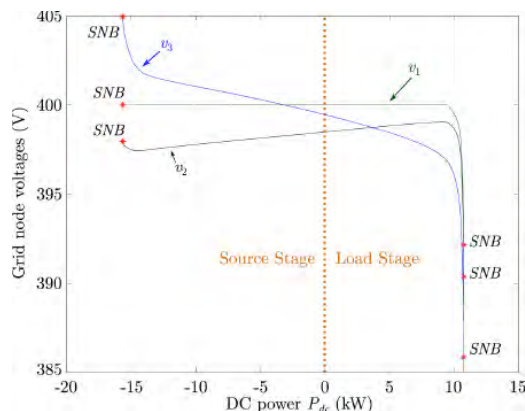
Control of power converters for applications in electricity networks

- Power Oscillation Damping using converter interfaced generation. Novel methods based on local measurements only.
- Implementation of Virtual Synchronous Machine in weak grids. Different applications of this control method in renewable and storage integration.
- Improvement of primary, secondary and tertiary control. Control and management algorithms for power converters in AC and DC microgrids.
- Improved control of power converters for applications in renewable integration. Enabled renewable sources to participate in voltage and frequency control.



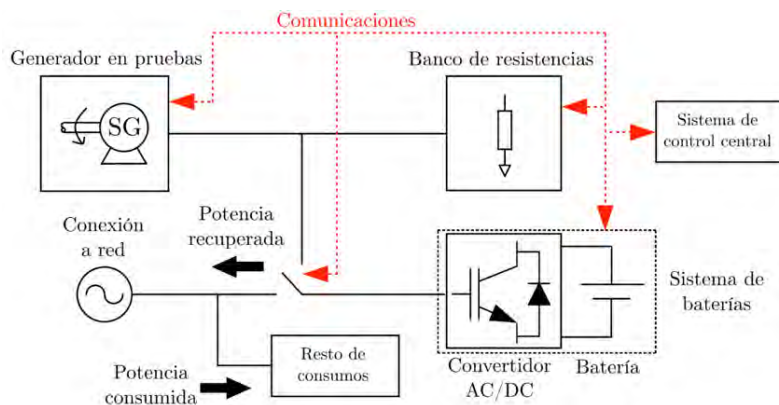
Stability of power networks with high penetration of renewables

- Power electronics converter interaction with the grid and rotating generators. Small signal and impedance based analyses of power networks.
- Frequency and voltage stability of power networks. Analyzed the impact of renewable sources and storage technologies for their use in power system stability.
- Small-signal modelling of AC, DC and hybrid power networks. Detailed small signal models of all network elements and their integration in the system model.
- Bifurcation theory application in power systems and microgrids. Addressed a novel way to determine the impact of conventional and renewable generation as well as dynamic loads on the network stability.



Energy management and energy efficiency applications

- Energy Management Systems for microgrids and self-consumption: developed optimisation based algorithms to reduce energy consumption, CO₂ emissions and running costs.
- Energy saving in generator testing and vibration testing systems: analyzed industrial real-time applications of energy saving and energy recovery.
- Application of power converters for energy efficiency: savings offered by increased flexibility of power converter applications.





System Analysis Unit

annual report
2021



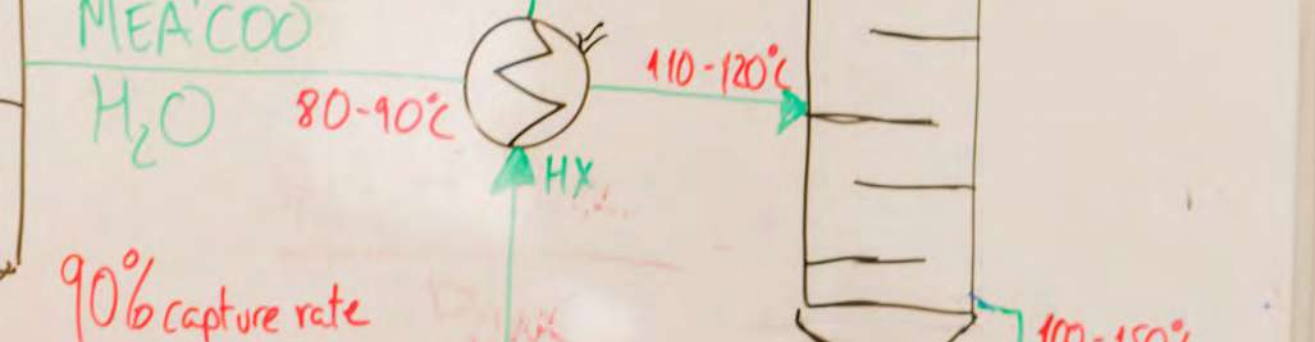
Dr. Javier Dufour
Research Professor
Head of the Unit



Dr. Diego Iribarren
Senior Researcher



Dr. José Luis Gálvez
Senior Assistant
Researcher

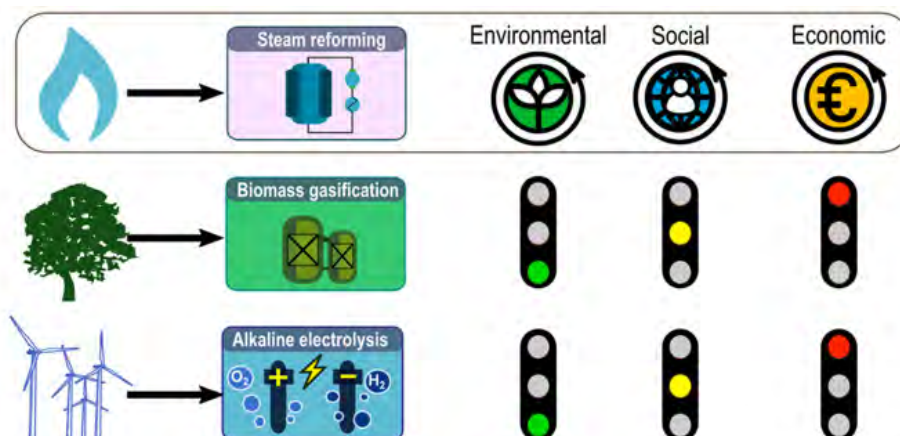


R&D Objectives

- Design, modelling, simulation and optimization of energy and energy-related systems.
- Sustainability assessment of energy-related processes, including environmental, economic and social issues.
- Sustainability-oriented energy planning.

Research lines

- Role of waste and waste-to-energy technologies in the framework of circular economy and production of clean fuels.
- Hydrogen systems analysis.
- Development of sustainability-oriented energy models.
- Sustainability of CO₂ capture and utilization processes. Industrial decarbonization.



Relevant projects and networking

In 2021, the Systems Analysis Unit (SAU) has participated in 11 research projects and 5 research contracts. At European level, two projects related to hydrogen (SH2E and eGHOST) were kicked-off, both of them are coordinated by SAU and are related to the development of harmonized life cycle sustainability assessment and the eco-design of hydrogen systems, respectively. As well, the HYSOLCHEM and OLE-OFERM projects, where SAU is in charge of the life cycle sustainability assessment of novel chemical and energy products, began. SAU continued its participation in the EU CEF ECO-GATE project about the deployment of compressed and liquid natural gas infrastructure for transportation, in the LIFE SUPERBIODIESEL project, which is focused on the deployment of a supercritical process for the production of biodiesel from waste animal fats, and in the 2 projects related to CO₂ mitigation in the construction materials sector coordinated by the Gulf Organisation for Research and Development and funded by the Qatar National Research Fund.

At domestic level, three projects were continued: the REDEFINERY project with simulation models of thermochemical processes for organic wastes recovery and an optimization model for waste management based on Madrid integrating economic and environmental issues; the MENTES network, related to energy planning; and the FotoArt programme, studying the scalability and feasibility of photo-electro-catalytic and photo-catalytic systems.

Among the 5 research contracts, the technical roadmap for the deployment of hydrogen technologies in Spain is being developed in the framework of DESHEO. Other contracts were related to hydrogen production from wastes (1), bioethanol also from wastes (2) and life cycle assessment of materials (1).

Regarding networking, Javier Dufour continued as Deputy Leader of the Cross-Cutting Activities Technical Committee of Hydrogen Europe Research and Diego Iribarren as the chairman of the Spanish Network for Life Cycle Assessment (esLCA).

Capabilities

Sustainability assessment of energy systems

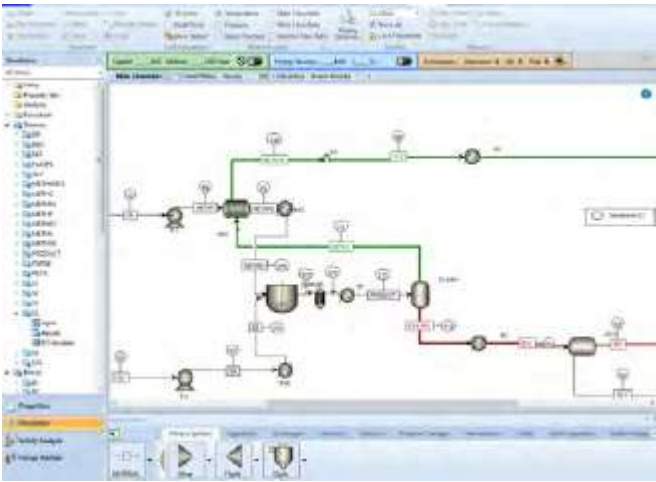
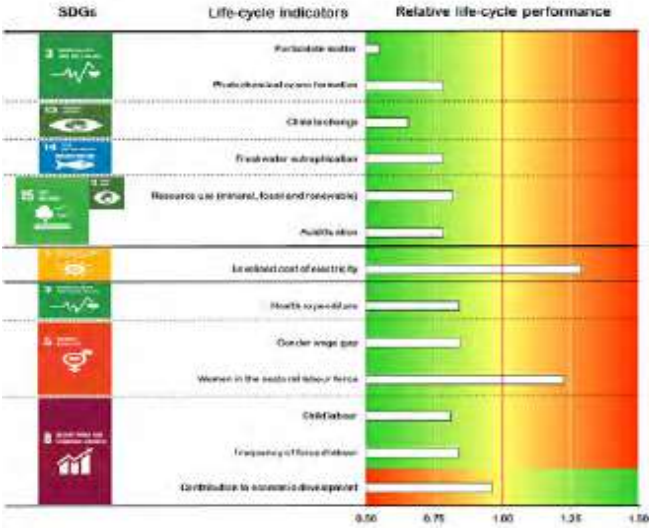
- Environmental LCA, carbon footprinting and eco-design.
- Combined application of LCA and Data Envelopment Analysis for multi-criteria decision analysis.
- Prospective LCA.
- Social life cycle assessment, life cycle costing, and eco-efficiency assessment.
- Harmonised LCA and life cycle sustainability assessment.

Feasibility of energy processes

- Mathematical modelling, scaling-up, simulation and optimization.
- Techno-economic analysis.
- Waste management system and waste-to-energy modelling within the circular economy paradigm.
- Energy and exergy analyses.

Energy planning

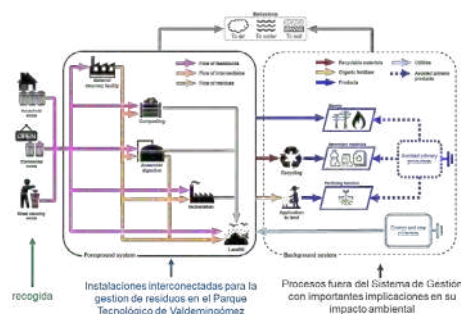
- Development of national and regional energy models and roadmaps (Spain, Region of Madrid, etc.).
- Evolution of techno-economic and sustainability indicators in prospective energy scenarios, and demand projection.



Scientific and technical results

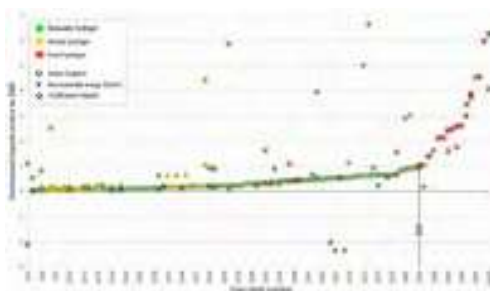
Role of waste and waste-to-energy technologies in the framework of circular economy and production of clean fuels

- Modelling of wastes pyrolysis has been obtained.
- Mathematical modelling, simulation and life cycle assessment of bio-ethanol production from the organic fraction of municipal solid waste were developed.
- Evaluated the life cycle assessment and modelling of supercritical biodiesel production from waste animal fats.
- Studied the conversion of synthesis gas to aromatics in dual catalyst beds.
- Completed the life cycle sustainability assessment of synthetic fuels from date palm waste.
- Assessment of the energy recovery potential of municipal solid waste under future scenarios.
- Environmental and economic optimization of municipal solid waste management for decision-making: case study of Madrid.



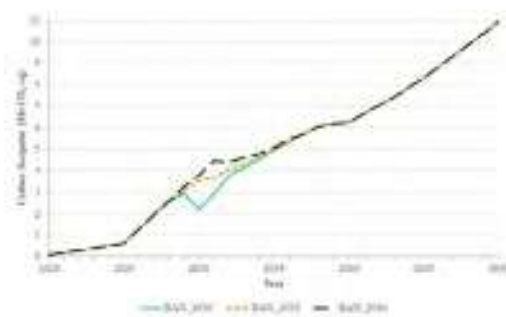
Hydrogen systems analysis

- Development of harmonized life cycle assessment of hydrogen systems.
- Completed the comparative life cycle sustainability assessment of renewable and conventional hydrogen.
- Studied the harmonized carbon and energy footprints of fossil hydrogen.
- Evaluated the harmonized life-cycle indicators of nuclear-based hydrogen.
- Completed the comparative life cycle assessment of hydrogen-fuelled passenger cars.
- Eco-design of a PEM fuel cell stack.



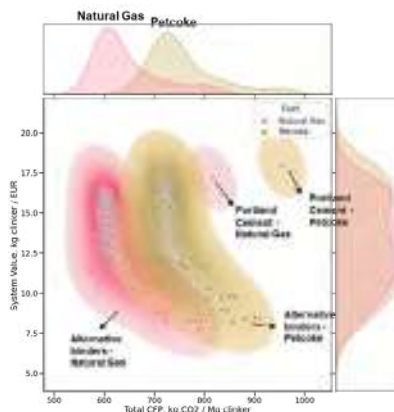
Development of sustainability-oriented energy models

- Revisiting the role of steam methane reforming with CO₂ capture and storage for long-term hydrogen production.
- Developed the prospective analysis of green hydrogen production in Spain with time horizon 2050.
- Proposed initiatives in energy-socio-economic-environmental modelling for a sustainable energy transition.
- Proposed the role of life cycle assessment in a taxonomy of models for investigating hydrogen energy systems.



Sustainability of CO₂ capture and use processes. CO₂ mitigation in the industrial sector

- Determined the feasibility of sodium hydroxide utilization in carbon capture approaches.
- Stated the eco-efficiency and life-cycle performance of decarbonization approaches of cementitious materials.
- Studied the production of carbon nanotubes from CO₂ electrolysis coupled to cement production with oxycombustion and/or post-combustion capture.
- Carbon-negative materials based on carbonates: thermodynamic modelling, statistic validation of performance and system-value inference.
- Early feasibility study of power-to-gas and power-to-fuel systems.
- Technical optimization and economic assessment of natural gas combined cycle power plants with CO₂ capture.





Photoactivated Processes Unit



Dr. Victor A. de la Peña
Senior Researcher
Head of the Unit



Dr. Marta Liras
Senior Assistant
Researcher



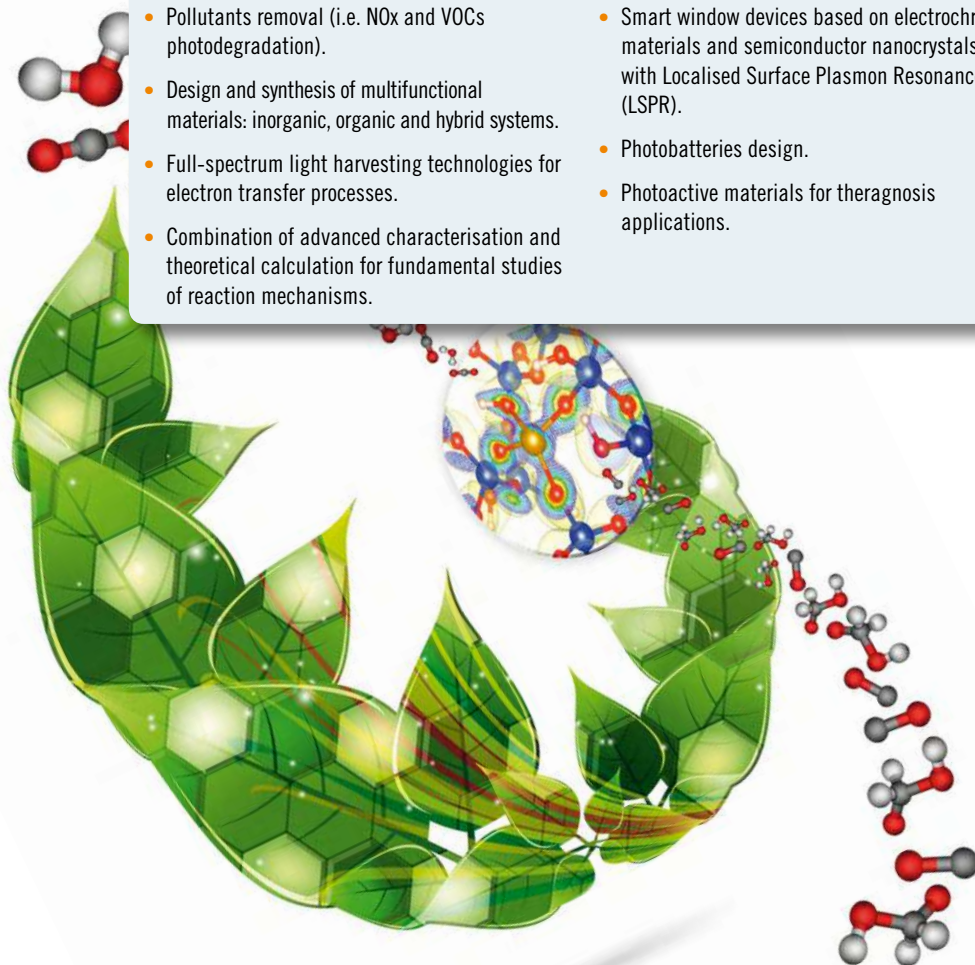
Dr. Fernando Fresno
Senior Assistant
Researcher



Dr. Mariam Barawi
Senior Assistant
Researcher



Dr. Laura Collado
Senior Assistant
Researcher



R&D Objectives

- Covering the materials, processes and technologies that allow a smart and efficient light harvesting to drive photo-activated processes for energy and environmental applications.

Research lines

- Solar fuels and chemicals production including: CO_2 photoreduction, H_2 production, ammonia production and add value chemical synthesis.
- Pollutants removal (i.e. NO_x and VOCs photodegradation).
- Design and synthesis of multifunctional materials: inorganic, organic and hybrid systems.
- Full-spectrum light harvesting technologies for electron transfer processes.
- Combination of advanced characterisation and theoretical calculation for fundamental studies of reaction mechanisms.
- Photoreactors and devices (photocatalytic and photoelectrocatalytic) for energy and environmental applications.
- Smart window devices based on electrochromic materials and semiconductor nanocrystals with Localised Surface Plasmon Resonance (LSPR).
- Photobatteries design.
- Photoactive materials for theragnosis applications.

Relevant projects and networking

In 2021 the Photoactivated Processes Unit (PAPU) has participated in 16 research projects and grants funded at regional, national and European level. Dr. Víctor A. de la Peña O'Shea, senior researcher and head of the PAPU, has the support of a European project, HYMAP, corresponding to the call ERC-2014- Consolidator Grant under the European Union's Horizon 2020 research and innovation programme. HYMAP has been extended during 2021 due to COVID-19. Furthermore, an ERC-PoC associated to HYMAP, NanoCPP, related with manufacture of nanostructured conjugated porous polymers has been carried out. At the beginning of 2021, HYSOLCHEM a FET Pro-Active Project (H2020) coordinated by the PAPU team started. Recently, a new ERC-PoC, DEMONIA, has been awarded with the objective to develop photoelectrochemical technologies to synthesize ammonia.

At the national level, PAPU is funded and supported through several projects such as Nhympa, Art Leaf as well as by a Ramón y Cajal Programme project, all of them related with the design and synthesis of new materi-

als and systems (inorganic semiconductors, conductive polymers, organic-inorganic hybrids and up-conversion sensitizers) as heterogeneous photocatalysts and photoelectrodes for artificial photosynthesis. Also, a couple of projects Nova CO₂ and ARMONIA were funded and started during 2021. It to be highlighted that a Strategic lines project (SOLFUTURE) coordinated by PAPU, focused on the development of solar catalysis for a renewable future, has been funded starting also during 2021.

In the regional framework, the unit is coordinating the FotoArt program (New Generation of Multifunctional Materials for Artificial Photosynthesis). Also, at industrial level, PAPU holds a project with Daimler Benz company and a project with HFC company. On the other hand, PAPU participates in the Spanish CO₂ technological platform (PTECO2) where the head of the Unit coordinates the CO₂ uses working group, and in the Iberian Photocatalysis Association. In addition, the PI is also vocal in the Specialized Group on Crystallography and Crystal Growth (GE3C) of Spanish Royal Society of Chemistry.



Facilities

Synthesis of materials

- Equipment for organic and polymer synthesis.
- Thermal and microwave ovens and autoclaves for hydrothermal synthesis.
- Tools for chemical synthesis under controlled atmosphere.
- Ball milling; spin coating and microfluidizer equipment.

Materials characterization facilities

- Single-crystal X-ray diffraction equipment with Cu μ -focus source.
- Transient absorption spectrophotometer provided with an i-CCD camera and a tuneable laser radiation source.
- Time-resolved fluorescence spectrometer.
- Electro- and photoelectrochemical characterisation in three and two electrode cell configurations. Cyclic voltammetry, photovoltage, photocurrent and electrochemical impedance spectroscopy (EIS) by potentiostatic and galvanostatic measurements.
- *In situ* and operando cells for spectroscopic measurements such as FTIR, Raman, XPS, NEXAFS, at laboratory and synchrotron set-ups.
- Near-ambient pressure (NAP) XPS which allows for *in-situ* characterisation of photocatalytic processes.

Reactors

- Gas-phase reactors and micro-reactors for photocatalytic reduction of CO₂ provided with gas chromatography for product analysis.
- Liquid- and gas-phase reactors for photocatalytic H₂ production coupled to in-line gas chromatography for product analysis or mass spectrometry.
- Photoelectrochemical cells for solar fuels production by water splitting and

CO₂ reduction, coupled to simulated solar light, potentiostatic measurements and in-line gas chromatography.

- Gas-phase compound parabolic collector solar reactor for CO₂ reduction and H₂ production with solar radiation measurement and chromatographic gas analysis.
- Spectroelectrochemical cells for spectral response and electrochromic response measures.

Theoretical calculations and modelling

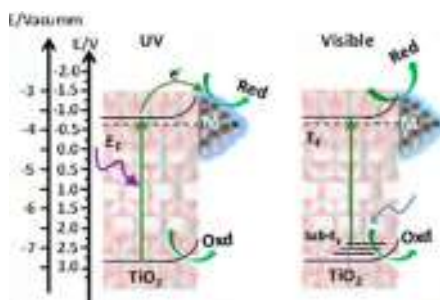
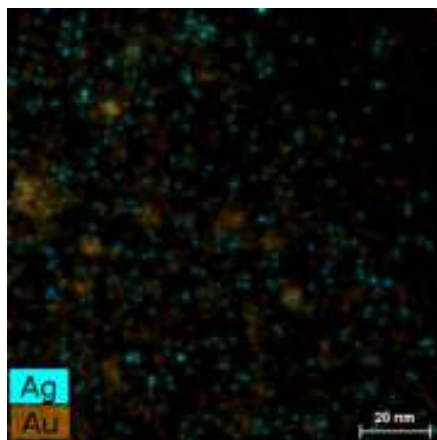
- Work stations
- Software for chemical modelling.
- Tools for computational fluid dynamics, data treatment and process engineering.



Scientific and technical results

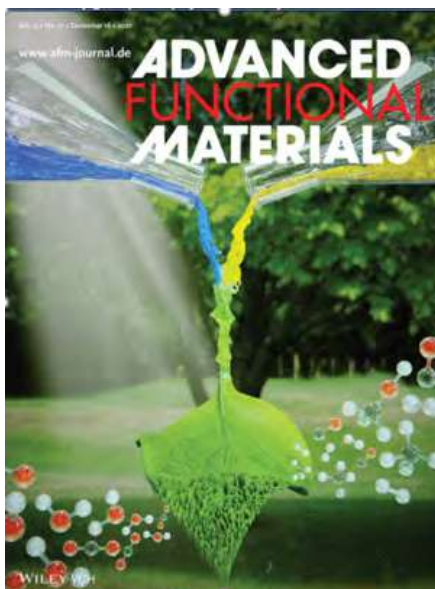
Development of novel inorganic photocatalysts

- Band-Gap engineering synthesis of UV- and visible-light-absorbing metallates based on group-5 metals and cations with outer shell s-electrons.
- Prepared novel metal-oxide heterojunctions with improved photocatalytic activity and extended absorption spectrum.
- Controlled deposition of metal nanoparticles as co-catalysts in mono- and bi-metallic catalytic systems.
- Developed new synthesis of colloidal metal oxides nanoparticles as well as doping of them to prepare smart windows.



