



research for a sustainable energy development

annual report
2019
www.energy.imdea.org



David Serrano

Director of IMDEA Energy

Móstoles, October 2020

The 2019 Annual Report of the IMDEA Energy Institute summarizes our main activities and achievements in line with the major focus of the center: the development of novel technologies to accelerate the transition towards a low-carbon energy system. As in previous years, our strategy has been defined according to three key drivers: scientific excellence, international impact and cooperation with industry.

The topics covered by IMDEA Energy are well aligned with the national and international programs on energy and environment, including solar energy, production of sustainable fuels, energy storage materials and devices, smart grids, energy efficiency, CO₂ valorization and techno-economic evaluation of the energy systems. In recent years the nexus energy/environment is being reinforced at IMDEA Energy, which is reflected in the increased number of projects dealing with concepts as circular economy, recycling, wastes and residues valorization and pollutants treatment. Moreover, application of LCA tools to all these technologies allows us to make an accurate assessment of their contribution to sustainability issues.

The personnel of IMDEA Energy, which consist of a highly qualified and multidisciplinary team of researchers, technicians and administration/management staff, have reached by the end of 2019 a total of 105 persons, keeping during the past five years an overall growing trend to successfully meet the additional commitments and duties associated with the new projects and initiatives being started. Moreover, we had working with us during 2019 as many as 51 students from universities and technical high-schools in the form of internships or doing their Master and Bachelor projects. Likewise, I would like to highlight that we have hosted along this year 22 visiting researchers, which reflects the high interest aroused by IMDEA Energy in other institutions to establish and develop new scientific collaborations.

Other remarkable figure is the number of research projects and contracts with companies active during 2019, which has reached a total of 74, including 26 national/regional projects, 9 industrial projects, 15 international projects and 24 contracts with companies. This impressive number of projects, when compared to our size, has been the result of the effort of our personnel to generate new concepts, ideas and prototypes that have been granted in competitive calls. In the same way, a total of 36 of our researchers have been awarded with personnel grants according to their excellent backgrounds. The external funding coming from these sources has been able to cover

about 55 % of the overall IMDEA Energy budget, which is also a remarkable indicator for a center with a strong scientific orientation.

Positive scientific outcomes have been also achieved in 2019 as it is reflected in the number of indexed publications (106 in total), which represents a ratio of 2.94 publications per doctor, and of congress communications (105 in total), mainly in the form of oral presentations, including 13 invited lectures. Other remarkable results to be highlighted are 4 granted patents and 2 filed patents, as well as the registration of one software and one brand.

By the end of 2019, IMDEA Energy submitted a proposal to the highly reputed "Severo Ochoa / María de Maeztu" program of the Spanish Ministry of Science and Innovation, which recognizes and provides additional funding for excellent research centers and units. This proposal was evaluated positively, becoming the first energy research institute that, as a whole, has entered this prestigious club. The preparation of the proposal required to perform an analysis of the performance of IMDEA Energy along the past 5 years, including a benchmarking exercise that showed how our center has been positioned among the top-level worldwide energy research institutions in terms of quality and impact of the scientific publications. Likewise, the proposal included a Strategic Program for IMDEA Energy that will be implemented along the next 4 years. It will involve a number of changes and initiatives to improve the internal organization of the institute and the working conditions of the personnel and to increase our international visibility and dissemination activities. To achieve these ambitious goals, I am sure that we will have, as usually, the enthusiastic collaboration of all the IMDEA Energy staff.

Finally, although this report corresponds to 2019, it is impossible not to take into account the really difficult situation we are still living at the moment of writing this foreword in the context of the COVID-19 pandemic. In spite of the fatigue that we are all feeling in the middle of the second wave, I would like to finish with an optimistic message since I am fully convinced that we will be able to overcome successfully this crisis, learning from this experience how to live and work in a better way.



words from the director...

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www.energy.imdea.org

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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 energy system with a high degree of decarbonisation, economically competitive and securing energy supply.