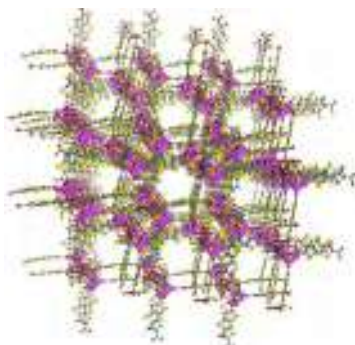
Design and synthesis of conjugated porous polymers and their hybrids

- Designed and synthesized Conjugated Porous Polymers (CPPs) based on DTT, benzodithiophenes, thienoacenes, phenylvinylidene, fulvalene, BODIPY and BOPHY moieties.
- Design and synthesis of Covalent Organic Frameworks (COFs) based on BODIPY and BOPHY dyes.
- Synthesized nanostructured CPPs and COFs by miniemulsion and electropolymerization techniques to obtain thin film photoelectrodes as well as electrochromic windows. Microfluidic techniques have been carried out in order to achieve control over particle size in miniemulsion approach.
- Prepared and characterized hybrid materials based on conjugated porous polymers and inorganic semiconductors, including thin film configuration.



MOFS

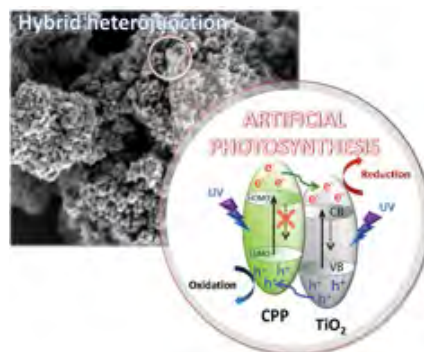
- Implemented the design and synthesis of novel UV- and visible-light-absorbing building blocks as organic MOF linkers. Implemented the design and synthesis of MOFs based on group-5 metals.
- Design and synthesis of organic ligands based on rotaxanes as organic linkers to Metal Organic Rotaxane Frameworks (MORFs)
- Carried out post-functionalization including metal nanoparticles, redox coordination compounds and organic polymers.



Fundamental studies of reaction mechanisms

- Determined the structural, textural and morphological properties of multifunctional materials.
- Performed the optoelectronic characterization by time-resolved optical techniques to correlate these intrinsic properties with the efficiency of the devices for light-driven technologies.
- Conducted *in-situ* characterization under working conditions using vibrational and optical spectroscopies with both laboratory and synchrotron radiation based techniques.
- Used advanced characterization techniques in synchrotron facilities (i.e. XAS and XPS).

- Carried out *ab-initio* and QM Theoretical calculation to study the influence of electronic properties in the reaction mechanism.



Process evaluation and scale-up

- Achieved synergistic improvement of solar fuels production using hybrid photocatalysts including organic-inorganic hybrid and MOFs.
- Isotopic experiments to determine the source of product have been carried out.
- Conducted scalability studies for CO₂ photoreduction catalysts.
- Realized the preparation of thin films of new synthesised materials and evaluation as photoelectrodes in photoelectrochemical cells including tandem cell.
- Photoelectrocatalysis testing of materials from other collaborative groups (ie. Carbonaceous, C₃N₄, MOFs, nanostructured TiO₂, etc.) have been carried out.





Advanced Porous Materials Unit

annual report
2021



Dr. Patricia Horcajada
Senior Researcher
Head of the Unit



Dr. Yolanda Pérez
Senior Researcher
(Associated)



Dr. Tania Hidalgo
Assistant Researcher

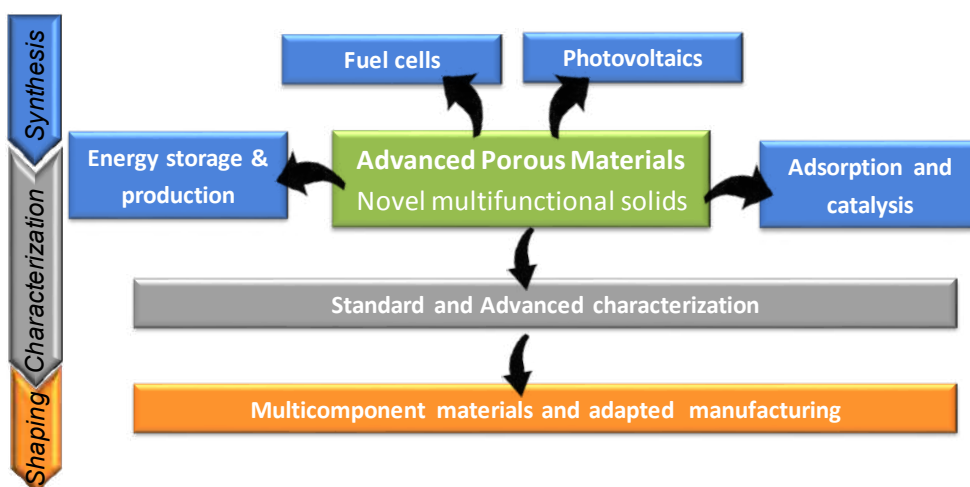


R&D Objectives

- Development of innovative multifunctional solids.
- Full understanding of the structural features for improving and/or adapting the materials properties to specific applications.
- Adapted devices for their final applications (scale-up and shaping).

Research lines

- Proton conducting materials: Fuel cells.
- Semiconducting materials: Photovoltaics.
- Electroactive materials: Energy storage and production.
- Adsorbent and catalytic materials.





Relevant projects and networking

During 2021, the Advanced Porous Materials Unit (APMU) has been involved in different projects:

- Coordinating 2 European projects: a MSCA-ITN project HeatNMof focused on the heating triggered drug release using nanometric inorganic-metal organic framework (MOF) composites and a M-ERA.NET C-MOF. Cell working on MOF composites as efficient electrolytes in fuel cells.
- 5 national projects: ESENCE, involving a company, dealing with the preparation of new multifunctional materials for the removal of emerging contaminants from wastewater; MOFseidon, focused on the development of MOFs for the combined removal of emerging organic contaminants from wastewater; H+MOF, which aims to develop fuel cells based on novel composite MOFs; BatPORO, aiming to develop nanostructured carbon materials as electrodes for supercapacitors; and a collaboration networking MetalloDrug dealing with the development of multifunctional metallodrugs in diagnosis and therapy.
- 4 regional fundings: Madrid-PV2-CM dealing with the investigation of materials, devices and technologies for the development of the photovoltaic industry; Clorato an industrial doctorate in collaboration with Canal de Isabel II for drinking water purification; Madrid+Circular developing new catalyst for hydrotreatment of pyrolytic and catalytic oils; and VirMOF dealing with the pulmonary combined multitherapy of Covid.

In addition, APMU has been awarded with 5 personal fellowships: 4 regional grants (1 Junior Postdoctoral Talento, 1 Predoctoral), 2 National predoctoral FPI grants and 2 postdoctoral European fellows (IF-MSCA, Cofund Energy Got Talent program in collaboration with URJC). Two additional grants, belonging to the PF-MSCA 2021 call have been granted for starting in 2023.

APMU possesses a large frame of collaborations at the national, European and international level that has enhanced mobility actions and collaborative projects. APMU is also involved in the MATERPLAT platform, promoting innovation in advanced materials Spanish system, and in different chemical-related associations (RSEQ, AEBIN, IAAM, IWA, SECAT, etc.).

Facilities

Synthesis

- Best practice organic/inorganic laboratory tools: Schlenk lines, ovens, rotatory evaporator, (ultra)centrifuge, climate chamber, thin-layer chromatography (TLC), UV lamp, Soxhlet, glove box, etc.
- Traditional inorganic synthetic methods: two-layer diffusion, evaporation, high temperature...
- Conventional solvothermal, microwave-assisted, sonochemical, mechanochemical methods, syringe pump techniques.
- High-through put solvothermal method.

Manufacturing

- Supercritical CO₂ extraction system (material purification, adsorption, shaping)
- Thin films, membranes, pellets, granules, monoliths press-molding, spray drying, spin-coating, pelletizer/coating pan evaporation, etc.



Characterization

- High-through put filtration system coupled with multi-sample XRPD.
- In situ structural characterization (XRD, IR) as a function of temperature, adsorbate and pressure.
- Experimental crystalline structure determination and refinement.
- Chemical, structural, mechanical and colloidal stability tests.
- High performance liquid chromatography (HPLC) coupled with a PDA and MS detectors.
- Ionic chromatography.
- Cell culture facilities, permeation chambers, cytotoxic handling, access to animal facilities.



Scientific and technical results

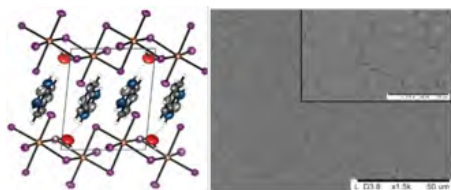
Proton conducting materials: fuel cells

- Ionic exchange of some labile protons from the robust zirconium phosphonate UPG-1 led to proton conductivities up to 2 orders of magnitude higher compared with the pristine material, being among the highest reported values for phosphonate MOFs.
- Mixed matrixed membranes of the K-exchanged UPG-1 were successfully prepared, demonstrating better mechanical stability and enhanced properties.



Semiconducting materials: photovoltaics

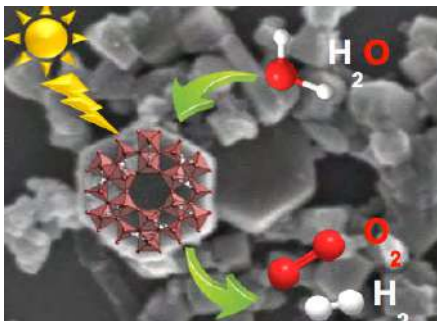
- A novel 1D perovskite (IEF-4) based on iodobismuthates and the benzimidazolium cation with an original reversible dehydration-hydration process and a high absorption coefficient, comparable to that of the toxic lead perovskites. Its exceptional stability, excellent optical properties and environmentally friendly



character pave the way for its successful application in optoelectronic devices such as multijunction solar cells, LEDs, and photodetectors.

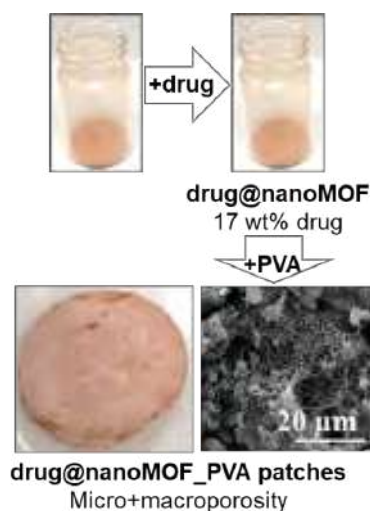
Electroactive materials: energy storage and production

- Two novel MOF structures based on a nickel triazine phosphonate (IEF-13) and a titanium squarate (IEF-11) with outstanding stability and optical properties. Without further modification and in absence of any co-catalyst or sacrificial agent, they are able to produce H_2 and O_2 from water at rates among the highest ever reported under visible light.



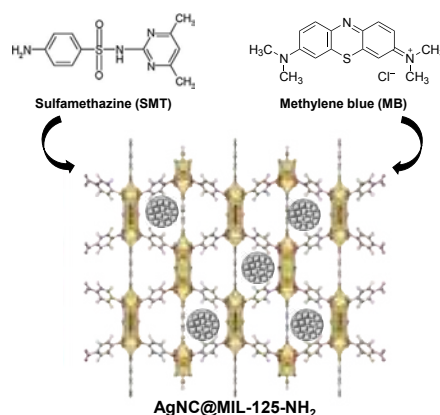
Adsorbent and catalytic materials: biomedical applications

- Development of a supercritical CO₂ technology for the preparation of a cutaneous formulation based on drug-loaded MOFs and polymers, including 3-steps for the MOF synthesis, drug encapsulation and patch shaping.
- *In vitro* evaluation of the biosafety and cell internalization of a pulmonary formulation of a MOF containing the first line antituberculosis drug isoniazid.
- The porous zirconium aminoterephthalate UiO-66-NH₂ fulfilled the requirements of a topical delivery system for salicylic acid (important loadings and adapted release kinetics).
- Pioneer biosafe oral formulation based on the antitumoral genistein and a MOF, with a higher oral bioavailability than the free drug. MOF acted as a shelter for the drug, impeding its metabolization.



Adsorbent and catalytic materials: environmental applications

- A robust nickel bispyrazolate MOF showing a very efficient decontamination of the widely prescribed antihypertensive atenolol (higher than that for current active charcoal filters. Its manufacturing into columns demonstrated an effective removal of atenolol during 12 days.
- Development of an ultrafast two-step photoreduction synthetic protocol for the stabilization of very small Ag nanoclusters (1 nm; 28 Ag atoms) within the porosity of a photoactive MOF.
- The resulting AgNC@MOF composite demonstrated great potential for the visible light assisted degradation of challenging emerging organic contaminants in tap water. This in-continuous flow decontamination system enabled the purification of 6.5 L h⁻¹ g⁻¹ of contaminated water.
- The ability to remove the antibiotic sulfamethazine from water could be improved by nanosizing the MOF and functionalizing its porosity.



annex

R&D projects,
contracts and grants

73

scientific results

98

training and
dissemination activities

123

annex

1. R&D projects, contracts and grants

1.1. Regional R&D projects

1. Title/Acronym: Concentrated solar thermal energy in the transport sector and heat and electricity production / ACES2030-CM (S2018/EMT-4319)

Partners: IMDEA Energy Institute (Coordinator); CIEMAT; ICP-CSIC; Carlos III University; UNED, Polytechnic University of Madrid; Rey Juan Carlos University; Lab 327

Period: 2019-2023

Funding Institution/Program: Comunidad de Madrid / Program of R&D activities between research groups in Technology 2018

IMDEA Energy Institute external funding: 251.671 € €

2. Title/Acronym: New generation of multifunctional materials for artificial photosynthesis / FotoArt-CM (S2018/NMT-4367)

Partners: IMDEA Energy Institute (Coordinator); ICMM-CSIC; Autonoma University of Madrid; IMDEA Nanoscience Institute; ICP-CSIC; IMDEA Materials Institute; Lab 369; Lab 150; Lab 442; Lab 433

Period: 2019-2023

Funding Institution/Program: Comunidad de Madrid / Program of R&D activities between research groups in Technology 2018

IMDEA Energy Institute external funding: 303.774 € €

3. Title/Acronym: Smart Microgrids Programme for Community of Madrid / PROMINT-CM (S2018/EMT-4366)

Partners: University of Alcalá (Coordinator); Carlos III University; Pontificia Comillas University of Madrid; IMDEA Energy Institute; Lab 169; Lab 368

Period: 2019-2023

Funding Institution/Program: Comunidad de Madrid / Programa de Actividades de I+D entre Grupos de Investigación de la Comunidad de Madrid en Tecnologías 2018

IMDEA Energy Institute external funding: 169.728 € €

4. Title/Acronym: Materials, devices and technologies for the development of the photovoltaic industry / MADRID-PV2-CM (S2018/EMT-4308)

Partners: Polytechnic University of Madrid (Coordinator); IMDEA Nanoscience Institute; Complutense University of Madrid; INM-CSIC; Lab 270; Lab 439

Period: 2019-2023

Funding Institution/Program: Comunidad de Madrid / Programa de Actividades de I+D entre Grupos de Investigación de la Comunidad de Madrid en Tecnologías 2018

IMDEA Energy Institute external funding: 79.585 € €

5. Title/Acronym: Development of advanced microalgae technologies for a circular economy / ALGATEC-CM (S2018/BAA-4532)

Partners: Rey Juan Carlos University (Coordinator); CIB-CSIC; CIEMAT; Autonoma University of Madrid; Polytechnic University of Madrid; Lab 370

Period: 2019-2023

Funding Institution/Program: Comunidad de Madrid / Programa de Actividades de I+D entre Grupos de Investigación de la Comunidad de Madrid en Tecnologías 2018

IMDEA Energy Institute external funding: 131.000 € €

6. Title/Acronym: Urban bioeconomy: transformation of bio-waste into biofuels and bioproducts of industrial interest / BIOTRES-CM (S2018/EMT-4344)

Partners: Rey Juan Carlos University (Coordinator); ICP-CSIC; Autonoma University of Madrid; CIEMAT; Lab 165; Lab 444

Period: 2019-2023

Funding Institution/Program: Comunidad de Madrid / Programa de Actividades de I+D entre Grupos de Investigación de la Comunidad de Madrid en Tecnologías 2018

IMDEA Energy Institute external funding: 120.433 € €

7. Title/Acronym: NanoMOFs inmuno/quimio-activos para la multiterapia pulmonar anti-COVID / VIRMOF-CM

Partners: IMDEA Energy Institute

Periodo: 2011-2022

Funding Institution/Program: Comunidad de Madrid / Proyectos de I+D+i en materia de respuesta a COVID-19

IMDEA Energy Institute external funding: 1.065.000 € €

1.2. National R&D projects

1. Title/Acronym: Microbial-oils production via anaerobic digestion: bioconversion of volatile fatty acids by oleaginous yeasts / ACMIBIO-DA (ENE2017-86864-C2-2-R)

Partners: CIEMAT (Coordinator); IMDEA Energy Institute; Neol Biosolution; BIOPLAT; FIAB

Period: 2018-2021

Funding Institution/Program: Ministry of Economy, Industry and Competitiveness / Research, Development and Innovation Oriented Challenges of the Society. Research Challenges 2017

IMDEA Energy Institute external funding: 114.950 € €





2. Title/Acronym: Environmental and energy applications of electrochemical technology / Red E3Tech (CTQ2017-90659-REDT)

Partners: University of Castilla-La Mancha (Coordinator); Universitat de Barcelona; University of Cantabria; University of Alicante; Polytechnic University of Valencia; University of Vigo; Polytechnic University of Cartagena; University of Valencia; IMDEA Energy Institute

Period: 2018-2021

Funding Institution/Program: Ministry of Economy, Industry and Competitiveness / State Program for Promotion of Scientific and Technical Research Excellence. Acciones de dinamización “Redes de excelencia” 2017

3. Title/Acronym: Nanostructured multifunctional membranes for solar fuels production by artificial photosynthesis / Art-LEAF (CIVP19A5951)

Partners: IMDEA Energy Institute

Period: 2019-2022

Funding Institution/Program: Fundación Ramón Areces / XVII Concurso Nacional para la adjudicación de ayudas a la Investigación en Ciencias de la Vida y de la Materia 2018
IMDEA Energy Institute external funding: 126.568 € €

4. Title/Acronym: Novel proton-conducting MOF composites for fuel cell devices / H+MOFs (CIVP19A5950)

Partners: IMDEA Energy Institute

Period: 2019-2022

Funding Institution/Program: Fundación Ramón Areces / XVII Concurso Nacional para la adjudicación de ayudas a la Investigación en Ciencias de la Vida y de la Materia 2018
IMDEA Energy Institute external funding: 126.568 € €

5. Title/Acronym: Computer-aided macromolecular design of redox-active polymers: promising paradigm for sustainable battery research and development / SUSBAT (RTI2018-101049-B-I00)

Partners: IMDEA Energy Institute

Period: 2019-2022

Funding Institution/Program: Ministry of Science, Innovation and Universities / Research, Development and Innovation Oriented Challenges of the Society. Research Challenges 2018
IMDEA Energy Institute external funding: 145.200 € €

6. Title/Acronym: Redefining the waste-energy nexus: a new concept of regional refinery for the circular economy / REDEFINERY (RTI2018-097227-B-I00)

Partners: IMDEA Energy Institute

Period: 2019-2022

Funding Institution/Program: Ministry of Science, Innovation and Universities / Research, Development and Innovation Oriented Challenges of the Society. Research Challenges 2018
IMDEA Energy Institute external funding: 181.500 € €

7. Title/Acronym: Ionic systems for energy sustainability / SISE (RED2018-102679-T)

Partners: Universidade da Coruña (Coordinator); Universidade de Santiago de Compostela; Fundación Universidad San Jorge; University of País Vasco; University of Vigo; University of Cantabria; Fundación Tecnalia; University of Murcia; IIAG-CSIC; Universitat Rovira I Virgili; Universitat Jaume I De Castello; Complutense University of Madrid; University of Valencia; Polytechnic University of Cartagena; IMDEA Energy Institute

Period: 2020-2022

Funding Institution/Program: Ministry of Science, Innovation and Universities / State Program for Promotion of Scientific and Technical Research Excellence. Acciones de dinamización “Redes de excelencia” 2018

8. Title/Acronym: Concentrating Solar Thermal Systems / SolTerCo (RED2018-102460-E)

Partners: CIEMAT (Coordinator); Carlos III University of Madrid; Universitat Politècnica de Catalunya; Fundación Tekniker; IMDEA Energy Institute; University of Sevilla; CIC Energigune; Fundación CENER-CIEMAT

Period: 2020-2022

Funding Institution/Program: Ministry of Science, Innovation and Universities / State Program for Promotion of Scientific and Technical Research Excellence. Acciones de dinamización “Redes de excelencia” 2018

9. Title/Acronym: Combined separation and (photo)degradation of water contaminants using Metal-Organic Framework devices / MOFSEIDON (PID2019-104228RB-I00)

Partners: IMDEA Energy Institute

Period: 2020-2023

Funding Institution/Program: Ministry of Science and Innovation / Research, Development and Innovation Oriented Challenges of the Society. Research Challenges 2019
IMDEA Energy Institute external funding: 193.600 € €

10. Title/Acronym: Nano-Structured Hybrid Materials for Solar Fuels Photoelectrocatalytic / NHyMPha (PID2019-106315RB-I00)

Partners: IMDEA Energy Institute

Period: 2020-2023

Funding Institution/Program: Ministry of Science and Innovation / Research, Development and Innovation Oriented Challenges of the Society. Research Challenges 2019
IMDEA Energy Institute external funding: 249.260 € €

11. Title/Acronym: Hydrogen produced in microbial electrolytic cells as an energetic storage system / POWER TO GAS

Partners: IMDEA Energy Institute

Period: 2020-2021

Funding Institution/Program: Fundación Iberdrola Spain / Call for research funding in energy and environment 2020-2021
IMDEA Energy Institute external funding: 10.000 € €

12. Title/Acronym: Nanostructured porous carbons for the electrochemical energy storage / Bat-poro

Partners: IMDEA Energy Institute

Period: 2020-2021

Funding Institution/Program: Fundación Iberdrola Spain / Call for research funding in energy and environment 2020-2021

IMDEA Energy Institute external funding: 20.000 € €

13. Title/Acronym: Unit of Excellence María de Maeztu (CEX2019-000931-M)

Partners: IMDEA Energy Institute

Period: 2020-2023

Funding Institution/Program: Ministry of Science and Innovation / “Severo Ochoa Centres of Excellence” and the “María de Maeztu Units of Excellence” 2019

IMDEA Energy Institute external funding: 2.000.000 € €

14. Title/Acronym: Catalytic upgrading and co-processing of holocellulose-derived bio-oils / NHyMPha (PID2020-114740RB-C21)

Partners: IMDEA Energy Institute (Coordinator); Rey Juan Carlos University

Period: 2021-2024

Funding Institution/Program: Ministry of Science and Innovation / Research, Development and Innovation Oriented Challenges of the Society. Research Challenges 2020

IMDEA Energy Institute external funding: 213.686 € €

15. Title/Acronym: Biowaste conversion to H₂ and microbial oils for fuel production / BIOMIO (PID2020-119403RB-C21)

Partners: IMDEA Energy Institute (Coordinator); CIEMAT

Period: 2021-2024

Funding Institution/Program: Ministry of Science and Innovation / Research, Development and Innovation Oriented Challenges of the Society. Research Challenges 2020

IMDEA Energy Institute external funding: 133.100 € €

16. Title/Acronym: High-efficiency and modular solar fields for high-solar flux densities / HECTOR (PID2020-119693RB-C31)

Partners: IMDEA Energy Institute

Period: 2021-2024

Funding Institution/Program: Ministry of Science and Innovation / Research, Development and Innovation Oriented Challenges of the Society. Research Challenges 2020

IMDEA Energy Institute external funding: 145.200 €

17. Title/Acronym: Photochemical technologies for CO₂ valorization / novaCO₂ (PID2020-118593RB-C22)

Partners: ICP-CSIC (Coordinator); IMDEA Energy Institute

Period: 2021-2024

Funding Institution/Program: Ministry of Science and Innovation / Research, Development and Innovation Oriented Challenges of the Society. Research Challenges 2020

IMDEA Energy Institute external funding: 145.200 € €

18. Title/Acronym: Powering the Future with Solar Ammonia: Innovative light-mediated routes over nanostructured hybrid materials / ARMONIA (PID2020-119125RJ-I00)

Partners: IMDEA Energy Institute

Period: 2021-2024

Funding Institution/Program: Ministry of Science and Innovation / Research, Development and Innovation Oriented Challenges of the Society. Research Challenges 2020

IMDEA Energy Institute external funding: 181.500 € €

19. Title/Acronym: GREENH2CM

Partners: CIEMAT (Coordinator); IMDEA Energy Institute; UCM; CEU-San Pablo

Period: 2021-2024

Funding Institution/Program: Ministry of Science and Innovation / Comunidad de Madrid / Plan de trabajo para la ejecución de un programa de I+D+i en el marco de los planes complementarios con cargo a los fondos del Plan de Recuperación, Transformación y Resiliencia (PRTR)

IMDEA Energy Institute external funding: 2.181.212 € €

1.3. Industrial R&D projects

1. Title/Acronym: Design and optimization of a continuous reactor for the catalytic pyrolysis of biomass and the production of high quality bio-oils / DI-PID (IND2017/AMB-7660)

Partners: Process Integral Development & Tech; IMDEA Energy Institute

Period: 2018-2021

Funding Institution/Program: Comunidad de Madrid / Industrial Doctorates 2017

IMDEA Energy Institute external funding: 76.000 € €

2. Title/Acronym: Research and study of flow microbatteries for application in photovoltaic microinverters / MIBAMIN (IND2017/AMB-7719)

Partners: Micro Electrochemical Technologies; IMDEA Energy Institute

Period: 2018-2021

Funding Institution/Program: Comunidad de Madrid / Industrial Doctorates 2017

IMDEA Energy Institute external funding: 78.000 € €

3. Title/Acronym: Advanced fuels and polymers from municipal solid wastes / RESUCAP (IND2018/AMB-9594)

Partners: Repsol; IMDEA Energy Institute

Period: 2019-2022

Funding Institution/Program: Comunidad de Madrid / Industrial Doctorates 2018

IMDEA Energy Institute external funding: 89.000 € €

4. Title/Acronym: Porous materials for the minimization of chlorates in treated waters / CLORATO (IND2019/AMB-17129)

Partners: Canal Isabel II; IMDEA Energy Institute

Period: 2020-2023

Funding Institution/Program: Comunidad de Madrid / Industrial Doctorates 2019

IMDEA Energy Institute external funding: 89.995 € €

5. Title/Acronym: Modeling and reformulation of batteries for emergency lighting devices / BAILEM (IND2019/AMB-17189)

Partners: Electroemper; IMDEA Energy Institute

Period: 2020-2023

Funding Institution/Program: Comunidad de Madrid / Industrial Doctorates 2019

IMDEA Energy Institute external funding: 90.000 € €

6. Title/Acronym: Hybridization of geothermal energy and flow batteries for heating and cooling of zero-energy tertiary use buildings / GeoBATT (RTC-2017-5955-3)

Partners: Sacyr Industrial (Coordinator); PVH Energy Storage; IMDEA Energy Institute; Polytechnic University of Madrid; Carlos III University of Madrid

Period: 2018-2022

Funding Institution/Program: Ministry of Science, Innovation and Universities / Research, Development and Innovation Oriented Challenges of the Society. Collaboration Challenges 2017

IMDEA Energy Institute external funding: 255.476 € €



7. Title/Acronym: Battery inverter with integrated controls of power converter and micro-grid / MICROGRID-ON-CHIP (RTC-2017-6262-3)

Partners: Norvento Energía Distribuida (Coordinator); IMDEA Energy Institute; University of Alcalá.