The IMDEA Energy Institute is committed with having a significant impact on R&D energy themes 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 European levels; such as the European Strategic Energy Technology (SET) Plan with selected targets

for 2020 and 2050; the European Research Framework HORIZON 2020; 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, on a plot of with 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 recognized with the prestigious LEED Gold Certificate and the A Energy Efficiency Certificate.

building



8 scientific labs
2 pilot plants
office work areas and
an auditorium



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.

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. Eduardo Sicilia

Vice-president of the Foundation
Regional Minister of Science, Universities and Innovation
Comunidad de Madrid, Spain

REGIONAL ADMINISTRATION REPRESENTATIVES

Mrs. María Luisa Castaño
General Director of Research and Technological Innovation
Comunidad de Madrid, Spain

Mrs. Sara Gómez
General Director of Universities and Artistic Education
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 Transfer
Rey Juan Carlos University, Spain

Prof. Dr. Máximo León
Professor of Applied Physics
Autónoma University of Madrid, Spain

Prof. Dr. Carlos del Cañizo
Director of the Solar Energy Institute
Polytechnic University of Madrid, Spain

Dr. Carlos Alejaldre
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 Girio
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.
Spain
Director of Engineering

SECRETARY

Mr. Alejandro Blázquez
Consultalia

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

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 at the ETH Zurich and Head of the Solar Technology Laboratory at the Paul Scherrer Institute, Switzerland

Dr. Francisco Girio

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

Prof. Dr. Gumersindo Feijoo

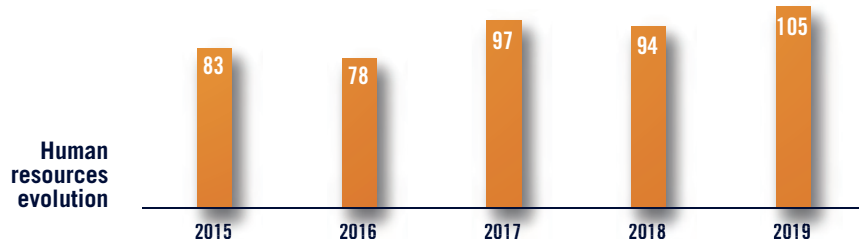
Full Professor of Chemical Engineering
Santiago de Compostela University, Spain

Dr. Rufino Navarro

Scientist
Institute of Catalysis and Petrochemistry, CSIC, Spain

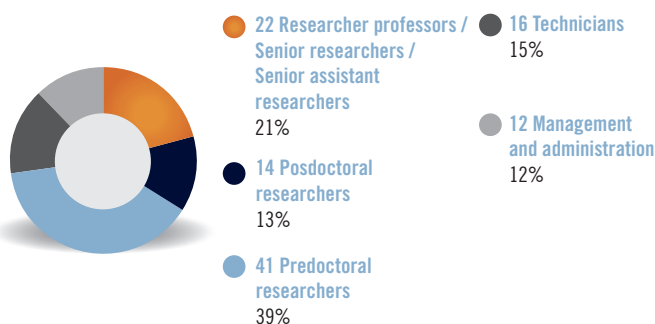
in figures

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.

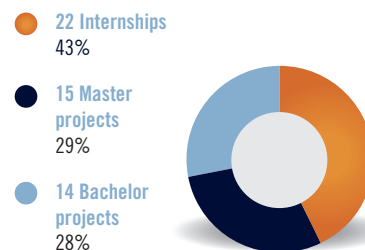


human
resources

**Human resources distribution
by the 31st of December of 2019**



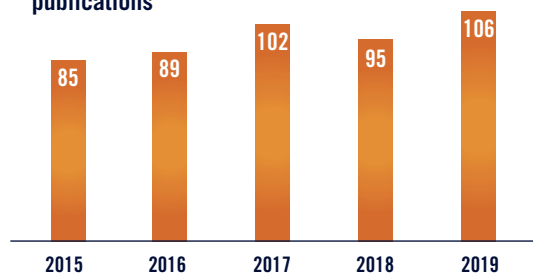
**51 students in connection
with the IMDEA Energy Institute in 2019**



Mobility actions in 2019

8 Secondments of Imdea Energy researchers
22 visiting researchers

**Scientific
indexed
publications**



2019

69 congress communications,
13 invited conferences
and 23 poster communications.