Period: 2018-2021

Funding Institution/Program: Ministry of Science, Innovation and Universities / Research, Development and Innovation Oriented Challenges of the Society. Collaboration Challenges 2017

IMDEA Energy Institute external funding: 91.480 € €

8. Title/Acronym: New technologies for the removal and in situ detection of emerging contaminants in wastewater / ESENCE (RTC-2019-007254-5)

Partners: Depuración de Aguas del Mediterráneo (Coordinator); IMDEA Energy Institute; Fundación Centro Tecnológico de Investigación Multisectorial

Period: 2020-2023

Funding Institution/Program: Ministry of Science and Innovation / Research, Development and Innovation Oriented Challenges of the Society. Collaboration Challenges 2019

IMDEA Energy Institute external funding: 82.288 € €

9. Title/Acronym: Production of sustainable fuels by UPGrading of both digestate and stillage RESidues through the integration of thermochemical, catalytic and biotechnological processes / UPGRES (PLEC2021-007761)

Partners: IMDEA Energy Institute (Coordinator); Rey Juan Carlos University; Ingelia; Repsol

Period: 2021-2024

Funding Institution/Program: Ministry of Science and Innovation / European Union Next-GenerationEU / PRTR / Proyectos en líneas estratégicas 2021

IMDEA Energy Institute external funding: 262.940 € €

10. Title/Acronym: Solar catalysis for a renewable energy future / SOL-Future (PLEC2021-007906)

Partners: IMDEA Energy Institute (Coordinator); ICMM; ICIQ; CIEMAT; Apria Systems; CEPASA

Period: 2021-2024

Funding Institution/Program: Ministry of Science and Innovation / European Union Next-GenerationEU / PRTR / Proyectos en líneas estratégicas 2021

IMDEA Energy Institute external funding: 253.630 € €

11. Title/Acronym: Circular Economy Innovation HUB of the Community of Madrid / HUB-MADRID+CIRCULAR

Partners: Repsol (Coordinator); IMDEA Energy Institute; Evoenzyme; Ariema Energía y Medioambiente; Seenso Renoval

Period: 2021-2023

Funding Institution/Program: Comunidad de Madrid

IMDEA Energy Institute external funding: 970.589 € €

1.4. International R&D projects

1. Title/Acronym: Hybrid materials for artificial photosynthesis / HyMap (648319)

Partners: IMDEA Energy Institute

Period: 2015-2022

Funding Institution/Program: European Union / H2020. ERC-2014-CoG

IMDEA Energy Institute external funding: 2.506.738 € €

2. Title/Acronym: High temperature concentrated solar thermal power plant with particle receiver and direct thermal storage / NEXT-CSP (727762)

Partners: CNRS (Coordinator); Électricité de France; Sbp Sonne; IMDEA Energy Institute; Comessa; Whittaker Engineering; European Powder and Process Technology; Katholieke Universiteit Leuven; Institut National polytechnique de Toulouse; Euronovia

Period: 2016-2021

Funding Institution/Program: European Union / H2020-JTI-FCH-2015-1 (FCH-04.1-2015)

IMDEA Energy Institute external funding: 199.791 € €

3. Title/Acronym: Membrane-free redox flow batteries / MFreeB (726217)

Partners: IMDEA Energy Institute

Period: 2017-2022

Funding Institution/Program: European Union / H2020. ERC-2016-CoG

IMDEA Energy Institute external funding: 1.998.407 € €

4. Título/Acrónimo: European corridors for natural gas transport efficiency / ECO-GATE (INEA/CEF/TRAN/M2016/1359344)

Partners: Gas Natural Madrid; CETIL Dispensing technology; Fundacion Cidaut; Instituto IMDEA Energía; GASNAM; Inversora Melofe; Autoridad Portuaria de Huelva; SOLTEL IT Solutions; Universidad de Santiago de Compostela; Port Authority of Gijón; Sociedad Estatal de Correos y Telégrafos; SOULMAN Insightful Thinking; ENAGAS Transporte; ENDESA Energía; MOLGAS Energía; EVARM Innovación; Mantenimiento de instalaciones de gas y servicios auxiliares; REPSOL Comercial de productos petrolíferos; Dourogás Natural- medição e exploração de sistema de gás; GALP Gas Natural; Universidade De tras-os-montes e alto douro; Gas Natural Europe; Ghenova Ingeniería; AUDIGNA.

Period: 2017-2021

Funding Institution/Program: Unión Europea / H2020. CEF-Transport-2016-MAP-General

IMDEA Energy Institute external funding: 20.646 €

5. Title/Acronym: Solar facilities for the european research area - third phase / SFERA-III (823802)

Partners: Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIE-MAT) (Coordinator); Centre National de la Recherche Scientifique (CNRS); Agenzia Nazionale per le Nuove Tecnologie; L'Energia e lo Sviluppo Economico Sostenibile (ENEA); Deutsches Zentrum für Luft – und Raumfahrt e.V. (DLR); Commissariat à L'Énergie Atomique et aux Énergies Alternatives (CEA); Universidade de Évora; Eidgenössische Technische Hochschule Zürich (ETHZ); Fundación IMDEA Energía; The Cyprus Institute; Fraunhofer Gesellschaft zur Förderung der angewandten Forschung; Laboratorio Nacional de Energia e Geologia I.P. (LNEG); Middle East Technical University; Universidad de Almería; Euronovia; European Solar Thermal Electricity Association (ESTELA)

Period: 2019-2022

Funding Institution/Program: European Union / H2020-INFRAIA-2018-2020 (H2020-INFRAIA-2018-1)

IMDEA Energy Institute external funding: 467.065 € €

6. Title/Acronym: Removing hazardous substances to increase recycling rates of WEEE, ELV and CDW plastics / NONTOX (820895)

Partners: Teknologian tutkimuskeskus VTT Oy (Coordinator); Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung; Università degli studi della Campania Luigi Vanvitelli; Relight srl; Fundación IMDEA Energía; AIMPLAS - Asociación de Investigación de Materiales Plásticos y Conexas; Stena Recycling International ab; Galea Polymers sl; Ecodom - Consorzio Italiano per il Recupero e Riciclaggio Elettrodomestici; Norner Research as; Aalto-Korkeakoulusäätiö; Coolrec bv

Period: 2019-2022

Funding Institution/Program: European Union / H2020-SC5-2018-2019-2020 (H2020-SC5-2018-2)

IMDEA Energy Institute external funding: 538.321 € €

7. Title/Acronym: European training network in innovative polymers for next-generation electrochemical energy storage / POLYSTORAGE (860403)

Partners: Friedrich-Schiller-Universität JENA (Coordinator), Universidad del País Vasco/ Euskal Herriko Unibertsitateam; Karlsruher Institut fuer technologie; Uppsala Universitet; Universite Catholique de louvain; Politecnico di Torino; Fundación IMDEA Energía; Lithops; Universite de pau et des pays de l'adour; Aalto korkeakoulusaatio; Kemijski Institut; Energy Storage Solutions. Partner Organisations: Deakin University; Scania CV AB; Toyota Motor Europe; Evonik Creavis GmbH; TCI Europe; CALIXHE; Chemspeed Technologies AG; NETZSCH Gerätebau GmbH; Solvionic; Repsol; University of Ljubljana

Period: 2019-2023

Funding Institution/Program: European Union / H2020-MSCA-ITN-2019 (ETN)

IMDEA Energy Institute external funding: 376.357 € €

8. Title/Acronym: “Non-conventional yeasts for the production of bioproducts / Yeast-4Bio (CA18229)

Partners: IMDEA Energy Institute (Coordinator); more than 70 researchers of 50 companies, universities, research centres, associations, from all over the world

Period: 2019-2023

Funding Institution/Program: European Union / COST actions

IMDEA Energy Institute external funding: 80.000 € (estimated)

9. Title/Acronym: Heating triggered drug release from nanometric inorganic-metal organic framework composites / HeatNMof (860942)

Partners: IMDEA Energy Institute (Coordinator); Universidad de Santiago de Compostela; Centre National de la Recherche Scientifique CNRS; Universiteit Antwerpen; Immaterial labs ltd; Institut National des Sciences Appliquees de Toulouse; Universitaet Hamburg; Fondazione istituto italiano di tecnologia; Nanoscale biomagnetics; Isern patentes y marcas. Partner Organizations: Universidad Rey Juan Carlos; Universidad de Zaragoza; University of Cambridge; Universite de Nantes; Universita degli studi di Genova; Oncodesign

Period: 2020-2024

Funding Institution/Program: European Union / H2020-MSCA-ITN-2019 (ETN)

IMDEA Energy Institute external funding: 501.810 € €

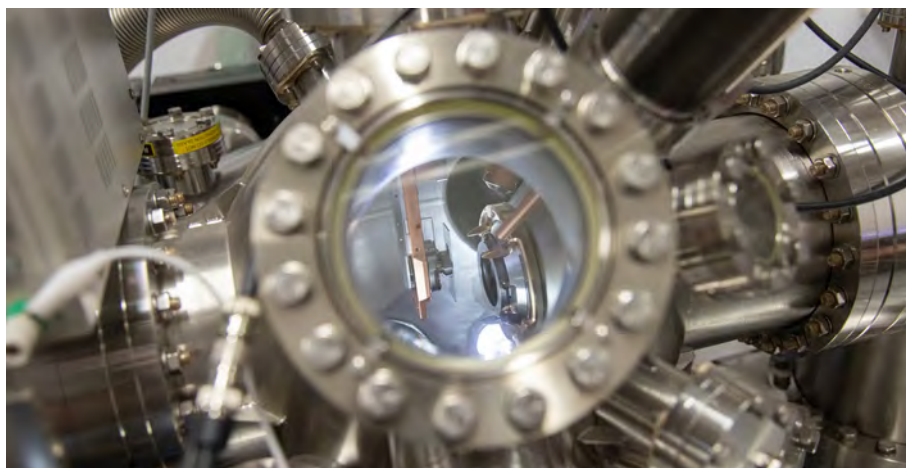
10. Title/Acronym: GHz nanoscale electrical and dielectric measurements of the solid-electrolyte interface and applications in the battery manufacturing line / NanoBat (861962)

Partners: Keysight Technologies Gmbh (Coordinator); Ruhr-universitaet bochum; Qwed Spolka z Ograniczona Odpowiedzialnoscia; Universitat Linz; Pleione Anonymi Etairia Kainotomon Energeiakon Efarmogon; Eidgenossisches Institut fur Metrologie Metas; AIT Austrian Institute of Technology Gmbh; IMDEA Energy Institute; Technische Universitaet Braunschweig; Kreisel Electric Gmbh & co kg; Centro Ricerche Fiat Scpa; Eurice European Research and Project Office Gmbh

Period: 2020-2023

Funding Institution/Program: European Union / H2020-NMBP-TO-IND-2018-2020 (DT-NMBP-08-2019)

IMDEA Energy Institute external funding: 190.937 € €



11. Title/Acronym: Production of advanced biodiesel from animal wastes using supercritical technologies / LIFE Superbiodiesel (LIFE19 CCM/ES/001189)

Partners: Asociación de Investigación de la Industria del Juguete, Conexas y Afines (AIJU) (Coordinator); Compañía Española de Petróleos; IMDEA Energy Institute; Asociación de Investigación para la Industria del Calzado y Conexas; Agencia Estatal Consejo Superior de Investigaciones Científicas; ORGANOVA; Universidad de Murcia

Period: 2020-2023

Funding Institution/Program: European Union / H2020. LIFE 2019 - Climate change and mitigation

IMDEA Energy Institute external funding: 57.867 € €

12. Title/Acronym: Technical, business and regulatory approaches to enhance the renewable energy capabilities to take part actively in the electricity and ancillary services markets / DRES2Market (952851)

Partners: Asociación de empresas de energías renovables, APPA (Coordinator); Institute of communication and computer systems; Fronius International; Etaireia Parohis Aeriou Attikis - Elleniki Anonymi Energeias Fysiko Aerio - Elleniki Etaireia Energeias; IMDEA Energy Institute; Gesternova; Commissariat à l'énergie atomique et aux énergies alternatives; Instytut Energetyki; OMI, Polo Español S.A.; ENEA Operator sp. z o.o.; Deloitte Advisory; PKP Energetyka; Centre National de la Recherche Scientifique, CNRS; Høgskulen på Vestlandet; Instituto para la diversificación y ahorro de la energía, IDAE

Period: 2020-2023

Funding Institution/Program: European Union / H2020-LC-SC3-2018-2019-2020 (LC-SC3-RES-28-2018-2019-2020)

IMDEA Energy Institute external funding: 332.125 € €

13. Title/Acronym: Manufacture of nanostructured Conjugated Porous Polymers for energy applications / NanoCPPs (899773)

Partners: IMDEA Energy Institute

Period: 2020-2022

Funding Institution/Program: European Union / H2020. ERC-2019-PoC

IMDEA Energy Institute external funding: 150.000 € €

14. Title/Acronym: Novel materials as electrode and electrolyte components in fuel cell technology / C-MOF.cell (PCI2020-111998)

Partners: IMDEA Energy Institute (Coordinator); University of La Laguna; University of Tartu (UT-Estonia); Institut Charles Gerhardt Montpellier (ICGM-France)

Period: 2020-2023

Funding Institution/Program: Ministry of Science and Innovation / M-ERA.NET Call 2019/PCI 2020

IMDEA Energy Institute external funding: 100.000 € €

15. Title/Acronym: Developing early-warning systems for improved microalgae PROduction and anaerobic DIGestIO n / PRODIGIO (101007006)

Partners: Agencia Estatal Consejo Superior de Investigaciones Científicas (Coordinator), Alfred-Wegener-Institut, Helmholtz-Zentrum für Polar- und Meeresforschung; Association pour la Recherche et le Développement des Méthodes et Processus Industriels; Idconsortium; IMDEA Energy Institute; Norges Miljø-Og Biovitenskaplige Universitet; National Taiwan University; Universidad de Almería

Period: 2021-2023

Funding Institution/Program: European Union / H2020-LC-SC3-2018-2019-2020 (LC-SC3-RES-1-2019-2020)

IMDEA Energy Institute external funding: 324.920 € €

16. Title/Acronym: Sustainability Assessment of Harmonised Hydrogen Energy Systems: Guidelines for Life Cycle Sustainability Assessment and Prospective Benchmarking / SH2E (101007163)

Partners: MDEA Energy Institute (Coordinator); The Institute of Applied Energy; Green-delta GmbH; Forschungszentrum Jülich GmbH; Commissariat à l'énergie atomique et aux énergies alternatives; Fundación para el Desarrollo de las Nuevas Tecnologías del Hidrógeno en Aragón; Symbio

Period: 2021-2024

Funding Institution/Program: European Union / H2020-JTI-FCH-2020-1 (FCH-04-5-2020)

IMDEA Energy Institute external funding: 544.764 € €

17. Title/Acronym: Establishing Eco-design Guidelines for Hydrogen Systems and Technologies / eGHOST (101007166)

Partners: IMDEA Energy Institute (Coordinator); The Institute of Applied Energy; Commissariat à l'énergie atomique et aux énergies alternatives; Univerza v Ljubljani; Fundación para el Desarrollo de las Nuevas Tecnologías del Hidrógeno en Aragón; Symbio

Period: 2021-2023

Funding Institution/Program: European Union / H2020-JTI-FCH-2020-1 (FCH-04-3-2020)

IMDEA Energy Institute external funding: 275.890 € €

18. Title/Acronym: Hydrogen PROduction by MEans of solar heat and power in high TEMperature Solid Oxide Electrolysers / PROMETEO (101007194)

Partners: Agenzia Nazionale per le Nuove Tecnologie, L'energia e lo Sviluppo Economico Sostenibile, ENEA (Coordinator); Capital Energy; Fondazione Bruno Kessler; Solidpower; IMDEA Energy Institute; Snam S.p.A.; École Polytechnique Fédérale de Lausanne; Nextchem SRL; Stamicarbon B..

Period: 2021-2024

Funding Institution/Program: European Union / H2020-JTI-FCH-2020-1 (FCH-02-2-2020)

IMDEA Energy Institute external funding: 150.625 € €

19. Title/Acronym: A Hybrid Reactor for Solar CO₂ and N₂ Conversion Coupled to Waste-Water Treatment / HYSOLCHEM (101017928)

Partners: IMDEA Energy Institute (Coordinator); Rey Juan Carlos University; Innova SRL; Katholieke Universiteit Leuven; Amer-Sil Sa; Diamond Light Source Limited; Apria Systems.

Period: 2021-2023

Funding Institution/Program: European Union / H2020-FETPROACT-2018-2020 (FET-PROACT-EIC-07-2020)

IMDEA Energy Institute external funding: 801.875 € €

20. Title/Acronym: Multi-Electron Processes for Light Driven Electrodes and Electrolytes in Conversion and Storage of Solar Energy / LIGHT-CAP (101017821)

Partners: Fondazione Istituto Italiano Di Tecnologia; École Polytechnique Fédérale de Lausanne (Coordinator); Technische Universität Dresden; Justus-Liebig-Universität Gießen; Politecnico Di Milano; IMDEA Energy Institute

Period: 2021-2024

Funding Institution/Program: European Union / H2020-FETPROACT-2018-2020 (FET-PROACT-EIC-07-2020)

IMDEA Energy Institute external funding: 402.190 € €

21. Title/Acronym: Sustainable oleochemicals bioproduction from carboxylates via oleaginous fermentation / OLEOFERM (PCI2021-121936)

Partners: IMDEA Energy Institute (Coordinator); Université Clermont, University of Ljubljana, Jožef Stefan Institute, BIO-VALO

Period: 2021-2023

Funding Institution/Program: Ministry of Science and Innovation / ERA CoBiotech. Call 2020/ PCI 2021

IMDEA Energy Institute external funding: 199.964 € €

22. Title/Acronym: Opening the pathway towards dendritic zeolites / TODENZE (101021502)

Partners: IMDEA Energy Institute

Period: 2021-2026

Funding Institution/Program: European Union / ERC-2020-ADG

IMDEA Energy Institute external funding: 2.378.438 € €

1.5. Contracts with companies and other organizations

1. Title/Acronym: Technical advice for the determination of polluting substances in a paint application process

Company: Mercedes Benz Spain (Spain)

Period: 2018-2022

IMDEA Energy Institute external funding: 12.650 € €

2. Title/Acronym: Testing of batteries for wireless surveillance devices / BAMOWI

Company: Securitas Direct Spain (Spain)

Period: 2019-2022

IMDEA Energy Institute external funding: 59.080 € €

3. Title/Acronym: Performance analysis of a prototype for the desalination and extraction of high added value products in brine / CI19 SEENSO

Company: SEENSO RENOVAL (Spain) / “Cheque Innovación 2018” Programme

Period: 2019-2021

IMDEA Energy Institute external funding: 75.000 € €

4. Title/Acronym: Services RedLab Biopen

Period: 2020-2022

IMDEA Energy Institute external funding: 2.240 € €

5. Title/Acronym: Services RedLab OperandoLab

Period: 2020

IMDEA Energy Institute external funding: 240 € €

6. Title/Acronym: Services RedLab TermoCat

Period: 2020-2021

IMDEA Energy Institute external funding: 32.940 € €

7. Title/Acronym: Solar thermal conversion of CO2 into valuable nanomaterials (NPRP12S-0322-190433)

Partners: Gulf Organisation for Research and Development QSTP LLC (Coordinator); IMDEA Energy Institute

Period: 2020-2023

IMDEA Energy Institute external funding: 51.108 \$ (45.271 €)

8. Title/Acronym: Development of a low carbon and economically-competitive cement (NPRP12S-0319-190413)

Partners: Gulf Organisation for Research and Development QSTP LLC (Coordinator); IMDEA Energy Institute; Bauhaus Universitat Weimar; Eddymir Ltd.

Period: 2020-2024

IMDEA Energy Institute external funding: 76.873 \$ (68.098 €)

9. Title/Acronym: Experimental demonstration of solar-driven methane conversion to syngas or hydrogen on a solar tower / EFESTO

Company: Synhelion (Switzerland)

Period: 2020-2021

IMDEA Energy Institute external funding: 250.077 € €

10. Title/Acronym: Investigation of power quality in the electrical distribution network of “Energijos Skirstymo Operatorius” / PQESO

Institution: Lithuanian Energy Institute (LEI)

Period: 2020-2021

IMDEA Energy Institute external funding: 10.000 € €

11. Title/Acronym: Investigation of new organic electrolytes with hydroxy-derivatives of phenazine for flow microbatteries / Hidroxi-FEBAT

Company: Aceleradora de Bachman (Spain)

Period: 2020

IMDEA Energy Institute external funding: 25.000 € €

12. Title/Acronym: Control of power converters in vibration systems / COPOWC02

Company: IMV Corporation (Japan).

Period: 2020-2021

IMDEA Energy Institute external funding: 23.268 € €

13. Title/Acronym: Renewable technologies for energy storage based on new photovoltaic-thermal systems / TRANSFER

Company: CEDRIÓN (Spain) / MISIONES CDTI

Period: 2020-2022

IMDEA Energy Institute external funding: 40.000 € €



14. Title/Acronym: New generation of waste biomass energy use systems without emissions. Towards carbon negative energy sources / Oe-mision

Company: INGELIA (Spain) / MISIONES CDTI

Period: 2020-2022

IMDEA Energy Institute external funding: 125.040 € €

15. Title/Acronym: New flexible energy system for the efficient integration of new decarbonisation technologies / FLEXENER

Company: Siemens Gamesa (Spain) / MISIONES CDTI

Period: 2021-2023

IMDEA Energy Institute external funding: 87.000 € €

16. Title/Acronym: Proof of concept of a hybrid supercapacitor with redox electrolytes with organic active species / REDCAP

Company: Micro Electrochemical Technologies (Spain)

Period: 2021

IMDEA Energy Institute external funding: 18.000 €

17. Title/Acronym: Thermal control system based on the corona effect for hybrid and electric vehicles / eVEHICOOOL

Company: CEDRION (Spain) / Start-up's y pymes

Period: 2021-2022

IMDEA Energy Institute external funding: 30.000 € €

18. Title/Acronym: Test Specification Ni-MH backup pack new manufacturer approval testing

Company: Master Battery (Spain)

Period: 2021-2022

IMDEA Energy Institute external funding: 7.000 €

19. Title/Acronym: Proof of concept of an electrolyzer based on urea derivatives

Company: Hydrogen & Innovation (Spain)

Period: 2021

IMDEA Energy Institute external funding: 10.000 € €

20. Title/Acronym: Control of power converters in vibration systems / COPOWCO3

Company: IMV Corporation (Japan)

Period: 2021

IMDEA Energy Institute external funding: 25.505 €

21. Title/Acronym: Development and strategic innovation in technologies, advanced processes and products for the sustainable manufacture of generator sets / NEXTFACTORY

Company: Genesal Energy IB (Spain)

Period: 2021

IMDEA Energy Institute external funding: 13.980 € €

22. Title/Acronym: Perseo process simulation / PERSIM

Company: Genesal Energy IB (Spain)

Period: 2021

IMDEA Energy Institute external funding: 10.070 € €

23. Title/Acronym: Technical, economic and environmental feasibility study of existing technologies for the reduction of the carbon footprint at the Loeches thermal sludge drying plant

Company: Canal Isabel II (Spain)

Period: 2021

IMDEA Energy Institute external funding: 14.250 € €

24. Title/Acronym: Investigation of an electrochemical capacitor hybridized with a redox flow battery at the cell level / REDCAPCELL

Company: Micro Electrochemical Technologies (Spain)

Period: 2021

IMDEA Energy Institute external funding: 100.000 € €

25. Title/Acronym: Investigation of an electrochemical capacitor hybridized with a redox flow battery at the cell level / REDCAPCELL

Company: Micro Electrochemical Technologies (Spain)

Period: 2021

IMDEA Energy Institute external funding: 100.000 € €

26. Title/Acronym: Investigation of new organic electrolytes derived from phenacin and viologen for batteries / ORFEVIBAT2

Company: Micro Electrochemical Technologies (Spain)

Period: 2021

IMDEA Energy Institute external funding: 30.000 € €

27. Title/Acronym: Technical assistance service for a prospective study of renewable hydrogen production, logistics and demand in Spain (2020-2050) / DESHEO

Institution: Fundación para el desarrollo de las nuevas tecnologías del hidrógeno en Aragón (Spain)

Period: 2021

IMDEA Energy Institute external funding: 30.000 € €

28. Title/Acronym: Economic and environmental analysis of train parts / E2TRAIN

Company: Innovation Tree (Spain)

Period: 2021-2022

IMDEA Energy Institute external funding: 18.900 € €

29. Title/Acronym: Solar tailings transformation / STT

Institution: SMI-ICE-Chile (Chile)

Period: 2021-2022

IMDEA Energy Institute external funding: 6.683 € €

30. Title/Acronym: EFESTO-C

Company: Synhelion (Switzerland)

Period: 2021-2022

IMDEA Energy Institute external funding: 123.000 € €

31. Title/Acronym: Life cycle analysis of Perseo Biotechnology's distillation process for the production of bioethanol from FORSU, in the framework of the URBIOFIN project / PERACV

Company: Perseo Biotechnology (Spain)

Period: 2021-2022

IMDEA Energy Institute external funding: 8.900 € €

32. Title/Acronym: Application of capacitive deionisation to the treatment of ground and surface waters / ReWaise-CDI

Company: FCC Aqualia (Spain)

Period: 2021-2022

IMDEA Energy Institute external funding: 99.000 € €

33. Title/Acronym: Control of power converters in vibration systems / COPOWCO4

Company: IMV Corporation (Japan)

Period: 2021-2022

IMDEA Energy Institute external funding: 22.361 € €

34. Title/Acronym: New materials, technologies and processes for the generation, storage, transport and integration of renewable hydrogen and biomethane from biowaste / ECLOSIÓN

Company: GHENOVA INGENIERÍA (Spain) / MISIONES CDTI

Period: 2021-2024

IMDEA Energy Institute external funding: 45.011 € €

35. Title/Acronym: Research on Innovative and Efficient Green Hydrogen Production and Storage Technologies based on the Circular Economy / ZEPPELIN
Company: Perseo Biotechnology (Spain) / MISIONES CDTI
Period: 2021-2024
IMDEA Energy Institute external funding: 14.736 € €

1.6. Researcher grants

1. Program: Ramón y Cajal 2014
Project: Bioapplications of porous materials (RYC-2014-15039)
Period: 2016-2021
Funding Institution: Ministry of Economy and Competitiveness
IMDEA Energy Institute external funding: 168.600 € (Total: 208.600 €)
Dr. Patricia Horcajada

2. Program: Ramón y Cajal 2015
Project: Design and Synthesis of Hybrid Materials for Advances Applications: Solar Fuels Generation (RYC-2014-15039)
Period: 2017-2021
Funding Institution: Ministry of Economy, Industry and Competitiveness
IMDEA Energy Institute external funding: 168.600 € (Total: 208.600 €)
Dr. Marta Liras

3. Program: Recruitment of young doctors 2016 (Modality 2) (2016-T2/AMB-1310)
Period: 2017-2021
Funding Institution: Comunidad de Madrid
IMDEA Energy Institute external funding: 80.000 €
Dr. Julio Lado

4. Program: Contract FPI2016 (BES2016-077031)
Project/Acronym: Multidisciplinary analysis of indirectly-heated particles receivers/reactors for solar applications in extreme conditions / ARROPAR-CEX (ENE2015-71254-C3-1-R)
Period: 2017-2021
Funding Institution: Ministry of Economy, Industry and Competitiveness
IMDEA Energy Institute external funding: 75.036 € €(Total: 76.660 €)
Mr. Mario Sánchez





5. Program: Recruitment of experienced doctors 2017 (Modality 1)

Project/Acronym: Computer-aided design of functional nanomaterials for energy storage applications / CADFUNES (2017-T1/AMB-5264)

Period: 2018-2022

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 110.000 € (Total: 306.976 €)

Dr. Andreas Mavrantakis

6. Program: Contract FPI2017 (BES2017-082749)

Project/Acronym: CO2 photoconversion to solar fuels using multifunctional materials / Ra-Phuel (ENE2016-79608-C2-1-R)

Period: 2018-2022

Funding Institution: Ministry of Science, Innovation and Universities

IMDEA Energy Institute external funding: 82.000 € (Total: 88.250 €)

Mr. Giacomo Armani

7. Program: Recruitment of experienced doctors 2018 (Modality 1)

Project/Acronym: Development of biochar-based materials for their application in bio-filters for the treatment of polluted air (nox, vocs) in urban environments / BioCharFilt (2018-T1/AMB-10023)

Period: 2019-2023

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 110.000 € (Total: 310.000 €)

Dr. Javier Feroso

8. Program: Recruitment of young doctors 2018 (Modality 2) (2018-T2/IND-11407)

Period: 2019-2021

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 44.986 € €

Dr. Tania Hidalgo

9. Program: Call for Predoctoral and Postdoctoral Researchers 2018 (PEJD-2018-PRE/AMB-9310)

Period: 2019-2021

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 22.484 € €

Mr. Pablo Rodríguez

10. Program: Call for Predoctoral and Postdoctoral Researchers 2018 (PEJD-2018-PRE/AMB-8330)

Period: 2019-2020

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 25.000 € €

Mr. Julio López

11. Program: Recruitment of research assistants and laboratory technicians 2018 (PEJ-2018-TL/AMB-10908)

Period: 2019-2021

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 38.000 € €

Ms. Sonia Sevilla

12. Program: Recruitment of research assistants and laboratory technicians 2018 (PEJ-2018-TL/AMB-11661)

Period: 2019-2021

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 33.784 € €

Ms. Raquel Martín

13. Program: Recruitment of laboratory technicians 2018 (PEJ2018-004809-A)

Period: 2019-2022

Funding Institution: Ministry of Science, Innovation and Universities

IMDEA Energy Institute external funding: 43.205 € €

Mr. Christian Sánchez

14. Program: Recruitment of laboratory technicians 2018 (PEJ2018-005232-A)

Period: 2019-2021

Funding Institution: Ministry of Science, Innovation and Universities

IMDEA Energy Institute external funding: 40.312 € €

Mr. Gonzalo Castro

15. Program: Recruitment of laboratory technicians 2018 (PEJ2018-004802-A)

Period: 2019-2021

Funding Institution: Ministry of Science, Innovation and Universities

IMDEA Energy Institute external funding: 29.179 € €

Ms. Laura Buceta

16. Program: Recruitment of laboratory technicians 2018 (PEJ2018-004828-A)

Period: 2019-2022

Funding Institution: Ministry of Science, Innovation and Universities

IMDEA Energy Institute external funding: 43.205 € €

Mr. Manuel Ortega

17. Program: Contract FPI2018 (PRE2018-086502)

Project/Acronym: Microbial-oils production via anaerobic digestion: bioconversion of volatile fatty acids by oleaginous yeasts / ACMIBIO-DA (ENE2017-86864-C2-2-R)

Period: 2019-2023

Funding Institution: Ministry of Science, Innovation and Universities

IMDEA Energy Institute external funding: 82.000 € (88.250 €)

Mr. Sergio Morales

18. Program: Juan de la Cierva-Formación 2018 (FJC2018-037781-I)

Period: 2020-2022

Funding Institution: Ministry of Science, Innovation and Universities

IMDEA Energy Institute external funding: 58.219 €

Dr. Nagaraj Patil

19. Program: Juan de la Cierva-Incorporación 2018 (IJC2018-038426-I)

Period: 2020-2022

Funding Institution: Ministry of Science, Innovation and Universities

IMDEA Energy Institute external funding: 61.337 € (Total: 67.337 €)

Dr. Senthilkumar Sirugaloor

20. Program: Recruitment of research assistants and laboratory technicians 2019 (PEJ-2019-AI/AMB-15893)

Period: 2020-2022

Funding Institution: Comunidad de Madrid.

IMDEA Energy Institute external funding: 45.000 €€

Mr. Adrián Lago

21. Program: Recruitment of research assistants and laboratory technicians 2019 (PEJ-2019-TL/AMB-14824)

Period: 2020-2022

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 38.000 €€

Mr. Amir Jnaini

22. Program: Call for Predoctoral and Postdoctoral Researchers 2019 (PEJD-2019-PRE/IND-16975)

Period: 2020-2021

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 25.000 €€

Mr. Antonio Chacón

23. Program: Ramón y Cajal 2019

Project: Producción de Biocombustibles y Bioproductos a partir de lignocelulosa y ácidos grasos volátiles (RYC2019-027773-I)

Period: 2021-2025

Funding Institution: Ministry of Science, Innovation and Universities/FSE

IMDEA Energy Institute external funding: 168.600 € (Total: 208.600 €)

Dr. Elia Tomás

24. Program Ramón y Cajal 2014 / IED

Project: Bioapplications of porous materials (RYC-2014-15039)

Period: 2021-2023

Funding Institution: Ministry of Science and Innovation

IMDEA Energy Institute external funding: 100.000 € €

Dr. Patricia Horcajada

25. Program: Juan de la Cierva-Formación 2019 (FJC2019-040159-I)

Period: 2021-2022

Funding Institution: Ministry of Science, Innovation and Universities

IMDEA Energy Institute external funding: 50.000 € €

Dr. Teresa Naranjo

26. Program: Juan de la Cierva-Incorporación 2019 (IJC2019-042430-I)

Period: 2021-2023

Funding Institution: Ministry of Science, Innovation and Universities

IMDEA Energy Institute external funding: 87.000 € (Total: 93.000 €)

Dr. Mariam Barawi

27. Program: Juan de la Cierva-Incorporación 2019 (IJC2019-042342-I)

Period: 2021-2023

Funding Institution: Ministry of Science, Innovation and Universities

IMDEA Energy Institute external funding: 87.000 € (Total: 93.000 €)

Dr. Javier Roldán

28. Program: Recruitment of research assistants and laboratory technicians 2020 (PEJ-2020-TL/AMB-19678)

Period: 2021-2023

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 38.000 € €

Ms. Antártida Rodríguez

29. Program: Contract FPI2020 (PRE2020-094445)

Project/Acronym: NHyMPHa: "Nano-Structured Hybrid Materials for Solar Fuels Photo-electrocatalytic" (PID2019-106315RB-I00)

Period: 2021-2025

Funding Institution: Ministry of Science and Innovation

IMDEA Energy Institute external funding: 90.600 € (Total: 97.460 €)

Ms. Tania Mazuelo

30. Program: Contract FPI2020 (PRE2020-094485)

Project/Acronym: Fourth generation fuels (fuels from residues and wastes) (CEX2019-000931-M-20-1)

Period: 2021-2025

Funding Institution: Ministry of Science and Innovation

IMDEA Energy Institute external funding: 90.600 € (Total: 97.460 €)

Mr. Adrián Lago

31. Program: Contract FPI2020 (PRE2020-094485)

Project/Acronym: New concepts for electromobility (CEX2019-000931-M-20-2)

Period: 2021-2022

Funding Institution: Ministry of Science and Innovation

IMDEA Energy Institute external funding: 11456 € (Total: 11.846 €)

Mr. Manuel del Barrio

32. Program: H2020-MSCA-IF-2019 (EF-ST)

Project: NeuroMOF: “Self-propelled Metal-Organic Framework nanocarriers as promising brain delivery platform” (897678)

Period: 2021-2023

Funding Institution: European Union

IMDEA Energy Institute external funding: 160.932 € €

Dr. Tania Hidalgo

33. Program: H2020-MSCA-IF-2020 (EF-RI)

Project: HEASeRS: “High-temperature angular-selective radiant surfaces for the decarbonisation of energy intensive industries” (101027316)

Period: 2021-2023

Funding Institution: European Union

IMDEA Energy Institute external funding: 160.932 € €

Dr. Charles-Alexis Asselineau



2. Scientific Results

2.1. Indexed publications (SCOPUS)

1. Alonso-Doncel, M.; Peral, A.; Ochoa-Hernández, C.; Sanz, R.; Serrano, D.P. "Tracking the evolution of embryonic zeolites into hierarchical ZSM-5". *Journal of Materials Chemistry A*, **2021**, 9 (23), 13570-13587.
2. Arenas-Vivo, A.; Rojas, S.; Ocaña, I.; Torres, A.; Liras, M.; Salles, F.; Arenas-Esteban, D.; Bals, S.; Ávila, D.; Horcajada, P. "Ultrafast reproducible synthesis of a Ag-nanocluster@MOF composite and its superior visible-photocatalytic activity in batch and in continuous flow". *Journal of Materials Chemistry A*, **2021**, 9 (28), 15704-15713.
3. Arroyo, M.; Briones, L.; Hernando, H.; Escola, J. M.; Serrano, D.P. "Selective decarboxylation of fatty acids catalyzed by Pd-supported hierarchical ZSM-5 zeolite". *Energy & Fuels*, **2021**, 35 (21), 17167-17181.
4. Babaryk, A.A.; Pérez, Y.; Martínez, M.; Mosquera, M.E.G.; Zehender, M.H.; Svatek, S.A.; Antolín, E.; Horcajada, P. "Reversible dehydration-hydration process in stable bismuth-based hybrid perovskites". *Journal of Materials Chemistry C*, **2021**, 9 (34), 11358-11367.
5. Barawi, M.; Collado, L.; Gomez-Mendoza, M.; Oropeza, F.E.; Liras, M.; de la Peña O'Shea, V.A. "Conjugated Porous Polymers: Ground-Breaking Materials for Solar Energy Conversion". *Advanced Energy Materials*, **2021**, 11 (43), art. no. 2101530.
6. Barreiro-Vescovo, S.; González-Fernández, C.; de Godos, I. "Characterization of communities in a microalgae-bacteria system treating domestic wastewater reveals dominance of phototrophic and pigmented bacteria". *Algal Research*, **2021**, 59, art. no. 102447.
7. Ben Hnich, K.; Martín-Gamboa, M.; Khila, Z.; Hajjaji, N.; Dufour, J.; Iribarren, D. "Life cycle sustainability assessment of synthetic fuels from date palm waste". *Science of the Total Environment*, **2021**, 796, art. no. 148961.
8. Blanco, M.; Ramirez, D.; Zarei, M.E.; Gupta, M. "Dual multivector model predictive control for the power converters of a floating OWC WEC". *International Journal of Electrical Power and Energy Systems*, **2021**, 133, art. no. 107263. Open Access.
9. Botet-Carreras, A.; Tamames-Tabar, C.; Salles, F.; Rojas, S.; Imbuluzqueta, E.; Lana, H.; Blanco-Prieto, M.J.; Horcajada, P. "Improving the genistein oral bioavailability via its formulation into the metal-organic framework MIL-100(Fe)". *Journal of Materials Chemistry B*, **2021**, 9 (9), 2233-2239.



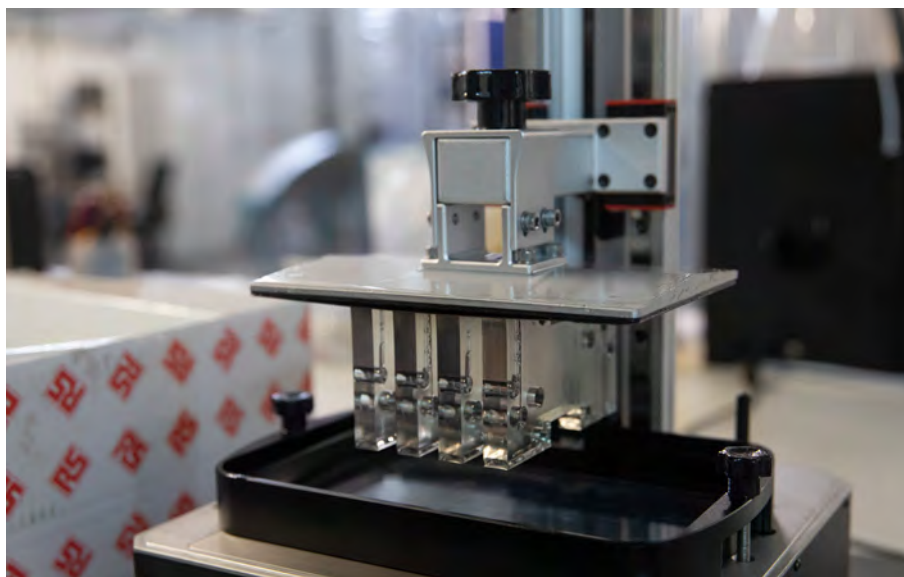
10. Bucci, A.; García-Tecedor, M.; Corby, S.; Rao, R.R.; Martin-Diaconescu, V.; Oropeza, F.E.; De La Peña O'Shea, V.A.; Durrant, J.R.; Giménez, S.; Lloret-Fillol, J. "Self-supported ultra-active NiO-based electrocatalysts for the oxygen evolution reaction by solution combustion". *Journal of Materials Chemistry A*, **2021**, 9 (21), 12700-12710.
11. Candelaresi, D.; Valente, A.; Iribarren, D.; Dufour, J.; Spazzafumo, G. "Comparative life cycle assessment of hydrogen-fuelled passenger cars". *International Journal of Hydrogen Energy*, **2021**, 46 (72), 35961-35973.
12. Carrillo, A.J.; Chinchilla, L.E.; Iglesias-Juez, A.; Gutiérrez-Rubio, S.; Sastre, D.; Pizarro, P.; Hungria, A.B.; Coronado, J.M. "Determining the Role of Fe-Doping on Promoting the Thermochemical Energy Storage Performance of $(\text{Mn}_{1-x}\text{Fe}_x)_3\text{O}_4$ Spinel". *Small Methods*, **2021**, 5 (10), art. no. 2100550.
13. Carrillo, A.J.; Pizarro, P.; Coronado, J.M. "Assessing Cr incorporation in Mn2O3/Mn3O4 redox materials for thermochemical heat storage applications". *Journal of Energy Storage*, **2021**, 33, art. no. 102028.
14. Castillo-Blas, C.; Álvarez-Galván, C.; Puen-te-Orench, I.; García-Sánchez, A.; Oropeza, F.E.; Gutiérrez-Puebla, E.; Monge, Á.; de la Peña-O'Shea, V.A.; Gándara, F. "Highly efficient multi-metal catalysts for carbon dioxide reduction prepared from atomically sequenced metal organic frameworks". *Nano Research*, **2021**, 14 (2), 493-500.
15. Chaliulina, R.; Galvez-Martos, J.-L.; Hakki, A.; Elhoweris, A.; Mwanda, J.; Al-Horr, Y. "Eco materials from CO2 capture: Compressive strengths of a plasterboard alternative". *Construction and Building Materials*, **2021**, 312, art. no. 125276.
16. Chen, R.; Romero, M.; González-Aguilar, J.; Rovense, F.; Rao, Z.; Liao, S. "Design and off-design performance comparison of supercritical carbon dioxide Brayton cycles for particle-based high temperature concentrating solar power plants". *Energy Conversion and Management*, **2021**, 232, art. no. 113870.
17. Ciurduc, D.E.; Boaretto, N.; Fernández-Blázquez, J.P.; Marcilla, R. "Development of high performing polymer electrolytes based on superconcentrated solutions". *Journal of Power Sources*, **2021**, 506, art. no. 230220.
18. Collado, L.; Naranjo, T.; Gomez-Mendoza, M.; López-Calixto, C.G.; Oropeza, F.E.; Liras, M.; Marugán, J.; de la Peña O'Shea, V.A. "Conjugated Porous Polymers Based on BODIPY and BOPHY Dyes in Hybrid Heterojunctions for Artificial Photosynthesis". *Advanced Functional Materials*, **2021**, 31 (51), art. no. 2105384.
19. Coronado, J.M.; Fresno, F.; Iglesias-Juez, A. (2021). "Approaching photocatalysts characterization under real conditions: In situ and operando studies". En: *Materials Science in Photocatalysis*. Ed: Elsevier. ISBN: 978-0128218594. Book chapter
20. de la Peña O'Shea, V. A.; Costa, R. D. "Recent Advances Towards Sustainable Materials and Processes for Energy Conversion and Storage". *Advanced Energy Materials*, **2021**, 11 (43), art. no. 2102874.
21. de las Heras, I.; Dufour, J.; Coto, B. "A novel method to obtain solid-liquid equilibrium and eutectic points for hydrocarbon mixtures by using differential scanning calorimetry and numerical integration". *Fuel*, **2021**, 297, art. no.120788.
22. Deng, D.; Chen, B.; Zhao, C.; Anderson, M.A.; Wang, Y. "Importance of anode/cathode mass loadings on capacitive deionization performance". *Journal of the Electrochemical Society*, **2021**, 168 (5), art. no. 053503.
23. Dessì, F.; Mureddu, M.; Ferrara, F.; Ferramoso, J.; Orsini, A.; Sanna, A.; Pettinau, A. "Thermogravimetric characterisation and kinetic analysis of *Nannochloropsis* sp. and *Tetraselmis* sp. microalgae for pyrolysis, combustion and oxy-combustion". *Energy*, **2021**, 217, art. no. 119394.

24. Díaz-Sánchez, M.; Reñones, P.; Mena-Palomo, I.; López-Collazo, E.; Fresno, F.; Oropeza, F.E.; Prashar, S.; de la Peña O'Shea, V.A.; Gómez-Ruiz, S. "Ionic liquid-assisted synthesis of F-doped titanium dioxide nanomaterials with high surface area for multi-functional catalytic and photocatalytic applications". *Applied Catalysis A: General*, **2021**, 613, art. no. 118029.
25. Esteves, M. A.; Fresno, F.; Fernandes, V. R.; Oropeza, F. E.; de la Peña O'Shea, V.A.; Rangel, C.M. "TiO₂-reduced graphene Oxide-Pt nanocomposites for the photogeneration of hydrogen from ethanol liquid and gas phases". *Catalysis Today*, **2021**, 380, 41-52.
26. Fernández-Paz, C.; Fernández-Paz, E.; Salcedo-Abraira, P.; Rojas, S.; Barrios-Esteban, S.; Csaba, N.; Horcajada, P.; Remuñán-López, C. "Microencapsulated isoniazid-loaded metal-organic frameworks for pulmonary administration of antituberculosis drugs". *Molecules*, **2021**, 26 (21), art. no. 6408.
27. Freire, J. M. A.; Lado, J. J.; García-Quismondo, E.; Burillo, G. C.; Palma, J.; Loiola, A. R.; Longhinotti, E.; Anderson, M. A. "Strategies to boost capacitive deionization performance of 3D electrodes". *Separation and Purification Technology*, **2021**, 273, art. no. 118977.
28. Fresno, F.; Galdón, S.; Barawi, M.; Alfonso-González, E.; Escudero, C.; Pérez-Dieste, V.; Huck-Iriart, C.; de la Peña O'Shea, V.A. "Selectivity in UV photocatalytic CO₂ conversion over bare and silver-decorated niobium-tantalum perovskites". *Catalysis Today*, **2021**, 361, 85-93.
29. Fresno, F.; Iglesias, O.; Alfonso-González, E.; Rivero, M.J.; Ortiz, I.; de la Peña O'Shea, V.A. "Assessing the feasibility of reduced graphene oxide as an electronic promoter for photocatalytic hydrogen production over Nb-Ta perovskite photocatalysts". *Catalysis Today*, **2021**, 362, 22-27.
30. Fresno, F.; González, M.U.; Martínez, L.; Fernández-Castro, M.; Barawi, M.; Villar-García, I.J.; Soler-Morala, J.; Reñones, P.; Luna, M.; Huttel, Y.; de la Peña O'Shea, V.A.; García-Martín, J.M. "Photo-Induced Self-Cleaning and Wettability in TiO₂ Nanocolumn Arrays Obtained by Glancing-Angle Deposition with Sputtering". *Advanced Sustainable Systems*, **2021**, 5 (11), art. no. 2100071.
31. Gálvez-Martos, J.-L.; Chaliulina, R.; Elhoweris, A.; Mwanda, J.; Hakki, A.; Al-horr, Y. "Techno-economic assessment of calcium sulfoaluminate clinker production using elemental sulfur as raw material". *Journal of Cleaner Production*, **2021**, 301, art. no. 126888.
32. Gálvez-Martos, J.-L.; Chaliulina, R.; Medina-Martos, E.; Elhoweris, A.; Hakki, A.; Mwanda, J.; Al-Horr, Y. "Eco-efficiency of a novel construction material produced by carbon capture and utilization". *Journal of CO₂ Utilization*, **2021**, 49, art. no. 101545.
33. Gálvez-Martos, J.-L.; Greses, S.; Magdalena, J.A.; Iribarren, D.; Tomás-Pejó, E.; González-Fernández, C. "Life cycle assessment of volatile fatty acids production from protein- and carbohydrate-rich organic wastes". *Bioresource Technology*, **2021**, 321, art. no. 124528.
34. García-Muñoz, P.; Fresno, F.; Ivanez, J.; Keller, N. "Irradiance-controlled photoassisted synthesis of sub-nanometre sized ruthenium nanoparticles as co-catalyst for TiO₂ in photocatalytic reactions". *Materials*, **2021**, 14 (17), art. no. 4799.
35. Gómez-Pozuelo, G.; Pizarro, P.; Botas, J.A.; Serrano, D.P. "Hydrogen production by catalytic methane decomposition over rice husk derived silica". *Fuel*, **2021**, 306, art. no. 121697.
36. Gothner, F.; Roldan Perez, J.; Torres, R.; Midtgard, O. "Harmonic Virtual Impedance Design for Optimal Management of Power Quality in Microgrids". *IEEE Transactions on Power Electronics*, **2021**, 36 (9), art. no. 9376914, 10114-10126.