32 Ph.D. thesis under development
and 4 Ph. D. thesis defended.

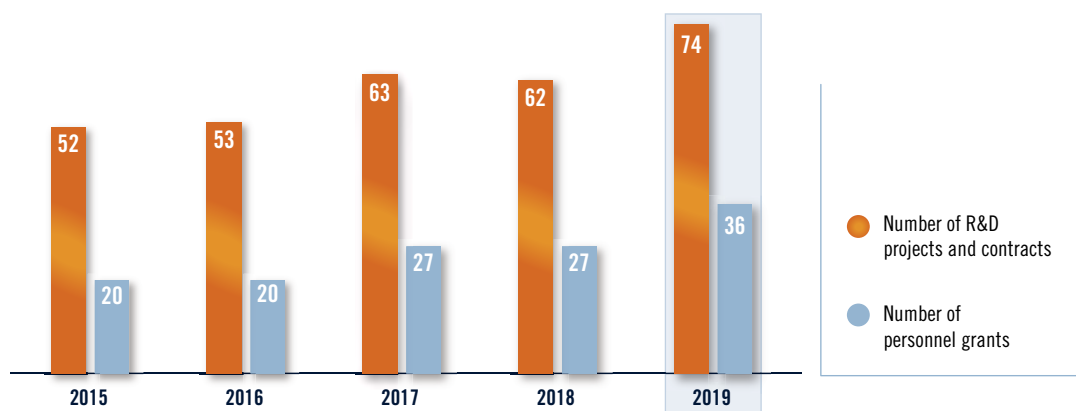
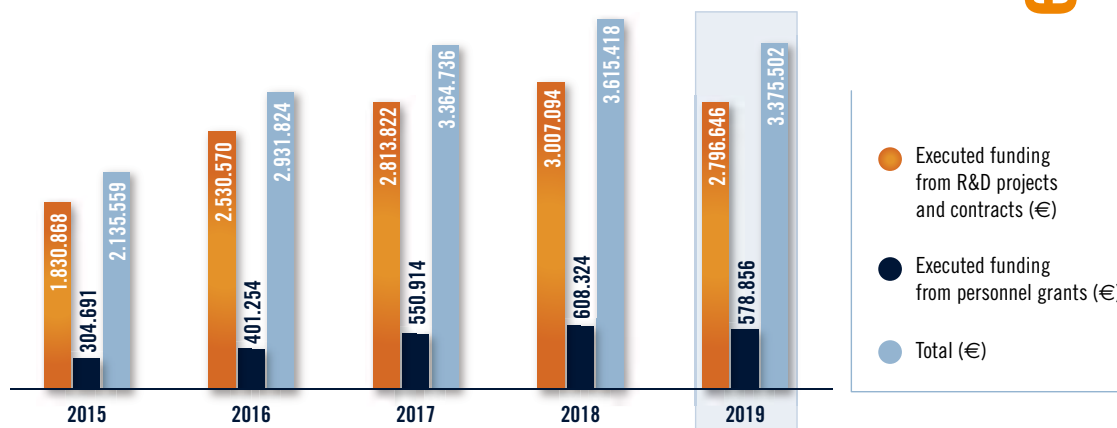
1 new patent applied and 1 brand applied
and 1 software, 4 patents and 1 brand granted.

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 2019 the Institute was hosting two Consolidator Grants awarded by the European Research Council with a total budget of 4.5 M€.

external funding

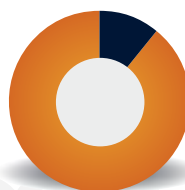


2019



- 6 Regional R&D Projects
250.617 €
9%
- 9 Industrial Projects
198.822 €
7%
- 20 National R&D Projects
464.194 €
17%
- 24 Contracts with companies
646.147 €
23%
- 15 International R&D Projects
1.236.866 €
44%

2019



- 35 National and regional personnel grants
511.638 €
89%
- 1 International personnel grants
62.218 €
11%

cooperation

IMDEA Energy collaborates with universities and research centres worldwide, both within the framework of research projects and for the development of educational programs. Cooperation with industry in collaborative projects of 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 platforms with participation of companies.