37. Gothner, F.; Torres-Olguin, R.E.; Roldan-Perez, J.; Rygg, A.; Midtgard, O.M. "Apparent Impedance-Based Adaptive Controller for Improved Stability of a Droop-Controlled Microgrid". *IEEE Transactions on Power Electronics*, **2021**, 36 (8), art. no. 9319550, 9465-9476.
38. Goujon, N.; Casado, N.; Patil, N.; Marcilla, R.; Mecerreyes, D. "Organic batteries based on just redox polymers: Abstract". *Progress in Polymer Science*, **2021**, 122, art. no. 101449.
39. Greses, S.; Tomás-Pejó, E.; González-Fernández, C. "Short-chain fatty acids and hydrogen production in one single anaerobic fermentation stage using carbohydrate-rich food waste". *Journal of Cleaner Production*, **2021**, 284, art. no. 124727.
40. Gutiérrez-Rubio, S.; Shamzhy, M.; Čejka, J.; Serrano, D.P.; Moreno, I.; Coronado, J.M. "Vapor phase acylation of guaiacol with acetic acid over micro, nano and hierarchical MFI and BEA zeolites". *Applied Catalysis B: Environmental*, **2021**, 285, art. no. 119826.
41. Hernández-Alonso, M. D.; Suárez, S.; Fresno, F.; Coronado, J. M.; Sánchez, B. "Simultaneous Photocatalytic Abatement of NO and SO₂: Influence of the TiO₂ Nature and Mechanistic Insights". *Journal of Photocatalysis*, **2021**, 2, 130-139.
42. Hernández-Giménez, A.M.; de Kort, L.M.; Whiting, G.T.; Hernando, H.; Puértolas, B.; Pérez-Ramírez, J.; Serrano, D.P.; Bruijninx, P.C.A.; Weckhuysen, B.M. "Upscaling Effects on Alkali Metal-Grafted Ultrastable Y Zeolite Extrudates for Modeled Catalytic Deoxygenation of Bio-oils". *ChemCatChem*, **2021**, 13 (8), 1951-1965.
43. Hernández-Giménez, A.M.; Heracleous, E.; Pachatouridou, E.; Horvat, A.; Hernando, H.; Serrano, D.P.; Lappas, A.A.; Bruijninx, P.C.A.; Weckhuysen, B.M. "Effect of Mesoporosity, Acidity and Crystal Size of Zeolite ZSM-5 on Catalytic Performance during the Ex-situ Catalytic Fast Pyrolysis of Biomass". *ChemCatChem*, **2021**, 13 (4), 1207-1219.
44. Hernando, H.; Gómez-Pozuelo, G.; Botas, J.A.; Serrano, D.P. "Evaluating fractional pyrolysis for bio-oil speciation into holocellulose and lignin derived compounds". *Journal of Analytical and Applied Pyrolysis*, **2021**, 154, art. no. 105019.
45. Huang, X. C.; Li, W. W.; Zhang, S.; Oropeza, F.E.; Gorni, G.; de la Peña-O'Shea, V.A.; Lee, T. L.; Wu, M.; Wang, L. S.; Qi, D. C.; Qiao, L.; Cheng, J.; Zhang, K. H. L. "Ni³⁺-induced semiconductor-to-metal transition in spinel nickel cobaltite thin films". *Physical Review B*, **2021**, 104 (12), art. no. 125136.
46. Ibáñez, S.E.; Quintero, A.E.; García-Salaberri, P.A.; Vera, M. "Effects of the diffusive mixing and self-discharge reactions in microfluidic membraneless vanadium redox flow batteries". *International Journal of Heat and Mass Transfer*, **2021**, 170, art. no. 121022.
47. Istrate, I.R.; Galvez-Martos, J.L.; Dufour, J. "The impact of incineration phase-out on municipal solid waste landfilling and life cycle environmental performance: Case study of Madrid, Spain". *Science of the Total Environment*, **2021**, 755, art. no. 142537.
48. Istrate, I.R.; Medina-Martos, E.; Galvez-Martos, J. L.; Dufour, J. "Assessment of the energy recovery potential of municipal solid waste under future scenarios". *Applied Energy*, **2021**, 293, art. no. 116915.
49. Istrate, I.R.; Juan, R.; Martin-Gamboa, M.; Domínguez, C.; García-Muñoz, R.A.; Dufour, J. "Environmental life cycle assessment of the incorporation of recycled high-density polyethylene to polyethylene pipe grade resins". *Journal of Cleaner Production*, **2021**, 319, art. no. 128580.
50. Jankovic, N.; Roldan-Perez, J.; Prodanovic, M. "Power Oscillation Damping Using Converter-Interfaced Generators under Constrained Active and Reactive Powers". *Proceedings of 2021 IEEE PES Innovative Smart Grid Technologies Europe: Smart Grids: Toward a Carbon-Free Future, ISGT Europe 2021*, **2021**.

51. Kubovics, M.; Rojas, S.; Lopez, A.M.; Fraile, J.; Horcajada, P.; Domingo, C. "Fully supercritical CO₂ preparation of a nanostructured MOF composite with applications in cutaneous drug delivery". *Journal of Supercritical Fluids*, **2021**, 178, 105379-105390.
52. Lado, J.J.; Cartolano, V.; García-Quismondo, E.; García, G.; Almonacid, I.; Senatore, V.; Naddeo, V.; Palma, J.; Anderson, M.A. "Performance analysis of a capacitive deionization stack for brackish water desalination". *Desalination*, **2021**, 501, art. no. 114912.
53. Lado, J.J.; García-Quismondo, E.; Almonacid, I.; García, G.; Castro, G.; Palma, J. "A successful transition from a vanadium redox flow battery stack to an energy efficient electrochemical desalination module". *Journal of Environmental Chemical Engineering*, **2021**, 9 (6), art. no. 106875.
54. Lago, A.; Hernando, H.; Moreno, J.M.; Serrano, D.P.; Fermoso, J. "Valorisation of a lignin-rich residue via catalytic pyrolysis over ZrO₂/ZSM-5 technical catalyst". *Fuel Processing Technology*, **2021**, 215, art. no. 106746.
55. Leung, P.; Martin, T.; Xu, Q.; Flox, C.; Mohamad, M.R.; Palma, J.; Rodchanarowan, A.; Zhu, X.; Xing, W.W.; Shah, A.A. "A new aqueous all-organic flow battery with high cell voltage in acidic electrolytes". *Applied Energy*, **2021**, 282, art. no. 116058.
56. Liu, L.; Zhao, C.; Zheng, F.; Deng, D.; Anderson, M.A.; Wang, Y. "Three-dimensional electrode design with conductive fibers and ordered macropores for enhanced capacitive deionization performance". *Desalination*, **2021**, 498, art. no. 114794.
57. Llamas, M.; Greses, S.; Tomás-Pejó, E.; González-Fernández, C. "Tuning microbial community in non-conventional two-stage anaerobic bioprocess for microalgae biomass valorization into targeted bioproducts". *Bioresource Technology*, **2021**, 337, art. no. 125387.
58. Llamas, M.; Magdalena, J.A.; Greses, S.; Tomás-Pejó, E.; González-Fernández, C. "Insights on the microbial communities developed during the anaerobic fermentation of raw and pretreated microalgae biomass". *Chemosphere*, **2021**, 263, art. no. 127942.
59. Lopes, F. M.; Conceição, R.; Silva, H. G.; Salgado, R.; Collares-Pereira, M. "Improved ECMWF forecasts of direct normal irradiance: A tool for better operational strategies in concentrating solar power plants". *Renewable Energy*, **2021**, 163, 755-771.
60. López-Renau, L.M.; García-Pina, L.; Hernando, H.; Gómez-Pozuelo, G.; Botas, J.A.; Serrano, D.P. "Enhanced bio-oil upgrading in biomass catalytic pyrolysis using KH-ZSM-5 zeolite with acid-base properties". *Biomass Conversion and Biorefinery*, **2021**, 11 (6), 2311-2323. (Published 17/06/2019 – Issue Date December 2021)
61. Luna, M.; Barawi, M.; Gómez-Moñivas, S.; Colchero, J.; Rodríguez-Peña, M.; Yang, S.; Zhao, X.; Lu, Y.-H.; Chintala, R.; Reñones, P.; Altoe, V.; Martínez, L.; Huttel, Y.; Kawasaki, S.; Weber-Bargioni, A.; De La Peña Óshea, V.A.; Yang, P.; Ashby, P.D.; Salmeron, M. "Photoinduced Charge Transfer and Trapping on Single Gold Metal Nanoparticles on TiO₂". *ACS Applied Materials and Interfaces*, **2021**, 13 (42), 50531-50538.
62. Madrona, C.; Vila, M.; Oropeza, F.E.; de la Peña O'Shea, V.A.; Vilatela, J.J. "Macroscopic yarns of FeCl₃-intercalated collapsed carbon nanotubes with high doping and stability". *Carbon*, **2021**, 173, 311-321.
63. Magdalena, J.A.; Greses, S.; González-Fernández, C. "Valorisation of bioethanol production residues through anaerobic digestion: Methane production and microbial communities". *Science of the Total Environment*, **2021**, 772, art. no. 144954.

- 64.** Markou, G.; Diamantis, A.; Arapoglou, D.; Mitrogiannis, D.; González-Fernández, C.; Unc, A. "Growing *Spirulina* (*Arthrospira platensis*) in seawater supplemented with digestate: Trade-offs between increased salinity, nutrient and light availability". *Biochemical Engineering Journal*, **2021**, *165*, art. no. 107815.
- 65.** Martínez, L.; Merino, P.; Santoro, G.; Martínez, J. I.; Katsanoulis, S.; Ault, J.; Mayoral, Á.; Vázquez, L.; Accolla, M.; Dazzi, A.; Mathurin, J.; Borondics, F.; Blázquez-Blázquez, E.; Shauloff, N.; Lebrón-Aguilar, R.; Quintanilla-López, J.E.; Jelinek, R.; Cernicharo, J.; Stone, H. A.; de la Peña O'Shea, V. A.; de Andres, P. L.; Haller, G.; Ellis, G. J.; Martín-Gago, J. A. "Metal-catalyst-free gas-phase synthesis of long-chain hydrocarbons". *Nature Communications*, **2021**, *12* (1), art. no. 5937.
- 66.** Martín-Gamboa, M.; Quinteiro, P.; Dias, A.C.; Iribarren, D. "Comparative social life cycle assessment of two biomass-to-electricity systems". *International Journal of Environmental Research and Public Health*, **2021**, *18* (9), art. no. 4918.
- 67.** Montoya, F.G.; Baños, R.; Alcayde, A.; Arrabal-Campos, F. M.; Pérez, J. R. "Geometric algebra framework applied to symmetrical balanced three-phase systems for sinusoidal and non-sinusoidal voltage supply". *Mathematics*, **2021**, *9* (11), art. no. 1259.
- 68.** Montoya, F.G.; Baños, R.; Alcayde, A.; Arrabal-Campos, F.M.; Roldán-Pérez, J. "Vector geometric algebra in power systems: An updated formulation of apparent power under non-sinusoidal conditions". *Mathematics*, **2021**, *9* (11), art. no. 1295.
- 69.** Moreno, A.D.; Magdalena, J.A.; Oliva, J.M.; Greses, S.; Lozano, C.C.; Latorre-Sánchez, M.; Negro, M.J.; Susmozas, A.; Iglesias, R.; Llamas, M.; Tomás-Pejó, E.; González-Fernández, C. "Sequential bioethanol and methane production from municipal solid waste: An integrated biorefinery strategy towards cost-effectiveness". *Process Safety and Environmental Protection*, **2021**, *146*, 424-431.
- 70.** Moutevelis, D.; Roldan-Perez, J.; Prodano-vic, M. "Virtual Admittance Control for Providing Voltage Support using Converter Interfaced Generation". *Proceedings of 2021 IEEE PES Innovative Smart Grid Technologies Europe: Smart Grids: Toward a Carbon-Free Future, ISGT Europe 2021*, **2021**.
- 71.** Moyano Rodríguez, E.; Gomez-Mendoza, M.; Pérez-Ruiz, R.; Peñín, B.; Sampedro, D.; Caamaño, A.; de la Peña O'Shea, V.A. "Controlled Synthesis of Up-Conversion NaYF₄:Yb,Tm Nanoparticles for Drug Release under Near IR-Light Therapy". *Biomedicines*, **2021**, *9* (12), art. no. 1953.



72. Navalpotro, P.; Castillo-Martínez, E.; Carretero-González, J. "Sustainable materials for off-grid battery applications: Advances, challenges and prospects". *Sustainable Energy and Fuels*, **2021**, 5 (2), 310-331.
73. Navas-Anguita, Z.; García-Gusano, D.; Dufour, J.; Iribarren, J. "Revisiting the role of steam methane reforming with CO₂ capture and storage for long-term hydrogen production". *Science of the Total Environment*, **2021**, 771, art. no.145432.
74. Oropeza, F.E.; Barawi, M.; Alfonso-González, E.; de la Peña O'Shea, V.A.; Trigo, J.F.; Guillén, C.; Saiz, F.; Villar-García, I.J. "Understanding ultrafast charge transfer processes in SnS and SnS₂: using the core hole clock method to measure attosecond orbital-dependent electron delocalisation in semiconducting layered materials". *Journal of Materials Chemistry C*, **2021**, 9 (35), 11859-11872.
75. Ortiz-Bustos, J.; Hierro, I.D.; Sánchez-Ruiz, A.; García-Martínez, J.C.; Pérez, Y. "Tuning of type-I and type-II mechanisms for visible light degradation in tris(styryl)benzene-sensitized TiO₂ nanoparticles". *Dyes and Pigments*, **2021**, 184, art. no. 108802.
76. Ortiz-Bustos, J.; Pérez, Y.; Hierro, I. D. "Structure, stability, electrochemical and catalytic properties of polyoxometalates immobilized on choline-based hybrid mesoporous silica". *Microporous and Mesoporous Materials*, **2021**, 321, art. no. 111128.
77. Páez, T.; Martínez-Cueva, A.; Marcilla, R.; Palma, J.; Ventosa, E. "Mitigating capacity fading in aqueous organic redox flow batteries through a simple electrochemical charge balancing protocol". *Journal of Power Sources*, **2021**, 512, art. no. 230516.
78. Park, Y.-K.; González-Fernández, C.; Robles-Iglesias, R.; Vidal, L.; Fontanille, P.; Kennes, C.; Tomás, Pejó, E.; Nicaud, J.-M.; Fickers, P. "Bioproducts generation from carboxylate platforms by the non-conventional yeast *Yarrowia lipolytica*". *FEMS Yeast Research*, **2021**, 21 (6), art. no. foab047.
79. Patil, N.; de la Cruz, C.; Ciurduc, D.; Mavrantakis A.; Palma, J.; Marcilla, R. "An Ultrahigh Performance Zinc-Organic Battery using Poly(catechol) Cathode in Zn(TFSI)₂-Based Concentrated Aqueous Electrolytes". *Advanced Energy Materials*, **2021**, 11 (26), art. no. 2100939.
80. Patil, N.; Marcilla, R. (2021). "Catechol Containing Polymers for Electrochemical Energy Storage". En: *Redox Polymers for Energy and Nanomedicine*. Ed: Royal Society of Chemistry. ISBN: 978-1-78801-871-5. Book Chapter
81. Patil, N.; Mavrantakis, A.; Jérôme, C.; Detrembleur, C.; Casado, N.; Mecerreyes, D.; Palma, J.; Marcilla, R. "High-performance all-organic aqueous batteries based on a poly(imide) anode and poly(catechol) cathode". *Journal of Materials Chemistry A*, **2021**, 9 (1), 505-514.
82. Patil, N.; Palma, J.; Marcilla, R. "Macromolecular engineering of poly(Catechol) cathodes towards high-performance aqueous zinc-polymer batteries". *Polymers*, **2021**, 13 (11), art. no. 1673.
83. Peters, J.F.; Baumann, M.; Binder, J.R.; Weil, M. "On the environmental competitiveness of sodium-ion batteries under a full life cycle perspective-a cell-chemistry specific modelling approach". *Sustainable Energy and Fuels*, **2021**, 5 (24), 6414-6429.
84. Praticò, L.; Fronza, N.; Bartali, R.; Chiappini, A.; Sciubba, E.; González-Aguilar, J.; Crema, L. "Radiation propagation in a hierarchical solar volumetric absorber: Results of single-photon avalanche diode measurements and Monte Carlo ray tracing analysis". *Renewable Energy*, **2021**, 180, 482-493.
85. Prolongo, S.G.; Díaz-Maroto, C.G.; Jiménez-Suárez, A. "Electroactive shaping and shape memory of sequential dual-cured off-stoichiometric epoxy/CNT composites". *Journal of Materials Research and Technology*, **2021**, 15, 2970-2981.





86. Qu, M.; Ding, X.; Shen, Z.; Cui, M.; Oropeza, F.E.; Gorni, G.; de la Peña O'Shea, V.A.; Li, W.; Qi, D. C.; Zhang, K.H.L. "Tailoring the Electronic Structures of the $\text{La}_2\text{NiMnO}_6$ Double Perovskite as Efficient Bifunctional Oxygen Electrocatalysis". *Chemistry of Materials*, **2021**, 33 (6), 2062-2071.
87. Quiroz, J.; de Oliveira, P.F.M.; Shetty, S.; Oropeza, F.E.; de la Peña O'Shea, V.A.; Rodrigues, L.C.V.; de S. Rodrigues, M.P.; Torresi, R.M.; Emmerling, F.; Camargo, P.H.C. "Bringing Earth-Abundant Plasmonic Catalysis to Light: Gram-Scale Mechanochemical Synthesis and Tuning of Activity by Dual Excitation of Antenna and Reactor Sites". *ACS Sustainable Chemistry and Engineering*, **2021**, 9 (29), 9750-9760.
88. Ramirez, D.; Castillo, R.D.J.; Zarei, M.E.; Serrano, J. "Linear multi-vector model-based predictive control for grid side converters of renewable power plants under severe grid disturbances". *IET Renewable Power Generation*, **2021**, 15 (5), 964-979.
89. Rana, M.; Boaretto, N.; Mikhanchan, A.; Vila Santos, M.; Marcilla, R.; Vilatela, J.J. "Composite Fabrics of Conformal MoS_2 Grown on CNT Fibers: Tough Battery Anodes without Metals or Binders". *ACS Applied Energy Materials*, **2021**, 4 (6), 5668-5676.
90. Rodríguez-Garrido, R.; Carballar, A.; Vera, J.; Gonzalez-Aguilar, J.; Altamirano, A.; Loureiro, A.; Pereira, D. "High-temperature monitoring in central receiver concentrating solar power plants with femtosecond-laser inscribed fbg". *Sensors*, **2021**, 21 (11), art. no. 3762.
91. Rodriguez-Ortega, P.; Prodanovic, M.; Roldan-Perez, J. "Converter-Based Solution for Cancellation of Subsynchronous Oscillations in Local Power Grids". *2021 IEEE Madrid PowerTech, PowerTech 2021 - Conference Proceedings*, **2021**, art. no. 9495065.
92. Rojas, S.; Horcajada, P. "Understanding the Incorporation and Release of Salicylic Acid in Metal-Organic Frameworks for Topical Administration". *European Journal of Inorganic Chemistry*, **2021**, 2021 (14), 1325-1331.
93. Rojas, S.; Navarro, J. A. R.; Horcajada, P. "Metal-organic frameworks for the removal of the emerging contaminant atenolol under real conditions". *Dalton Transactions*, **2021**, 50 (7), 2493-2500.
94. Rojas, S.; Torres, A.; Dato, V.; Salles, F.; Ávila, D.; García-González, J.; Horcajada, P. "Towards improving the capacity of UiO-66 for antibiotic elimination from contaminated water". *Faraday Discussions*, **2021**, 231, 356-370.
95. Roldan-Perez, J.; Prodanovic, M.; Rodriguez-Cabero, A. "Modelling Power-Frequency Interactions between Voltage Source Converters with PLLs and Power Networks with Reduced Inertia". *2021 IEEE Madrid PowerTech, PowerTech 2021 - Conference Proceedings*, **2021**, art. no. 9494986.
96. Roldan-Perez, J.; Moran-Rio, D.P.; Moutevelis, D.; Rodriguez-Ortega, P.; Jankovic, N.; Zarei, M.E.; Prodanovic, M. "Emulation of Complex Grid Scenarios by using Power Hardware in the Loop (PHIL) Techniques". *IECON Proceedings (Industrial Electronics Conference)*, **2021**, 1-6.
97. Salcedo-Abaira, P.; Babaryk, A.A.; Montero-Lanzuela, E.; Contreras-Almengor, O.R.; Cabrero-Antonino, M.; Grape, E.S.; Willhammar, T.; Navalón, S.; Elkäim, E.; García, H.; Horcajada, P. "A Novel Porous Ti-Square as Efficient Photocatalyst in the Overall Water Splitting Reaction under Simulated Sunlight Irradiation". *Advanced Materials*, **2021**, 33 (52), art. no. 2106627.
98. Salcedo-Abaira, P.; Vilela, S.M.F.; Babaryk, A.A.; Cabrero-Antonino, M.; Gregorio, P.; Salles, F.; Navalón, S.; García, H.; Horcajada, P. "Nickel phosphonate MOF as efficient water splitting photocatalyst". *Nano Research*, **2021**, 14 (2), 450-457.
99. Salcedo-Abaira, P.; Vilela, S.M.F.; Ureña, N.; Salles, F.; Várez, A.; Horcajada, P. "Ion-Exchanged UPG-1 as Potential Electrolyte for Fuel Cells". *Inorganic Chemistry*, **2021**, 60 (16), 11803-11812.

100. Sánchez-Díez, E.; Ventosa, E.; Guarnieri, M.; Trovò, A.; Flox, C.; Marcilla, R.; Soavi, F.; Mazur, P.; Aranzabe, E.; Ferret, R. "Redox flow batteries: Status and perspective towards sustainable stationary energy storage". *Journal of Power Sources*, **2021**, 481, art. no. 228804.
101. Santos, C.; Rodriguez, I. V.; Lado, J. J.; Vila, M.; García-Quismondo, E.; Anderson, M. A.; Palma, J.; Vilatela, J. J. "Low-energy consumption, free-form capacitive deionization through nanostructured networks". *Carbon*, **2021**, 176, 390-399.
102. Senthilkumar, S.T.; Park, J.-S.; Marcilla, R.; Palma, J.; Kim, Y. "Using redox electrolytes to extend the charge storage capacity in an aqueous hybrid ion battery". *Chemical Engineering Journal*, **2021**, 411, art. no. 128416.
103. Šuligoj, A.; Kete, M.; Černigoj, U.; Fresno, F.; Lavrenčič Štangar, U. "Synergism in TiO₂ photocatalytic ozonation for the removal of dichloroacetic acid and thiocloprid". *Environmental Research*, **2021**, 197, art. no. 110982.
104. Tasbihi, M.; Fresno, F.; Álvarez-Prada, I.; Acharjya, A.; Thomas, A.; Escriche, L.; Romero, N.; Sala, X.; De La Peña O'Shea, V.A.; García-Antón, J. "A molecular approach to the synthesis of platinum-decorated mesoporous graphitic carbon nitride as selective CO₂ reduction photocatalyst". *Journal of CO₂ Utilization*, **2021**, 50, art. no. 101574.
105. Tomás-Pejó, E.; Morales-Palomo, S.; González-Fernández, C. "Microbial lipids from organic wastes: Outlook and challenges". *Biore-source Technology*, **2021**, 323, art. no. 124612.
106. Torres-Garcia, N.L.; Fresno, F.; Oropeza, F.E.; Huirache-Acuña, R.; de la Peña-O'Shea, V.A. "Effect of the TiO₂ Nanocrystal Dispersion Over SBA-15 in the Photocatalytic H₂ Production Using Ethanol as Electron Donor". *Advanced Sustainable Systems*, **2021**, 5 (11), art. no. 2100133.
107. Valente, A.; Iribarren, D.; Dufour, J. "Harmonised life-cycle indicators of nuclear-based hydrogen". *International Journal of Hydrogen Energy*, **2021**, 46 (57), 29724-29731.
108. Valente, A.; Iribarren, D.; Dufour, J. "Harmonised carbon and energy footprints of fossil hydrogen". *International Journal of Hydrogen Energy*, **2021**, 46 (33), 17587-17594.
109. Valente, A.; Iribarren, D.; Dufour, J. "Comparative life cycle sustainability assessment of renewable and conventional hydrogen". *Science of the Total Environment*, **2021**, 756, art. no. 144132.
110. Wang, H.; Zhang, K.H.L.; Hofmann, J.P.; de la Peña O'Shea, V.A.; Oropeza, F.E. "The electronic structure of transition metal oxides for oxygen evolution reaction". *Journal of Materials Chemistry A*, **2021**, 9 (35), 19465-19488.
111. Weber, J.L.; Martínez del Monte, D.; Beertuis, R.; Dufour, J.; Martos, C.; de Jong, K.P.; de Jongh, P.E. "Conversion of synthesis gas to aromatics at medium temperature with a fischer tropesch and ZSM-5 dual catalyst bed". *Catalysis Today*, **2021**, 369, 175-183.
112. Zaoui, F.; Sebba, F.Z.; Liras, M.; Sebti, H.; Hachemaoui, M.; Mokhtar, A.; Beldjilali, M.; Bounaceur, B.; Boukoussa, B. "Ultrasonic preparation of a new composite poly(GMA)@Ru/TiO₂@Fe₃O₄: Application in the catalytic reduction of organic pollutants". *Materials Chemistry and Physics*, **2021**, 260, art. no. 124146.
113. Zarei, M.E.; Ramirez, D.; Prodanovic, M.N.; Medrano Arana, G. "Model Predictive Control for PMSG-based Wind Turbines with Overmodulation and Adjustable Dynamic Response Time". *IEEE Transactions on Industrial Electronics*, **2021**, *IN PRESS*.

114. Zarei, M.E.; Ramirez, D.; Prodanovic, M.; Venkataramanan, G. "Multi-Vector Model Predictive Power Control for Grid Connected Converters in Renewable Power Plants". IEEE Journal of Emerging and Selected Topics in Power Electronics, **2021**, *IN PRESS*.

115. Zarei, M.E.; Prodanovic, M.; Ramirez, D. "Doubly Fed Induction Generator with Multi-Vector Model Predictive Power Control". IECON Proceedings (Industrial Electronics Conference), 2021, 1-6.

2.2. Intellectual property

2.2.1. Patents

Submitted patents

1. Application number: P202131189, title: "Receptor solar constituido por paneles absorbedores basados en estructuras compactas". Date of application: 22/12/2021 (OEPM). Holders: Universidad Nacional de Educación a Distancia (UNED), Fundación IMDEA Energía. Inventors: Montes, M.J.; Rovira, A.J.; González, J.; Romero, M.

2. Application number: EP21383065.6, título: "Supercapacitor for energy storage". Date of application: 24/11/2021 (OEPM). Holder: Fundación IMDEA Energía. Inventors: Navalpotro, P.; Palma, J.; Marcilla, R.

3. Application number: N° solicitud: P202130926, title: "Cerramiento activo para controlar las cargas térmicas de los edificios". Date of application: 04/10/2021 (OEPM). Holders: Universidad Politécnica de Madrid, Fundación IMDEA Energía.

4. Application number: PCT/EP2021/073842 (extensión PCT), título: "Recyclable Electrode Cell". Date of application: 31/08/2021. Holders: Fundación IMDEA Energía. Inventors: Lado, J.; Ventosa, E.; Pérez, D.; García-Quismondo, E.; Palma, J.. Application number: EP20382772.0, title: "Recyclable Electrode Cell". Date of application: 31/08/2020 (OEPM). Holders: Fundación IMDEA Energía. Inventors: Lado, J.; Ventosa, E.; Pérez, D.; García-Quismondo, E.; Palma, J.

5. Application number: PCT/ES2021/070482. (extension PCT). Date of application: 01/07/2021. Holders: Universidad de Sevilla, Fundación CENER, Mesurex S.L.U., Cobra Instalaciones y Servicios, S.A., Egatel, S.L., Fundación IMDEA Energía. Inventors: Carballar Rincón, A.; Rodríguez Garrido, R.; Application number: P202030682, title: "Dispositivo y procedimiento de radiometría para la medida de irradiancia solar". Date of application: 02/07/2020 (OEPM). Holders: Universidad de Sevilla, Fundación CENER, Mesurex S.L.U., Cobra Instalaciones y Servicios, S.A., Egatel, S.L., Fundación IMDEA Energía. Inventors: Carballar Rincón, A.; Rodríguez Garrido, R.;

6. Application number: PCT/EP2021/059865 (extension PCT), title: "Redox flow battery". Date of application: 16/04/2021. Holders: Fundación IMDEA Energía. Inventors: Montes, I.; Marcilla, R.; Palma, J.; Ventosa, E.; Vera, M.; Sánchez, M. Application number: EP20382311.7, title: "Redox flow battery". Date of application: 17/04/2020 (OEPM). Holders: Fundación IMDEA Energía. Inventors: Montes, I.; Marcilla, R.; Palma, J.; Ventosa, E.; Vera, M.; Sánchez, M.

2.3. Books/chapters of books and other publications

1. Rojas, S.; Horcajada, P. (2021). "Metal-organic Frameworks in Biomedical and Environmental Engineering". Ed. Springer Nature. ISBN: 978-3-030-63379-0 [hardcover]; 978-3-030-63380-6 [ebook].
2. Armani, G.; Rojas, S.; de la Peña-O'Shea, V.A.; Horcajada, P. (2021). "Green energy generation using Metal-Organic Frameworks" En: Metal-organic Frameworks in Biomedical and Environmental Engineering. Ed. Springer Nature. ISBN: 978-3-030-63379-0 [hardcover]; 978-3-030-63380-6 [ebook].
3. Martín-Gamboa, M.; Iribarren, D. (2021) "Coupled life cycle thinking and data envelopment analysis for quantitative sustainability improvement". In: "Methods in Sustainability Science – Assessment, Prioritization, Improvement, Design and Optimization", Elsevier. ISBN: 978-0-12-823987-2.
4. Rodríguez-Cabero, A.; Carrizosa, M. J.; Rol-dán-Pérez, J.; Prodanovic, M. (2021). "Stability analysis and hierarchical control of DC power networks". En: Modeling, Operation, and Analysis of DC Grids. Ed: Academic Press. ISBN: 978-0-12-822101-3.
5. Tapia, E.; González-Pardo, A.; Iranzo, A.; Romero, M.; González-Aguilar, J.; Vidal, A.; Martín-Betancourt, M.; Rosa, F. (2021). "Multi-Tubular Reactor for Hydrogen Production: CFD Thermal Design and Experimental Testing" En: Hydrogen Production Technologies. ISBN: 978-3-03943-667-5 [hardcover]; ISBN 978-3-03943-668-2 [ebook].
6. Navalpotro, P.; Vaquero, S.; Tiruye, G. A.; Sánchez, J. S.; Senokos, E.; Palma, J.; Marcilla, R. (2021). "Supercondensadores, Sistemas de almacenamiento de alta potencia" En: Aplicaciones medioambientales y energéticas de la tecnología electroquímica. Ed. Reverté. ISBN: 978-84-291-7075-7.
7. Marcilla, R.; Palma, J.; Páez, T.; Berling, S.; García-Quismondo, E. (2021). "Baterías de flujo redox" En: Aplicaciones medioambientales y energéticas de la tecnología electroquímica. Ed. Reverté. ISBN: 978-84-291-7075-7.
8. Navas-Anguita, Z.; Iribarren, D. "Unidad de Análisis de Sistemas de IMDEA Energía. Modelo PICASO". Papeles de Energía, Nº 12, February 2021, 47-50.
9. Romero, M. "ACES2030, una respuesta integral de la tecnología CSP a los retos de sostenibilidad energética en el horizonte 2030". Energética XXI, Nº 206, May 2021, 86-87.
10. Navalpotro, P.; Patil, N.; Marcilla, R. "Baterías de flujo con polímeros Redox". Revista Plásticos Modernos, 2021, 121 (767). ISSN: 003-8708.
11. IMDEA Energía "Conversión y almacenamiento de energía solar en un único dispositivo integrado". Energética XXI, Nº 209, September 2021, 44.
12. Puig-Samper, G.; Iribarren, D.; Dufour, J. "Soluciones para trazar la sostenibilidad del hidrógeno: Decidiendo el futuro". RETEMA, Nº 233 Especial Bioenergía 2021, 122-125.

2.4. PhD Thesis

1. Title: Aprovechamiento de residuos lignocelulósicos para la producción de ácido láctico y bioetanol en un contexto de biorrefinería / Valorisation of lignocellulosic residues for lactic acid and bioethanol production in a biorefinery context

Author: Enrique Cubas Cano

Director: Dr. Elia Tomás

Venue: Complutense University of Madrid, Spain

Date: 13 January 2021

2. Title: Desarrollo de moléculas y materiales fotoactivos basados en polímeros para química fina y aplicaciones energéticas

Author: Carmen García López

Director: Dr. Víctor A. de la Peña O'Shea, Dr. Marta Liras Torrente

Venue: Semipresencial, Complutense University of Madrid, Spain

Date: 27 January 2021

3. Title: Desarrollo de nuevos materiales para la producción de combustibles limpios mediante fotosíntesis artificial / Development of new materials for the production of clean fuels through artificial photosynthesis

Author: Patricia Reñones Brasa

Director: Dr. Víctor A. de la Peña O'Shea, Dr. Fernando Fresno

Venue: Rey Juan Carlos University, Spain

Date: 5 February 2021

4. Title: Prospective assessment of alternative fuel production technologies for decarbonising road transport in Spain

Author: Zaira Navas Anguita

Director: Dr. Diego García, Dr. Diego Iribarren

Venue: Rey Juan Carlos University, Spain

Date: 16 April 2021

5. Title: Valorización de microalgas para la producción de ácidos grasos volátiles, aceites microbianos y biogás, en un contexto de biorrefinería

Author: Mercedes Llamas Redondo

Director: Dr. Elia Tomás, Dr. Cristina González

Venue: Complutense University of Madrid, Spain

Date: 7 May 2021

6. Title: Nuevas Redes Metal-Orgánicas y materiales compuestos: síntesis y aplicaciones. - Novel Metal-Organic Frameworks and composites: synthesis and applications.

Author: Pablo Salcedo Fernández

Director: Dr. Patricia Horcajada, Dr. Thomas Devic

Venue: Online, Complutense University of Madrid, Spain

Date: 27 July 2021

7. Title: Mejora de las propiedades de redes metal-orgánicas mediante la asociación de nano-especies activas

Author: Ana Arenas Vivo

Director: Dr. Patricia Horcajada

Venue: Online, Complutense University of Madrid, Spain

Date: 22 November 2021



2.5. Congress communications

2.5.1. Invited lectures

1. Title: Metal organic frameworks: biomedical and environmental applications

Authors: P. Horcajada

Congress: Ciclo de conferencias “RSEQ Lectures”

Venue: Online

Date: 25 February 2021

Organizer: Real Sociedad Española de Química (RSEQ)

2. Title: Insights into Energy Storage Materials by Computational Chemistry Techniques

Authors: A. Mavrantakis

Congress: Sussex Virtual Seminars

Venue: Online

Date: 10 March 2021

Organizer: School of Life Sciences of University of Sussex

3. Title: Membrane-free Batteries: One Idea, a Multidisciplinary Project

Authors: Navalpotro, P.

Congress: NEXT GENERATION - Flow Battery Conference and Networking Event

Venue: Online

Date: 11 March 2021

Organizer: FlowCamp, Redox Flow Battery Campus project

4. Title: New developments on life cycle sustainability assessment of hydrogen systems

Authors: J. Dufour

Congress: World Online Conference on Sustainable Technologies 2021

Venue: Online

Date: 17-19 March 2021

Organizer: CGS

5. Title: Metal organic frameworks: biomedical and environmental applications

Authors: P. Horcajada

Congress: Advanced Materials Lecture Series

Venue: Online

Date: 24 March 2021

Organizer: International Association of Advanced Materials (IAAM)

6. Title: Metal organic frameworks: biomedical applications

Authors: P. Horcajada

Congress: Workshop Metal Organic Frameworks and Zeolites: from synthesis to applications of crystalline porous materials

Venue: Online

Date: 23 April 2021

Organizer: Ecole Doctorale Sciences Chimique, University of Strasbourg

7. Title: Metal organic frameworks: biomedical and environmental applications

Authors: P. Horcajada

Congress: UCLM – International Science Webinar Series

Venue: Online

Date: 10 June 2021

Organizer: University of Castilla-La Mancha

8. Title: Redes metal-orgánicas: su gran potencial en biomedicina

Authors: P. Horcajada

Congress: V Jornadas de Promoción de la Investigación Básica para Estudiantes de Ciencias e Ingeniería

Venue: Móstoles, Spain

Date: 7-8 September 2021

Organizer: Rey Juan Carlos University

9. Title: Metal organic frameworks: from drug vectorization to decontamination (Plenaria)

Authors: P. Horcajada

Congress: 4th European Conference on Metal Organic Frameworks and Porous Polymers (EuroMOF 2021)

Venue: Online

Date: 13-15 September 2021

Organizer: Jagiellonian University

10. Title: Progress in biomass catalytic pyrolysis for the production of advanced biofuels and bio-based chemicals (Plenary)

Authors: D.P. Serrano

Congress: Brazilian Catalysis Congress (CBCAT 2021)

Venue: Online

Date: 13-17 September 2021

Organizer: Brazilian Catalysis Association

11. Title: Biomedical interest of metal-organic frameworks (Plenary)

Authors: P. Horcajada

Congress: II Congress sobre Materiales Multifuncionales

Venue: Almuñécar, Spain

Date: 20-21 September 2021

Organizer: University of Granada

12. Title: Nuevos desarrollos en el análisis de sostenibilidad de ciclo de vida de sistemas de hidrógeno (Plenary)

Authors: J. Dufour

Congress: XXI International Congress of the Mexican Hydrogen Society

Venue: Online

Date: 20-24 September 2021

Organizer: Sociedad Mexicana del Hidrógeno and Centro de Investigación Científica de Yucatán

13. Title: MOFs for novel biomedical and environmental applications

Authors: P. Horcajada

Congress: 1st Argentinian Symposium on Metal-Organic Frameworks (ArMOF 2021)

Venue: Online

Date: 13-15 October 2021

Organizer: Universidad Nacional de La Plata

14. Title: Hierarchical zeolites: synthesis strategies and singular properties (Plenary)

Authors: P. Pizarro

Congress: Workshop on zeolites

Venue: Liblice, República Checa

Date: 24-27 October 2021

Organizer: Charles University

15. Title: Development of Redox- Active Conjugated Microporous Polymer for High Performing and Sustainable Batteries

Authors: Marcilla, R.

Congress: Organic Battery Days 2021

Venue: Online

Date: 25-27 November 2021

Organizer: Waseda University

2.5.2. Oral communications

1. Title: Nickel phosphonate MOF as efficient water splitting photocatalyst

Authors: Salcedo-Abaira, P.; Vilela, S. M. F.; Babaryk, A. A.; Cabrero-Antonio, M.; Gregorio, P.; Salles, F.; Navalón, S.; García, H.; Horcajada, P.

Congress: XXIX Simposio del Grupo Especializado de Cristalografía y crecimiento Cristalino, GE3C 2021

Venue: Online

Date: 19-22 January 2021

Organizer: Real Sociedad Española de Química (RSEQ) and Real Sociedad Española de Física (RSEF)

2. Title: Redox- active conjugated microporous polymer based on anthraquinone for high-performance lithium-ion batteries

Authors: Patil, N.; Molina, A.; Grieco, R.; Liras, M.; Palma, J.; Marcilla, R.

Congress: I Meeting on Energy Conversion and Storage Electrochemical Devices

Venue: Online

Date: 28-29 January 2021

Organizer: Carlos III University

3. Title: Self-discharge reactions in membraneless redox flow batteries

Authors: Ibañez, S. E.; Palma, J.; Navalpotro, P.; Marcilla R.

Congress: I Meeting on Energy Conversion and Storage Electrochemical Devices

Venue: Online

Date: 28-29 January 2021

Organizer: Carlos III University

4. Title: A Strategy to Increase the Volumetric Storage Capacity of Redox Flow Batteries
Authors: Paez, T.; Palma, J.; Ventosa, E.

Congress: I Meeting on Energy Conversion and Storage Electrochemical Devices

Venue: Online

Date: 28-29 January 2021

Organizer: Carlos III University

5. Title: Membrane-free flow batteries based on immiscible electrolytes: Concept and development

Authors: Navalpotro, P.; Pedraza, E.; Ibáñez, S. E.; Senthilkumar, S. T.; Marcilla, R.

Congress: ACS Spring 2021

Venue: Online

Date: 5-16 April 2021

Organizer: American Chemical Society

6. Title: New Insights into Phenazine-based Redox Flow Batteries by using High-Throughput Density Functional Theory Modelling

Authors: Mavrantakis, A.; de la Cruz, C.; Marcilla, R.

Congress: ACS Spring 2021

Venue: Online

Date: 5-16 April 2021

Organizer: American Chemical Society

7. Title: Development of gel-polymer electrolytes based on superconcentrated electrolytes for lithium metal batteries

Authors: Ciurduc, D.

Congress: ACS Spring 2021

Venue: Online

Date: 5-16 April 2021

Organizer: American Chemical Society

8. Title: Effects of the diffusive mixing and self-discharge reactions in membraneless redox flow batteries

Authors: Ibáñez, S. E.; Quintero, A. E.; García-Salaberri, P. A.; Palma, J.; Marcilla, R.; Navalpotro, P.; Vera, M.

Congress: 17th Symposium on Modeling and Experimental Validation of Electrochemical Energy Technologies

Venue: Online

Date: 20-22 April 2021

Organizer: Ecole Polytechnique Fédérale de Lausanne (EPFL), Faculty of Engineering, Institute of Mechanical Engineering, Group of Energy Materials (GEM)

9. Title: Biotechnological advances in lactic acid production by lactic acid bacteria: ligno-cellulose as novel substrate

Authors: Tomás-Pejó, E.

Congress: 72nd Starch Convention & 17th European Bioethanol and Bioconversion Technology Meeting

Venue: Online

Date: 20-22 April 2021

Organizer: Arbeitsgemeinschaft Getreideforschung e.V. (AGF)

10. Title: Quantifying the Future Energy and Nutrient Recovery Potential of the Organic Fraction of Municipal Solid Waste

Authors: Istrate, I. R.; Galvez-Martos, J. L.; Dufour, J.

Congress: RETASTE: Rethink Food Waste 2021

Venue: Online

Date: 6-8 May 2021

Organizer: Sympraxis Team P.C.

11. Title: Biofuels from Hydrothermal Liquefaction of Food Waste: The Impact of Feedstock Composition on Process Economics

Authors: Medina-Martos, E.; Gálvez-Martos, J. L.; Dufour, J.

Congress: RETASTE: Rethink Food Waste 2021

Venue: Online

Date: 6-8 May 2021

Organizer: Sympraxis Team P.C.

12. Title: Exploring the Performance of Capacitive Deionization Modules for Brackish Water Desalination

Authors: Lado, J. J.; García-Quismondo, E.; García, G.; Almonacid, I.; Castro, G.; Palma, J.

Congress: 5th International Conference on Capacitive Deionization & Electrosorption (CDI&E)

Venue: Online

Date: 9-13 May 2021

Organizer: Georgia Tech





13. Title: Poly(catechol)s As Universal Electrode Materials for Advanced Organic Batteries

Authors: Patil, N.; Marcilla, R.

Congress: 239th ECS Meeting with the 18th International Meeting on Chemical Sensors (IMCS)

Venue: Online

Date: 30 May-3 June 2021

Organizer: ECS

14. Title: Challenges and Opportunities of Membrane-Free Redox Flow Batteries

Authors: Navalpotro, P.; Mavrantakis, A.; Palma, J.; Ibáñez, S. E.; de la Cruz, C.; Senthilkumar, S. T.; Marcilla, R.

Congress: 239th ECS Meeting with the 18th International Meeting on Chemical Sensors (IMCS)

Venue: Online

Date: 30 May-3 June 2021

Organizer: ECS

15. Title: Performance Analysis of a Capacitive Deionization Stack Equipped with Graphite Felt 3D Composites Electrodes

Authors: Lado, J. J.; Cartolano, V.; García-Quismondo, E.; Wang, Y.; Palma, J.; García, G.; Almonacid, I.; Naddeo, V.; Anderson, M. A.

Congress: 12th European Symposium on Electrochemical Engineering

Venue: Online

Date: 13-17 June 2021

Organizer: Working Party on Electrochemical Engineering at EFCE in cooperation with Wetsus

16. Title: Thermal energy storage reactor tests on Fe-doped CaMnO_3

Authors: Mastronardo, E.; Sánchez, M.; González, J.; Haile, S. M.; Coronado, J. M.; Calabrese, L.; Proverbio, E.

Congress: NewTimes – New Trend in Materials Science and Engineering 1st International Virtual Conference

Venue: Online

Date: 14-18 June 2021

Organizer: NewTimes

17. Title: BOPHY-based CPPs as Photocatalysts in Artificial Photosynthesis for Solar Fuels Production

Authors: Barawi, M.; Gómez-Mendoza, M.; Oropeza, F. E.; Fresno, F.; de la Peña O'Shea, V. A.; Liras, M.; López-Calixto, C. G.

Congress: 1ª Jornada de Jóvenes Investigadores del GEQOR (I GEQOR-Jóvenes)

Venue: Online

Date: 16 June 2021

Organizer: RSEQ

18. Title: State of the art and prospects in Life Cycle Sustainability Assessment of hydrogen energy systems

Authors: Iribarren, D.; Dufour, J.

Congress: 9th World Hydrogen Technologies Convention "Digital Edition"

Venue: Online

Date: 20-24 June 2021

Organizer: WHTC and f-cell+HFC

19. Title: Volatile fatty acids production from agroindustrial waste: impact of process pH

Authors: Greses, S.; Tomás-Pejó, E.; González-Fernández, C.

Congress: 8th International Conference on Sustainable Solid Waste Management

Venue: Online

Date: 23-26 June 2021

Organizer: National Technical University of Athens

20. Title: Evaluating the suitability of co-processing gardening residues and the organic fraction of municipal solid wastes via thermal and catalytic pyrolysis

Authors: Lago, A.; Sanz, M.; Gordón, J.M.; Moreno, I.; Feroso, J.; Serrano, D.P.; Pizarro, P.

Congress: 8th International Conference on Sustainable Solid Waste Management

Venue: Online

Date: 23-26 June 2021

Organizer: National Technical University of Athens

21. Title: Converter-Based Solution for Cancellation of Subsynchronous Oscillations in Local Power Grids

Authors: Rodríguez-Ortega, P.; Roldán-Pérez, J.; Prodanovic, M.

Congress: 14th IEEE PowerTech 2021

Venue: Online

Date: 28 June-2 July 2021

Organizer: Universidad Pontificia de Comillas

22. Title: Modelling Power-Frequency Interactions between Voltage Source Converters with PLLs and Power Networks with Reduced Inertia

Authors: Roldan-Pérez, J.; Prodanovic, M.; Rodríguez-Cabero, A.

Congress: 14th IEEE PowerTech 2021

Venue: Online

Date: 28 June-2 July 2021

Organizer: Pontificia Comillas University of Madrid

23. Title: Redox- Active Conjugated Microporous Polymer based on Anthraquinone for High-Performance Lithium-Ion Batteries

Authors: Molina, A.; Patil, N.; Ventosa, E.; Liras, M.; Palma, J.; Marcilla, R.

Congress: Current Trends in Electrochemistry

Venue: París, France (on-site and online)

Date: 6-9 July 2021

Organizer: Electrochemistry Group of the Spanish Royal Society of Chemistry (GE-RSEQ) and sub-division of Electrochemistry of the French Chemical Society (E-SCF)

24. Title: Water Desalination by Capacitive Deionization Using Graphite Felt 3D Framework Composites

Authors: Lado, J. J.; Wang, Y.; Vázquez-Rodríguez, I.; Santos, C.; García-Quismondo, E.; Palma, J.; Anderson, M. A.

Congress: Current Trends in Electrochemistry

Venue: París, France (on-site and online)

Date: 6-9 July 2021

Organizer: Electrochemistry Group of the Spanish Royal Society of Chemistry (GE-RSEQ) and sub-division of Electrochemistry of the French Chemical Society (E-SCF)

25. Title: Techno-economic and environmental comparison of hydrothermal treatments for sewage sludge valorization

Authors: Medina-Martos, E.; Istrate, I. R.; Gálvez-Martos, J. L.; Dufour, J.

Congress: 2021 International Conference on Resource Sustainability

Venue: Online

Date: 19-23 July 2021

Organizer: icRS

26. Title: Municipal solid waste management pathways to achieve economic and climate benefits

Authors: Istrate, I. R.; Gálvez-Martos, J. L.; Dufour, J.

Congress: 2021 International Conference on Resource Sustainability

Venue: Online

Date: 19-23 July 2021

Organizer: icRS

27. Title: Cracking the Immune Fingerprint of Metal-Organic Frameworks

Authors: Hidalgo, T.; Simón-Vázquez, R.; González-Fernández, A.; Horcajada, P.

Congress: Controlled Release Society (CRS) 2021 Virtual Annual Meeting

Venue: Online

Date: 25-29 July 2021

Organizer: Controlled Release Society

28. Title: Development of membrane-free Zn-based redox flow battery using immiscible electrolytes

Authors: Senthilkumar, S.T.; Ibáñez, S. E.; Nav-alpotro, P.; Marcilla, R.

Congress: 72nd Annual Meeting of the International Society of Electrochemistry

Venue: Jeju Island, Korea (on-site and online)

Date: 29 August-3 September 2021

Organizer: International Society of Electrochemistry

29. Title: How to define supply chains for practical LCSA: application to an energy system

Authors: Martín-Gamboa, M.; Dufour, J.; Iribarren, D.

Congress: 10th International Conference on Life Cycle Management

Venue: Online

Date: 5-8 September 2021

Organizer: Fraunhofer Institute for Building Physics IBP, Department Life Cycle Engineering (GaBi)

30. Title: Prospective life cycle assessment of hydrogen produced through solid oxide electrolysis

Authors: Puig-Samper, G.; Iribarren, D.; Dufour, J.

Congress: 10th International Conference on Life Cycle Management

Venue: Online

Date: 5-8 September 2021

Organizer: Fraunhofer Institute for Building Physics IBP, Department Life Cycle Engineering (GaBi)

31. Title: Microalgae valorization into volatile fatty acids: optimum trade-off between archaeal and bacterial communities by tuning temperature

Authors: Greses, S.

Congress: 17th International Conference on Renewable Resources and Biorefineries (RRB2021)

Venue: Aveiro, Portugal

Date: 6-8 September 2021

Organizer: IEA Bioenergy

32. Title: Conducting polymer nanostructuring in MOFs through template effect

Authors: Armani, G.; Salles, F.; Bordet, P.; Martineau-Corcos, C.; Atienzar, P.; Navalón, S.; Horcajada, P.

Congress: V Jornadas de Promoción de la Investigación Básica para Estudiantes de Ciencias e Ingeniería

Venue: Móstoles, Spain

Date: 7-8 September 2021

Organizer: Rey Juan Carlos University

33. Title: Novel use of Metal-Organic Frameworks in the elimination of drinking water disinfection by-products
Authors: Sánchez-Cano, G.; Lastra, A.; Sáez, L.; Arozamena, E.; Amado, M.; Rojas, S.; Horcajada, P.

Congress: V Jornadas de Promoción de la Investigación Básica para Estudiantes de Ciencias e Ingeniería

Venue: Móstoles, Spain

Date: 7-8 September 2021

Organizer: Rey Juan Carlos University

34. Title: Life cycle assessment of hydrogen passenger cars and sensitivity to technical parameters

Authors: Candelaresi, D.; Valente, A.; Bargiacchi, E.; Iribarren, D.; Dufour, J.; Spazzafumo, G.

Congress: 12th International Conference on Hydrogen Production (ICH2P-2021)

Venue: Online

Date: 19-23 September 2021

Organizer: The Advanced Energy Technology Institute (ITAE) "Nicola Giordano"

35. Title: Cracking the Immune Fingerprint of Metal-Organic Frameworks

Authors: Hidalgo, T.; Simón-Vázquez, R.; González-Fernández, A.; Horcajada, P.

Congress: II Congress sobre Materiales Multifuncionales

Venue: Almuñécar, Spain

Date: 20-21 September 2021

Organizer: University of Granada

36. Title: Design of novel perovskite as an efficient and robust candidate for solar cells

Authors: Pérez, Y.; Babaryk, A. A.; Martínez, M.; Mosquera, M. E. G.; Zehender, M. H.; Svatek, S. A.; Antolín, E.; Horcajada, P.

Congress: II Congress sobre Materiales Multifuncionales

Venue: Almuñécar, Spain

Date: 20-21 September 2021

Organizer: University of Granada

37. Title: A high throughput computational screening of phenazines in redox flow batteries
Authors: de la Cruz, C.; Marcilla, R.; Mavrantakis, A.

Congress: 2021 Fall Meeting of the European Materials Research Society

Venue: Online

Date: 20-23 September 2021

Organizer: European Materials Research Society

38. Title: Development of advanced alkaline rechargeable batteries using conjugated microporous polymers as high performing anodes

Authors: Grieco, R.; Patil, N.; Molina, A.; Palma, J.; Liras, M.; Sanchez, J. S.; Marcilla, R.

Congress: 2021 Fall Meeting of the European Materials Research Society

Venue: Online

Date: 20-23 September 2021

Organizer: European Materials Research Society

39. Title: Photophysical Properties of Photocatalytic Devices for Energy Applications

Authors: Gomez-Mendoza, M.; García-Eguizábal, A.; García-Sánchez, A.; López-Calixto, C. G.; Liras, M.; de la Peña O'Shea, V. A.

Congress: Symposium of the Spanish Royal Society of Chemistry 2021: Online Conference

Venue: Online

Date: 27-30 September 2021

Organizer: Real Sociedad Española de Química

40. Title: Heliostat drift correction by parametrized analyses

Authors: Martínez-Hernández, A.; Conceição, R.; Romero, M.; González-Aguilar, J.

Congress: SolarPACES 2021

Venue: Online

Date: 27 September-1 October 2021

Organizer: SolarPACES

41. Title: Particle Effect in a Very-High Concentration Solar Field

Authors: Conceição, R.; Martínez-Hernández, A.; Romero, M.; González-Aguilar, J.

Congress: SolarPACES 2021

Venue: Online

Date: 27 September-1 October 2021

Organizer: SolarPACES

42. Title: Circular economy in hydrogen technologies

Authors: Dufour, J.

Congress: International Conference on Polygeneration 2021 (ICP 2021) – Workshop I: HYDROGEN: Potential Energy Vector in Polygeneration Systems

Venue: Online

Date: 4-6 October 2021

Organizer: Grupo de Ingeniería Térmica y Sistemas Energéticos (GITSE) del Instituto Universitario de Investigación en Ingeniería de Aragón, Universidad de Zaragoza

43. Title: Thermal and catalytic lignocellulose pyrolysis using a continuous reactor system

Authors: Pagano, M.; Hernando, H.; Serrano, D. P.

Congress: School of Catalysis

Venue: Liblice, Czech Republic

Date: 4-6 October 2021

Organizer: Charles University

44. Title: Hydridehalogenation of oils from pyrolysis of WEEE plastic wastes: effect of catalysts and reaction system configuration

Authors: Amodio, L.; López, J.; Feroso, J.; Hernando, H.; Serrano, D. P.

Congress: School of Catalysis

Venue: Liblice, Czech Republic

Date: 4-6 October 2021

Organizer: Charles University

45. Title: From waste plastic to valuable free fuels and chemicals: oil production and dehalogenation by catalytic pyrolysis over modified ZSM-5 and zeolites

Authors: López, J.; Amodio, L.; Hernando, H.; Moreno, J. M.; Feroso, J.; Serrano, D. P.

Congress: School of Catalysis

Venue: Liblice, Czech Republic

Date: 4-6 October 2021

Organizer: Charles University

46. Title: Heliostat drift correction by parametrized analyses

Authors: Martínez-Hernández, A.; Conceição, R.; Romero, M.; González-Aguilar, J.

Congress: SFERA-III 2nd Doctoral Colloquium

Venue: Almería, Spain

Date: 6-8 October 2021

Organizer: CIEMAT



47. Title: State of the Art: Pressurised Gas Receivers & Performance Indicators

Authors: D Souza, D.; Romero, M.; González-Aguilar, J.

Congress: SFERA-III 2nd Doctoral Colloquium

Venue: Almeria, Spain

Date: 6-8 October 2021

Organizer: CIEMAT

50. Title: Doubly Fed Induction Generator with Multi-Vector Model Predictive Power Control

Authors: Zarei, M. E.; Prodanovic, M.; Ramirez, D.

Congress: 47th Annual Conference of the IEEE Industrial Electronics Society - IECON 2021

Venue: Online

Date: 13-16 October 2021

Organizer: IEEE Industrial Electronics Society (IES)

48. Title: Cracking the Immune Fingerprint of Metal-Organic Frameworks

Authors: Hidalgo, T.; Simón-Vázquez, R.; González-Fernández, A.; Horcajada, P.

Congress: Young Investigator Symposium (YIS) - EuroMOF 2021

Venue: Online

Date: 13-15 October 2021

Organizer: Jagiellonian University

51. Title: Integración de fuentes de energías renovables en microrredes

Authors: Prodanovic, M.

Congress: Avances en Energías Renovables y sus Aplicaciones en la Ingeniería (AERA 2021)

Venue: Móstoles, Spain

Date: 14-15 October 2021

Organizer: Rey Juan Carlos University

49. Title: Emulation of Complex Grid Scenarios by using Power Hardware In the Loop (PHIL) Techniques

Authors: Roldán Pérez, J.; Morán Río, D. P.; Moutevelis, D.; Rodríguez-Ortega, P.; Jankovic, N.; Zarei, M. E.; Prodanovic, M.

Congress: 47th Annual Conference of the IEEE Industrial Electronics Society - IECON 2021

Venue: Online

Date: 13-16 October 2021

Organizer: IEEE Industrial Electronics Society (IES)

52. Title: Sostenibilidad de sistemas energéticos de hidrógeno

Authors: Dufour, J.

Congress: Avances en Energías Renovables y sus Aplicaciones en la Ingeniería (AERA 2021)

Venue: Móstoles, Spain

Date: 14-15 October 2021

Organizer: Rey Juan Carlos University

53. Title: New Cu-based Metal Organic Frameworks as efficient water splitting photocatalysts

Authors: Biglione, C.; Salcedo, P.; Cabrero-Antoniño, M.; Navalón, S.; García, H.; Horcajada, P.

Congress: Reunión Bienal de la Sociedad Española de Catálisis (SECAT 2021)

Venue: Valencia, Spain

Date: 18-20 October 2021

Organizer: Sociedad Española de Catálisis

54. Title: Microwave-assisted synthesis of Zr/Hf porphyrin-based Metal-Organic Frameworks for CO₂ cycloaddition

Authors: Carrasco, S.; Orcajo, G.; Martínez, F.; Calleja, G.; Horcajada, P.

Congress: Reunión Bienal de la Sociedad Española de Catálisis (SECAT 2021)

Venue: Valencia, Spain

Date: 18-20 October 2021

Organizer: Sociedad Española de Catálisis

55. Title: Formación y evolución de embriones zeolíticos durante la síntesis de zeolita ZSM-5 con porosidad jerarquizada

Authors: Alonso, M. M.; Peral, A.; Ochoa, C.; Sanz, R.; Serrano, D. P.

Congress: Reunión Bienal de la Sociedad Española de Catálisis (SECAT 2021)

Venue: Valencia, Spain

Date: 18-20 October 2021

Organizer: Sociedad Española de Catálisis

56. Title: Efficient dehalogenation of unrecyclable plastic residues via catalytic pyrolysis over supported Fe₂O₃ and CaO catalyst

Authors: Amodio, L.; López, J.; Hernando, H.; Feroso, J.; Moreno, J. M.; Serrano, D. P.

Congress: Reunión Bienal de la Sociedad Española de Catálisis (SECAT 2021)

Venue: Valencia, Spain

Date: 18-20 October 2021

Organizer: Sociedad Española de Catálisis

57. Title: Removal of NO_x pollutants at low concentration from air by activated biochars

Authors: Díaz-Maroto, C. G.; Sáenz de Miera, B.; Pizarro, P.; Serrano, D. P.; Moreno, I.; Feroso, J.

Congress: Reunión Bienal de la Sociedad Española de Catálisis (SECAT 2021)

Venue: Valencia, Spain

Date: 18-20 October 2021

Organizer: Sociedad Española de Catálisis

58. Title: Virtual Admittance Control for Providing Voltage Support using Converter Interfaced Generation

Authors: Moutevelis, D.; Roldán-Pérez, J.; Prodanovic, M.

Congress: ISGT Europe 2021

Venue: Online

Date: 18-21 October 2021

Organizer: IEEE Power & Energy Society (PES) and Aalto University

59. Title: Power Oscillation Damping Using Converter-Interfaced Generators under Constrained Active and Reactive Powers

Authors: Jankovic, N.; Roldán-Pérez, J.; Prodanovic, M.

Congress: ISGT Europe 2021

Venue: Online

Date: 18-21 October 2021

Organizer: IEEE Power & Energy Society (PES) and Aalto University

60. Title: Reversible dehydration-hydration process in lead-free hybrid perovskites

Authors: Pérez, Y.; Babaryk, A. A.; Martínez, M.; Mosquera, M. E. G.; Zehender, M. H.; Svatek, S. A.; Antolín, E.; Horcajada, P.

Congress: nanoGe Fall Meeting 2021. #PerEmer21. Perovskites III: Emerging Materials and Phenomena

Venue: Online

Date: 18-22 October 2021

Organizer: nanoGe

61. Title: Water content effect of zeolites in the chlorine retention capacity from plastic pyrolysis oils

Authors: Romero, A.; Pizarro, P.; Serrano, D. P.

Congress: Workshop on Water in Zeolites

Venue: Liblice, Czech Republic

Date: 19-22 October 2021

Organizer: Charles University

62. Title: Evolution of embryonic zeolites in the synthesis of hierarchical ZSM-5

Authors: Alonso, M. M.; Peral, A.; Ochoa-Hernández, C.; Sanz, R.; Serrano, D. P.

Congress: Workshop on Zeolites

Venue: Liblice, Czech Republic

Date: 24-27 October 2021

Organizer: Charles University

63. Title: LIFE Superbiodiesel

Authors: Gálvez-Martos, J. L.

Congress: Jornadas de Otoño ETSIM (UPM). Generación de ReCourses Energéticos y Movilidad Sostenible

Venue: Madrid, Spain

Date: 28 October 2021

Organizer: ETSIM (UPM)

64. Title: Electrochemical Nanofabrication of Multilayer Mixed Metal Sulfide/Graphene Electrodes for Rechargeable Alkaline Batteries

Authors: Sánchez, J. S.; Xi, Z.; Patil, N.; Grieco, R.; Sun, J.; Christian, M.; Morandi, V.; Marcilla, R.; Palermo, V.

Congress: Virtual Graphene2021

Venue: Online

Date: 2-5 November 2021

Organizer: Phantoms Foundation

65. Title: Prospective life cycle assessment of hydrogen production in a solid oxide electrolyser integrated into a parabolic trough concentrated solar power plant

Authors: Puig-Samper, G.; Bargiacchi, E.; Iribarren, D.; Dufour, J.

Congress: HYPOTHESIS XVI - Hydrogen Power Theoretical & Engineering Solutions International Symposium

Venue: Online

Date: 8-10 November 2021

Organizer: CGS y AMWEB

66. Title: Conjugated Porous Polymers Based on BODIPY and BOPHY Dyes in Hybrid Heterojunctions for Artificial Photosynthesis

Authors: Naranjo, T.; Collado, L.; Gómez-Mendoza, M.; López-Calixto, C. G.; Oropeza, F.; Liras, M.; de la Peña O'Shea, V. A.

Congress: XVII Simposio de Investigadores Jóvenes de la RSEQ

Venue: Alcalá de Henares, Spain

Date: 23-26 November 2021

Organizer: Real Sociedad Española de Química (RSEQ)

67. Title: The role of polymer nanostructuration in hybrid materials for hydrogen production by means of artificial photosynthesis (Flash communication)

Authors: García-Eguizábal, A.; Gómez-Mendoza, M.; Barawi, M.; Liras, M.; García Martínez, J. C.; de la Peña O'Shea, V. A.

Congress: XVII Simposio de Investigadores Jóvenes de la RSEQ

Venue: Alcalá de Henares, Spain

Date: 23-26 November 2021

Organizer: Real Sociedad Española de Química (RSEQ)

68. Title: A Significantly Improved Polymer|Ni(OH)₂ Alkaline Rechargeable Battery in 1M KOH Using Poly(anthraquinone)-based Conjugated Microporous Polymer Anode

Authors: Grieco, R.; Molina, A.; Patil, N.; Liras, M.; Palma, J.; Marcilla, R.

Congress: Organic Battery Days 2021

Venue: Online

Date: 25-27 November 2021

Organizer: Waseda University

69. Title: Valorization of real plastic wastes coming from different sources by catalytic pyrolysis: Efficient oil dehalogenation over Fe and Ca oxides

Authors: López, J.; Amodio, L.; Hernando, H.; Moreno, J.M.; Feroso, J.; Serrano, D.P.

Congress: International Symposium on Feedstock Recycling of Polymeric Materials (e-ISFR)

Venue: Online

Date: 29-30 November 2021

Organizer: Research Association for Feedstock Recycling of Plastics (FSRJ)

70. Title: Dehalogenation of WEEE plastics waste pyrolysis oils over Fe₂O₃ and CaO supported zeolitic and clay based catalysts

Authors: Amodio, L.; López, J.; Hernando, H.; Feroso, J.; Moreno, J.M.; Serrano, D.P.

Congress: International Symposium on Feedstock Recycling of Polymeric Materials (e-ISFR)

Venue: Online

Date: 29-30 November 2021

Organizer: Research Association for Feedstock Recycling of Plastics (FSRJ)

71. Title: Chlorine removal from plastic pyrolysis oils by zeolite trapping

Authors: Romero, A.; Escudero, L.; Yuste, R.; Pizarro, P.; Moreno, J.M.; Serrano, D.P.

Congress: International Symposium on Feedstock Recycling of Polymeric Materials (e-ISFR)

Venue: Online

Date: 29-30 November 2021

Organizer: Research Association for Feedstock Recycling of Plastics (FSRJ)

72. Title: Social life cycle assessment of a proton exchange membrane fuel cell stack

Authors: Bargiacchi, E.; Campos-Carriedo, F.; Iribarren, D.; Dufour, J.

Congress: EFC21 - European Fuel Cells and Hydrogen Conference

Venue: Online

Date: 15-17 December 2021

Organizer: ATENA, ENEA, University "Parthenope" of Naples y University of Perugia

73. Title: Hydrogen production by means of solar heat and power in high temperature solid oxide electrolyzers **Authors:** Giaconia, A.; Della Pietra, M.; Moreno, P.; Testi, M.; Pellegrini, C.; Diethelm, S.; Romero, M.; Robino, M.; van Herle, J.; Morico, B.; Dobrée, J.

Congress: EFC21 - European Fuel Cells and Hydrogen Conference

Venue: Online

Date: 15-17 December 2021

Organizer: ATENA, ENEA, University "Parthenope" of Naples y University of Perugia

2.5.3. Poster communications

1. Title: Life cycle assessment of passenger car fleets partially fueled with hydrogen

Authors: Candelaresi, D.; Valente, A.; Iribarren, D.; Dufour, J.; Spazzafumo, G.

Congress: World Online Conference on Sustainable Technologies 2021

Venue: Online

Date: 17-19 March 2021

Organizer: CGS

2. Title: Waste-To-Fuel: Life Cycle Assessment of Hydrothermal Liquefaction of Household Food Waste

Authors: Istrate, I. R.; Medina-Martos, E.; Gálvez-Martos, J. L.; Dufour, J.

Congress: RETASTE: Rethink Food Waste 2021

Venue: Online

Date: 6-8 May 2021

Organizer: Sympraxis Team P.C.

3. Title: Development of High Performing Polymer Electrolytes based on Superconcentrated Solutions

Authors: Ciurduc, D. E.; Boaretto, N.; Fernández, J. P.; Palma, J.; Marcilla, R.

Congress: Current Trends in Electrochemistry

Venue: París, France (on-site and online)

Date: 6-9 July 2021

Organizer: Electrochemistry Group of the Spanish Royal Society of Chemistry (GE-RSEQ) and sub-division of Electrochemistry of the French Chemical Society (E-SCF)

4. Title: Development of conjugated microporous polymer anodes for advanced alkaline rechargeable batteries

Authors: Grieco, R.; Patil, N.; Molina, A.; Palma, J.; Liras, M.; Sanchez, J. S.; Marcilla, R.

Congress: Current Trends in Electrochemistry

Venue: París, France (on-site and online)

Date: 6-9 July 2021

Organizer: Electrochemistry Group of the Spanish Royal Society of Chemistry (GE-RSEQ) and sub-division of Electrochemistry of the French Chemical Society (E-SCF)

5. Title: Study of Vanadium Electrolytes for the Integration of Flow Batteries in Thermal Applications

Authors: Berling, S.; García - Quismondo, E.; Palma, J.

Congress: Current Trends in Electrochemistry

Venue: París, France (on-site and online)

Date: 6-9 July 2021

Organizer: Electrochemistry Group of the Spanish Royal Society of Chemistry (GE-RSEQ) and sub-division of Electrochemistry of the French Chemical Society (E-SCF)

6. Title: Social life cycle assessment of renewable natural gas

Authors: Martín-Gamboa, M.; Dufour, J.; Iribarren, D.

Congress: 10th International Conference on Life Cycle Management

Venue: Online

Date: 5-8 September 2021

Organizer: Fraunhofer Institute for Building Physics IBP, Department Life Cycle Engineering (GaBi)

7. Title: Novel use of Metal-Organic Frameworks in the elimination of drinking water disinfection by-products

Authors: Sánchez-Cano, G.; Lastra, A.; Sáez, L.; Arozamena, E.; Amado, M.; Rojas, S.; Horcajada, P.

Congress: II Congress sobre Materiales Multifuncionales

Venue: Almuñécar, Spain

Date: 20-21 September 2021

Organizer: University of Granada

8. Title: Conducting polymer nanostructuration in MOFs through template effect

Authors: Armani, G.; Salles, F.; Bordet, P.; Martineau-Corcós, C.; Atienzar, P.; Navalón, S.; Horcajada, P.

Congress: Symposium of the Spanish Royal Society of Chemistry 2021: Online Conference

Venue: Online

Date: 27-30 September 2021

Organizer: Real Sociedad Española de Química

9. Title: Novel use of Metal-Organic Frameworks in the elimination of drinking water disinfection by-products

Authors: Sánchez-Cano, G.; Lastra, A.; Sáez, L.; Arozamena, E.; Amado, M.; Rojas, S.; Horcajada, P.

Congress: Symposium of the Spanish Royal Society of Chemistry 2021: Online Conference

Venue: Online

Date: 27-30 September 2021

Organizer: Real Sociedad Española de Química

10. Title: Recent approaches in novel hybrid perovskites with optimal bandgap for optoelectronic applications

Authors: Chacón-García, A. J.; Babarik, A.; Rodríguez-Díez, A.; Pérez, Y.; Horcajada, P.

Congress: Symposium of the Spanish Royal Society of Chemistry 2021: Online Conference

Venue: Online

Date: 27-30 September 2021

Organizer: Real Sociedad Española de Química



11. Title: The Role of polymer nanostructuration in hybrid materials for hydrogen production by means of artificial photosynthesis

Authors: García-Eguizábal, A.; Gómez-Mendoza, M.; Barawi, M.; Liras, M.; García Martínez, J. C.; De La Peña O'Shea, V. A.

Congress: Symposium of the Spanish Royal Society of Chemistry 2021: Online Conference

Venue: Online

Date: 27-30 September 2021

Organizer: Real Sociedad Española de Química

12. Title: Hybrid Systems Based on Porous Polymers for Solar Fuels Production: The Victory of Crystallinity

Authors: Naranjo, T.; Gomez-Mendoza, M.; Gandara, F.; Liras, M.; de la Peña O'Shea, V. A.

Congress: Symposium of the Spanish Royal Society of Chemistry 2021: Online Conference

Venue: Online

Date: 27-30 September 2021

Organizer: Real Sociedad Española de Química

13. Title: Pressurized catalytic pyrolysis of lignocellulose as a way to obtain highly enriched aromatic bio-oils

Authors: Artillo, F.; Moreno, J. M.; Serrano, D. P.; Pizarro, P.

Congress: Reunión Bienal de la Sociedad Española de Catálisis (SECAT 2021)

Venue: Valencia, Spain

Date: 18-20 October 2021

Organizer: Sociedad Española de Catálisis

14. Title: Thermal and catalytic pyrolysis of real plastic wastes: oil upgrading by dehalogenation

Authors: López, J.; Amodio, L.; Hernando, H.; Feroso, J.; Moreno, J. M.; Serrano, D. P.

Congress: Reunión Bienal de la Sociedad Española de Catálisis (SECAT 2021)

Venue: Valencia, Spain

Date: 18-20 October 2021

Organizer: Sociedad Española de Catálisis

15. Title: Pirólisis catalítica de madera de pino sobre carbones activos preparados mediante activación química de preCourserses lignocelulósicos

Authors: Martínez, I. J.; Pizarro, P.; Botas, J. Á.; Serrano, D. P.; Gómez, G.; Moreno, I.

Congress: Reunión Bienal de la Sociedad Española de Catálisis (SECAT 2021)

Venue: Valencia, Spain

Date: 18-20 October 2021

Organizer: Sociedad Española de Catálisis

16. Title: The Importance of the Elucidation of the Charge Transfer Mechanism in Photocatalytic Devices for Energy Applications

Authors: Gómez-Mendoza, M.; Estrada, S.; López-Calixto, C. G.; García-Sánchez, A.; García-Eguizábal, A.; Naranjo, T.; Liras, M.; de la Peña O'Shea, V. A.

Congress: XVII Simposio de Investigadores Jóvenes de la RSEQ

Venue: Alcalá de Henares, Spain

Date: 23-26 November 2021

Organizer: Real Sociedad Española de Química (RSEQ)

17. Title: Modeling the Liquid Interphase Between Electrolytes in Membrane-Free Redox Flow Batteries

Authors: Ibáñez, S. E.; Navalpotro, P.; Sirugaloor, S.; Marcilla, R.

Congress: Nordic Flow Battery Network: Autumn School 2021

Venue: Turku, Finlandia

Date: 24-26 November 2021

Organizer: University of Turku

3. Training and dissemination activities

3.1. Mobility actions

IMDEA Energy Researchers

1. Stay at Complutense University of Madrid, Spain

Period: 8 months, 2021

Funding Institution: IMDEA Energy Institute

Mr. Manuel del Barrio Jimeno

2. Stay at ETH Zurich, Switzerland

Period: 2 months, 2021

Funding Institution: María de Maeztu

Mr. Ioan Robert Istrate

3. Stay at Austrian Institute of Technology AIT, Austria

Period: 3 months, 2021

Funding Institution : María de Maeztu

Ms. Diana Patricia Morán Río

4. Stay at Southampton University, United Kingdom

Period: 2 months, 2021

Funding Institution: María de Maeztu

Ms. Sabrina Berling

5. Stay at Denmark University, Denmark

Period: 2 months, 2021

Funding Institution: María de Maeztu

Mr. Carlos de la Cruz Pérez

6. Stay atTurku University, Finland

Period: 3 months, 2021

Funding Institution: María de Maeztu

Mr. Santiago Enrique Ibáñez León

7. Stay atPadova University, Italy

Period: 2 months, 2021

Funding Institution: María de Maeztu

Ms. Silvia Greses Huerta

8. Stay at Nantes University, France

Period: 2 weeks

Funding Institution: Institute IMDEA Energy

Mr. José González

Visiting Researchers

1. David Muñoz Torrero,

Home institution: University of Burgos, Spain

Host Unit: Electrochemical Processes Unit

Period: 1 month, 2021

2. María del Prado García Aparicio

Home institution: Alcalá de Henares University, Spain

Host Unit: Biotechnological Processes Unit

Period: 14 months, (March 2021-May 2022)

3. Kazemi Abolghasem

Home institution: Rey Juan Carlos University, Spain

Host Unit: Systems Analysis Unit

Period: 24 months, (March 2021-March 2023)

4. George Augusto Batista Cámara

Home institution: Alcalá de Henares University / Rey Juan Carlos University

Host Unit: Systems Analysis Unit

Period: 24 months, (January 2021-November 2022)

5. Ali Boray Sirma

Home institution: ETH Zurich

Host Unit: High Temperature Processes Unit

Period: 4 months, (May 2021- September 2021)



6. Umberto Matera

Home institution: ISERN Patent and Trademark Office, Spain

Host Unit: Advanced Porous Materials Unit

Period: 6 months, (May 2021-November 2021)

7. Kaijun Jiang

Home institution: North China Electric Power University, China

Host Unit: High Temperature Process Unit

Period: 12 months, (May 2021-May 2022)

8. Andrés Sarrión Pérez

Home institution: Autonomous University of Madrid, Spain

Host Unit: Systems Analysis Unit

Period: 2 months, (June 2021-July 2021)

9. Daniele Candelaresi

Home institution: Università degli Studi di Cassino del Lazio Meridionale, Italy

Host Unit: Systems Analysis Unit

Period: 10 months, (June 2021-March 2022)

10. Marco Antonio Ponce Patrón

Home Institution: National Autonomous University of Mexico, Mexico

Host Unit: Electrical Systems Unit

Period: 3 months (June 2021-August 2021)

11. María Elena Gálvez Parruca

Home institution: Sorbonne University, France

Host Unit: High Temperature Processes Unit

Period: 1 month, (June 2021-July 2021)

12. Matías Blanco Fernández

Home institution: Autonomous University of Madrid, Spain

Host Unit: Photoactivated Processes Unit

Period: 2 months, (July 2021-August 2021)

13. Carmen García López

Home institution: Gottingen University, Germany

Host Unit: Photoactivated Processes Unit

Period: 1 month, 2021

14. Kenya García Bautista

Home institution: National Autonomous University of Mexico, Mexico

Host Unit: Systems Analysis Unit

Period: 3 months, (August 2021-October 2021)

15. Laura Collado Brunete

Home institution: Rey Juan Carlos University, Spain

Host Unit: Photoactivated Processes Unit

Period: 1 month, September 2021.

16. Isabel Sa-Correia

Home institution: Higher Technical Institute of the University of Lisbon and Institute of Bioengineering and Biosciences iBB, Portugal

Host Unit: Biotechnological Processes Unit

Period: 1 month, October 2021

17. Kaíque Souza Gonçalves Cordeiro Oliveira

Home institution: Federal University of São Carlos UFScar, Brazil

Host Unit: Electrochemical Processes Unit

Period: 11 months, (September 2021-August 2022)

18. Damian Schob

Home institution: ETH Zurich, Switzerland

Host Unit: High Temperature Processes Unit

Period: 15 months, (September 2021-December 2022)

19. Ousmane Camara

Home institution: EPV/EHU POLYMAT, Spain

Host Unit: Electrochemical Processes Unit

Period: 2 months, (September 2021-October 2021)

20. Moritz Bitterling

Home institution: Fraunhofer Institute for Solar Energy Systems- ISE, Germany

Host Unit: High Temperature Processes Unit

Period: 1 month, September 2021

21. Gregor Ben

Home institution: Fraunhofer Institute for Solar Energy Systems - ISE, Germany

Host Unit: High Temperature Process Unit

Period: 1 month, September 2021

22. Petru Adrian Coftas

Home institution: Brasov University, Romania

Host Unit: High Temperature Processes Unit

Period: 1 month, October 2021

23. Daniel Tudor Coftas

Home institution: Brasov University, Romania

Host Unit: High Temperature Processes Unit

Period: 1 month, October 2021

24. Razvan Adrian Coftas

Home institution: Brasov University, Romania

Host Unit: High Temperature Processes Unit

Period: 1 month, October 2021

25. Paul Bere

Home institution: Brasov University, Romania

Host Unit: High Temperature Processes Unit

Period: 1 month, October 2021

26. David Castro Yáñez

Home institution: Rey Juan Carlos University, Spain

Host Unit: High Temperature Processes Unit

Period: 6 months, December 2021- May 2022

3.2. Workshops and industrial events

1. Webinar: Reciclado de baterías

Venue: IMDEA Energy Institute, Madrid, Spain

Date: 23 June 2021

Organizer: IMDEA Energy

2. Webinar: EUREKA International Call for R&D Collaboration Projects in Hydrogen Technologies' held on

Venue: Virtual event

Date: 21 September 2021

Organizer: CDTI and IMDEA Energy Institute

3. GENERA 2021: Workshop on Sustainable Fuel Production, waste recovery and circular economy

Venue: IFEMA, Madrid, Spain

Date: 16-18 November 2021

Organizer: IFEMA

4. 2nd Annual Workshop of Senior Researchers of IMDEA Energy

Venue: IMDEA Energy Institute, Madrid, Spain

Date: 17 June 2021

Organizer: IMDEA Energy

5. 10th Annual Workshop of Young Researchers of Imdea Energy

Venue: IMDEA Energy Institute, Madrid, Spain

Date: 14-15 December 2021

Organizer: IMDEA Energy

6. Workshop on New Trends in Materials and Electrochemical Characterisation for Li-ion Batteries (LIB) in the frame of NanoBat and POLYSTORAGE projects.

Venue: Virtual event

Date: 29/04/2021

Organizer: IMDEA Energy

3.3. Internal seminars

1. Conference: Control, protection and stability issues in renewable power generation systems

Speaker: Dr. Mohammad Zarei (IMDEA Energy)

Date: 26 February 2021

2. Course: Field Emission Scanning Electron Microscope (FESEM)

Speaker: Dr. Fernando Picó (IMDEA Energía)

Date: 10 March 2021

3. Course: RAMAN training – basic concepts and applications

Speaker: Jasco Spain

Date: 24 March 2021

4. Conference: When catalysis meets pyrolysis: the key to reach a sustainable fuel production

Speaker: Dr. Héctor Hernando (I IMDEA Energy)

Date: 26 March 2021

5. Conference: Fluid dynamics simulations of Redox Flow Batteries and other related problem

Speaker: Dr. Santiago Ibáñez (IMDEA Energy)

Date: 30 April 2021

6. Conference: Soiling in Solar Energy Conversion Technologies

Speaker: Dr. Ricardo Conceição (IMDEA Energy)

Date: 28 May 2021

7. Course: Hands on course about LATEX

Speaker: Dr. Javier Roldán (IMDEA Energy)

Date: 8-9 June 2021

8. Conference: Design of materials for catalytic and photovoltaic applications

Speaker: Dr. Yolanda Pérez (IMDEA Energía)

Date: 25 June 2021

9. Conference: Plasma-assisted CO₂ methanation on Ni/CeZrOx catalysts

Speaker: Dra. Maria Elena Gálvez-Parruca (Sorbonne Université, Francia)

Date: 29 June 2021

10. Course: Basic spectral interpretation in photoelectron spectroscopy

Speaker: Dr. Freddy Oropeza (I IMDEA Energy)

Date: 1-2 July 2021

11. Conference: PMoVx catalyzed oxidative cleavage of lignin and its models: Sonochemical intensification

Speaker: Dr. Maria Elena Gálvez-Parruca (Sorbonne Université, France)

Date: 6 July 2021

12. Webinar: Convocatoria EUREKA para proyectos colaborativos de I+D en tecnologías de hidrógeno

Speakers: Dr. Javier Dufour (IMDEA Energy), Antonio Gómez (CDTI)

Date: 21 September 2021

13. Conference: Fraunhofer Institute of Solar Energy Systems ISE – R&D activities in CSP

Speaker: Dr. Gregor Bern (Fraunhofer ISE, Germany)

Date: 22 September 2021

14. Webinar: Creación de Empresas de Base Tecnológica

Speakers: Dr. David Serrano, Dr. Manuel Romero, Dr. Félix Marín (IMDEA Energy), Ignacio Cid (Fundación Madri+d), Pablo Ramírez (Vivero de empresas de Móstoles), Javier Manzano (BeAble Capital)

Date: 29 September 2021

15. Conference: Electrolitos Redox y su Aplicación en nuevos dispositivos de almacenamiento electroquímica de energía

Speaker: Dr. Paula Navalpotro (IMDEA Energy)

Date: 1 October 2021

16. Conference: Yeast Advanced Biorefineries: the Microbiologist's view

Speaker: Dr. Isabel Sá-Correia (University of Lisboa, Portugal)

Date: 8 October 2021

17. Conference: Advanced Materials for Optoelectronics and Energy

Speaker: Dr. Miguel García (IMDEA Energy)

Date: 29 October 2021

18. Conference: Design of functional nanomaterials for catalytic and biomedical applications

Speaker: Dr. Catalina Biglione (IMDEA Energy)

Date: 29 October 2021

19. Conference: Energy storage with graphene composite multilayers deposited on carbon fibers and foams, achieved by electrochemical methods

Speaker: Dr. Jaime S. Sánchez (Chalmers University of Technology, Sweden)

Date: 10 November 2021

20. Conference: Environmental, social, economic impacts of hydrogen systems: is it the right path towards a sustainable energy transition?

Speaker: Dr. Eleonora Bargiacchi (IMDEA Energy)

Date: 26 November 2021

21. Conference: Advanced electrolytes to develop novel electrochemical energy storage devices

Speaker: Dr. Débora Ruiz (IMDEA Energy)

Date: 26 November 2021

3.4. Participation in science dissemination activities

1. International Day of Women and Girls in Science

Activity: La Energía de las Mujeres

Venue: Instituto IMDEA Energía, Madrid, Spain (Online)

Date: 11 February 2021

Organizer: IMDEA Energy Institute

2. Pint Of Science Madrid

Venue: Virtual event

Date: 17,18, 19 May 2021

Organizer: Pint Of Science

3. European Researchers' Night 2021

Activity: Energía limpia para un planeta sostenible

Venue: Instituto IMDEA Energía, Madrid, Spain (Online)

Date: 24 September 2021

Organizer: IMDEA Energy Institute, Fundación para el conocimiento madri+d

4. European Researchers' Night 2021

Activity: What do you do to improve the planet?

Venue: Residencia de Estudiantes de Madrid

Date: 24 de septiembre de 2021

Organizer: Fundación para el conocimiento madri+d

5. Madrid Fair for Science and Innovation 2021

Activity: Energy, the key to sustainability

Venue: Instituto IMDEA Energía, Madrid, Spain (Online)

Date: 11-13 November 2021

Organizer: IMDEA Energy Institute, Fundación para el conocimiento madri+d

6. Madrid Fair for Science and Innovation 2021

Activity: Meeting around knowledge and creativity in the face of great global challenges. Round tables and conferences.

Venue: Cervantes Institute (Madrid)

Date: 2 November 2021

Organizer: Fundación para el conocimiento madri+d

3.5. Training activities

The following list shows the students who have been initiate their training activities in IMDEA Energy Institute in 2021, as well as those who have defended their Bachelor or Master thesis during 2021.

INTERNSHIPS

1. Pablo Suárez Mesa

Vocational Training, IES-Palomeras-Vallecas

Internship: Support tasks in the Photoactivated Unit.

Supervisor: Dr. Marta Liras, PAPU

Period: January-March 2021

2. Jorge Joaquín Revuelta de la Vera

Vocational Training, IES-Palomeras-Vallecas

Internship: Support tasks in the High Temperature Processes Unit.

Supervisor: Dr. José González, HTPU

Period: March-June 2021

3. Óscar René Castellanos Orozco

Vocational Training, IES-Palomeras-Vallecas

Internship: Support Tasks at the Photoactivated Processes Unit

Supervisor: Dr. Marta Liras, PAPU

Period: March-June 2021

4. Cristina Lucio Gallardo

Vocational Training, IES-Virgen de la Paloma

Internship: Support Tasks at the Biotechnological Processes Unit

Supervisor: Dr. Cristina González, BTPU

Period: April-June 2021

5. Patricia Aragonés Arias

Vocational Training, IES-Virgen de la paloma

Internship: Support tasks in the central laboratories.

Supervisor: Dr. Marta Arroyo, CLU

Period: April-June 2021

6. Rubén Alberto Martín Hernández

Vocational Training, IES-Virgen de la paloma

Internship: Support Tasks at the Photoactivated Unit

Supervisor: Dr. Marta Liras, UPFA

Period: April-June 2021

7. Irene Hormigos Romero

Vocational Training, IES-Lope de Vega

Internship: Support tasks at the Electrochemical Processes Unit

Supervisor: Dr. Guzmán García, ECPU

Period: April-June 2021

8. Alejandro Olano Neyra

Vocational Training, IES Felipe Trigo

Traineeship: Support tasks in the Electrical Systems Unit

Supervisor: Dr. Milan Prodanovic, ESU

Period: June 2021

9. Daniel Merino Ortego

Vocational Training, IES-Lope de Vega

Internship: Support tasks in the central laboratories tasks.

Supervisor: Dr. Marta Arroyo, CLU

Period: October-December 2021

10. Heidi Vanessa Peñaloza Vasquez

Vocational Training, IES-Palomeras-Vallecas

Internship: Support Tasks at the Photoactivated Processes Unit

Supervisor: Dr. Marta Liras, PAPU

Period: October-December 2021



11. Rodrigo de Castro López

MSc Chemical Engineering Rey Juan Carlos University

Internship: To develop the operational procedure and application of the micro-pyrolyser technique combined with gas chromatography coupled to mass spectrometry (Py-GC/MS) for the study of the valorisation of plastic and lignocellulosic waste.

Supervisor: Dr. Juan Miguel Moreno/ Javier Fermoso, TCPU

Period: February 2021-March 2021

12. Álvaro Gonzalez Bernardo

MSc Chemical Engineering Autonomous University of Madrid and Rey Juan Carlos University

Internship: Support tasks in the research line of thermal and catalytic pyrolysis of organic waste of different origin: plastics from electrical waste, tyres, FORSU, etc. Preparation and performance of reactions, collection and analysis of products, interpretation of results.

Supervisor: Dr Inés Moreno, TCPU

Period: February 2021-March 2021

13. Alejandro Benito Puerto

MSc Chemical Engineering Rey Juan Carlos University

Internship: Laboratory and solar reactor work

Supervisor: Dr. Fernando Fresno, PAPU

Period: March 2021-April 2021

14. Elena Ramírez Borreguero

MSc Chemical Engineering, Rey Juan Carlos University

Internship: Development of LFP, LMO and CuHCF electrodes on CNTf with the doctor blade technique. Formulation of electrolytes with different ratios of PEG400 and water in glove box.

Supervisor: Dr. Diana Ciurduc, ECPU

Period: March 2021-June 2021

15. Marta Garcés Perís

MSc Chemical Engineering Rey Juan Carlos University

Internship: Physico-chemical characterisation of plastic materials and products resulting from pyrolysis tests in a high flow solar simulator: Thermogravimetric analysis, elemental analysis, XRD, optical and scanning electron microscopy.

Supervisor: Dr. Manuel Romero and Jose Gonzalez, HTPU

Period: April 2021-May 2021

16. César Tajuelo Moreno

MSc Chemical Engineering Rey Juan Carlos University/ Autonomous University of Madrid

Internship: Physico-chemical characterisation of materials for thermochemical storage by the CaO/Ca(OH)₂ system. Preparation of follow-up reports.

Supervisor: Dr. José González, HTPU

Period: June 2021- July 2021

17. Alejandro Sáez Gómez

MSc Chemical Engineering Rey Juan Carlos University/ Autonomous University of Madrid

Internship: Support tasks in the research line of preparation of biofilters from pyrolysis biochars and/or biomass hydrochars, characterisation and evaluation as adsorbents/catalysts for the removal of NO_x from gaseous effluents.

Supervisor: Dr. Javier Fermoso, TCPU

Period: May 2021- July 2021

18. Sara Roldán Gallego

MSc Chemical Engineering Autonomous University of Madrid

Internship: support in the fabrication of prototypes and in the performance of electrochemical experiments with flow batteries.

Supervisor: Dr. Santiago E. Ibañez, ECPU

Period: July 2021- September 2021

BACHELOR PROJECTS

1. Javier Alejandro Marquetti Castaño

BSc Chemical Engineering Rey Juan Carlos University

Internship: Support tasks in the research lines of the Unit, related to the thermochemical valorisation of waste.

Supervisor: Dr. Patricia Pizarro, TCPU

Period: April 2021- May 2021

2. Alberto Pinto Sánchez

BSc Chemical Engineering Rey Juan Carlos University

Practicum: Synthesis of MOFs based on porphyrin-type photoactive ligands

Supervisor: Dr. Sergio Carrasco/Dr. Patricia Horcajada, PMPU

Period: April 2021-June 2021

3. Fernández Heranz, Ramón

BSc in Chemical Engineering/Industrial Organisation Engineering, Rey Juan Carlos University

Project Title: Thermodynamic modelling of a hydrometallurgical process for battery recycling.

Supervisor: Dr. Enrique Medina, ASU

Reading date: July, 2021

4. Muñoz Daniel, Gonzalo

BSc in Environmental Engineering, Rey Juan Carlos University

Project Title: Techno-economic analysis of technologies for the treatment of municipal solid wastes

Supervisor: Ioan Robert Istrate, ASU

Reading date: July, 2021

5. Saúl Baltasar Jiménez

BSc Mathematics and Chemistry Complutense University of Madrid

Internship: Optical analysis of concentrating solar systems based on heliostats using simulation tools based on Monte Carlo ray tracing and cone optics. Participation in heliostat calibration tests by inclinometry and solar tracking. Analysis of the experimental data obtained and comparison with that obtained by the numerical models. Experimental error propagation analysis.

Supervisor: Dr. José González, HTPU

Period: July 2021- September 2021

6. Aguilera Salcedo, Juan

BSc in Environmental Engineering, Rey Juan Carlos University

Project Title: Environmental study of hydrogen storage methods

Supervisor: Dr. Javier Dufour/Dr. Diego Iribarren, ASU

Reading date: October, 2021

7. Rodrigo Saiz

BSc Industrial Electronic and Automatic Engineering University of País Vasco

Internship: Programming of electronic equipment for communication through CAN and MODBUS protocols, wiring and commissioning of electronic equipment, testing of laboratory control system, learning LabView and its programming.

Supervisor: Dr. Milan Prodanovic, ESU

Period: September 2021- December 2021

MASTER PROJECTS

1. García Fernández, Carlos

MSc in Chemical Engineering, Rey Juan Carlos University

Project Title: New electrolytes for membrane-less flow batteries

Supervisor: Dr. Rebeca Marcilla, ECPU

Reading date: June, 2021

2. Benito Puerto, Alejandro

MSc in Chemical Engineering Rey Juan Carlos University/Autonomous University of Madrid

Project Title: Photocatalytic reforming of bioethanol in gas phase for the sustainable production of hydrogen

Supervisor: Dr. Fernando Fresno, PAPU

Reading date: July, 2021

3. Sanz Navarro, María

MSc in Chemical Engineering Rey Juan Carlos University/Autonomous University of Madrid

Project Title: Catalytic pyrolysis of biowaste for the production of bio-oils with improved properties.

Supervisor: Dr. Javier Fermoso, TCPU

Reading date: March, 2021

4. Estrada Altamirano, Silvia del Rosario

MSc in Chemical Engineering, Rey Juan Carlos University

Project Title: Mechanistic study of the photoreduction of CO₂ by visible light to obtain products of industrial interest.

Supervisor: Dr. Miguel Gómez, PAPU

Due: July, 2021

5. Lamela Pablos, Ricardo

MSc In Agro-environmental and Agro-food Sciences, UNED

Project Title: Decontamination of Water by Capacitive Deionisation

Supervisor: Dr. Julio J. Lado, ECPU

Reading date: March 2021

6. De Vicente, Marta

MSc in Biotechnology, Autonomous University of Madrid

Project Title: Use of volatile fatty acids for the production of odd-chain fatty acids in *Yarrowia lipolytica*.

Supervisor: Dr. Elia Tomás, BTPU

Reading date: 2021

7. Dermitzkai, Nicolas

MSc in Agri-environmental and Agri-food Sciences, UNED

Project Title: Electrochemical Treatment of Nitrate Contaminated Groundwater for Agricultural Use

Supervisor: Dr. Julio Lado, ECPU

Reading date: October, 2021

8. Bodas Carballo, Salvador

MSc In Microbiology and Parasitology, Complutense University of Madrid

Project Title: Valorisation of agroindustrial wastes valorization into volatile fatty acids via anaerobic fermentation

Supervisor: Dr. Silvia Greses/Dr. Cristina González, BTPU

Reading date: 2021

9. De Castro López, Rodrigo

MSc In Chemical Engineering, Rey Juan Carlos University

Project Title: Micropyrolysis coupled to gas chromatography and mass spectrometry for the study and modelling of thermochemical processes for the valorisation of plastic waste.

Supervisor: Dr. Inés Moreno, TCPU

Reading date: July, 2021

10. Meruelo García, Ibai

MSc In Chemical Engineering, Rey Juan Carlos University/Autonomous University of Madrid

Project Title: Ecodesign of proton exchange membrane (PEM) type fuel cells

Supervisor: Dr. Javier Dufour/Dr. Diego Iribarren, ASU

Reading date: December, 2021

11. Sillero Moreno, Laura

MSc in Industrial Engineering, Rey Juan Carlos University

Project Title: Low cost Zn-MnO₂ re-injectable battery for energy storage applications.

Supervisor: Dr. Edgar Ventosa, ECPU

Reading date: January, 2021

12. Rincón Lucas, Irene

MSc in Inland Water Quality, Autonomous University of Madrid

Project Title: Enzyme@MOF composites as agents for microplastic degradation in water

Supervisor: Dr. Patricia Horcajada/ Dr. Tania Hidalgo, APMU

Reading date: July, 2021

13. Martín Vázquez, Laura

MSc in Chemical Engineering, Rey Juan Carlos University

Project Title: New more stable and sustainable perovskite

Supervisor: Dr. Patricia Horcajada/ Dr. Yolanda Pérez, APMU

Reading date: March, 2021

14. Serrano Nieto, Rubén

MSc in Chemical Science and Technology, Complutense University of Madrid

Project Title: New electro/photoactive MOFs: synthesis, characterisation and properties

Supervisor: Dr. Patricia Horcajada, APMU

Reading date: September, 2021

15. Ruiz Camino, Daniel

MSc in Applied Chemistry, Autonomous University of Madrid

Project Title: Design of new metallic compounds and study of their antitumour and antimicrobial properties.

Supervisor: Dr. Patricia Horcajada, APMU

Reading date: July, 2021

16. Valencia Bonilla, Rubén

MSc in Renewable Energies in Electrical Systems, University Carlos III of Madrid

Project Title: New control method for doubly-fed induction generators

Supervisor: Dr. Mohammad Ebrahim Zarei, ESU

Reading date: September, 2021

17. Greciano Tena, Paula

MSc in Renewable Energies in Electrical Systems, University Carlos III of Madrid

Project Title: Energy management systems including railway systems

Supervisor: Dr. Mohammad Ebrahim Zarei, ESU

Reading date: September, 2021

18. Jiménez Chiarri, Sergio

MSc in Renewable Energies in Electrical Systems, University Carlos III of Madrid

Project Title: Energy management system for microgrids

Supervisor: Dr. Mohammad Ebrahim Zarei, ESU

Reading date: July, 2021

19. Prieto López, Laura

MSc in Renewable Energies in Electrical Systems, University Carlos III of Madrid

Project Title: Distributed storage management to improve inertial properties of power grids

Supervisor: Dr. Mohammad Ebrahim Zarei, ESU

Reading date: September, 2021

20. Delgado Delgado, Ana

MSc in Systems and Applications Engineering, University Carlos III of Madrid

Project Title: Advanced control system for power electronics converters connected to electrical grids

Supervisor: Dr. Javier Roldán, ESU

Reading date: October, 2021

21. Avedaño Caiza, Marco Vinicio

MSc in Renewable Energies in Electrical Systems, University Carlos III of Madrid

Project Title: Stability analysis for three-phase photovoltaic converters connected to electrical grids using the impedance method.

Supervisor: Dr. Javier Roldán, ESU

Reading date: September, 2021

22. Garcerant Tafur, Mildred

MSc in Renewable Energies in Electrical Systems, University Carlos III of Madrid

Project Title: Inertial Support Service using Renewable Energy Sources in Electrical Islands

Supervisor: Dr. Javier Roldán, ESU

Reading date: March, 2021

23. García-Miguel del Álamo, Israel

MSc in Organic Chemistry, Complutense University of Madrid

Project Title: Synthesis of porous conjugated polymers as photocatalysts

Supervisor: Dr. Marta Liras/Dr. Teresa Naranjo, PAPU

Reading date: July, 2021

24. Palenzuela Rebella, Sandra

MSc in Organic Chemistry, Autonomous University of Madrid

Project Title: Nanostructured porous conjugated polymers for photoelectrochemical applications

Supervisor: Dr. Marta Liras/Dr. Teresa Naranjo, PAPU

Reading date: July, 2021

25. Da Aldea, Maísa

MSc in Chemistry for Sustainability and Energy, University of Alcalá de Henares

Project Title: Hybrid Photoelectrode Design: Design of Hybrid Photoelectrodes: Sustainable Technology for Energy Conversion

Supervisor: Dr. Marta Liras/Dr. Freddy Oropeza, PAPU

Reading date: July, 2021





EUROPEAN UNION
STRUCTURAL FUNDS



Contact
contact.energy@imdea.org
tel. +34 91 737 11 20
fax +34 91 737 11 40

Avda. Ramón de la Sagra, 3
Parque Tecnológico de Móstoles
E-28935 Móstoles, Madrid, Spain