COOPERATION WITH COMPANIES 2019





During the year 2019, it should be highlighted the organization of 75 meetings, including 64 with companies related with the energy sector, covering a wide range of sizes and business areas, like Empresarios Agrupados, Repsol, Naturgy and ACS Cobra, leading to the preparation of several proposals of projects. A newsletter has been launched in July 2020 and distributed to a target audience of more than 1,600 professionals and stakeholders. IMDEA Energy has been present in numerous events of associations, technological platforms, seminars, fairs, infodays and brokerage events. A booth was shown during the energy days at COP25 in Madrid.



COOPERATION WITH RESEARCH INSTITUTIONS 2019

J. Heyrovský
Institute of Physical Chemistry
Academy of Sciences of the Czech Republic

COOPERATION WITH UNIVERSITIES 2019



networking

IMDEA Energy Institute, since its creation, has considered as a relevant activity its 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.



The following lists summarizes the main associations in which IMDEA Energy Institute has participated as a member in 2019:

NATIONAL



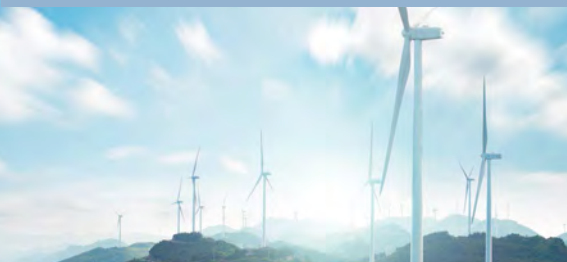
INTERNATIONAL





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.

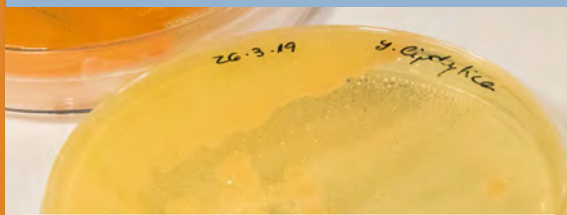
Electrochemical energy storage

- 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

- Development of 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.
- Development of 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 of plastic wastes.

Concentrated solar power

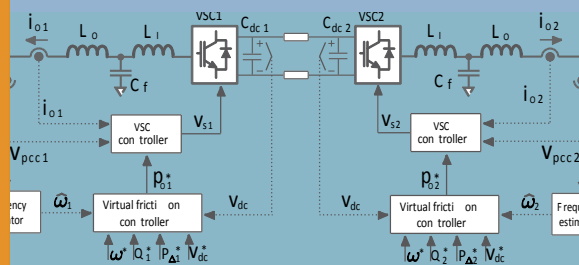


Efficient and dispatchable solar concentrating technologies for power generation, industrial process heat and production of solar fuels and chemicals.

- 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.



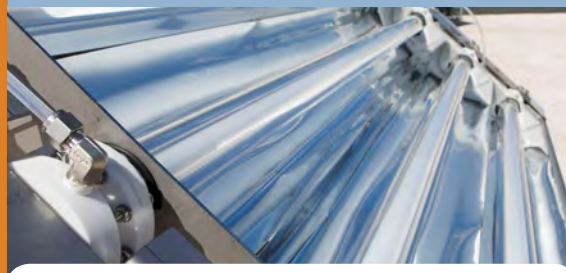
Smart management of electricity demand



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.
- Development of 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

- 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.
- Chemical characterization techniques: mass spectrometry, gas/mass chromatography, elemental analysis ICP - OES and CHONS.
- Thermogravimetric analysis (TG-DTA) in oxidising (air), inert (Ar) or reductive (10% H₂/Ar) atmospheres.
- Properties of solids: textural and chemisorption.
- X-ray diffraction with structural PDF 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.
- Biotechnological characterisation techniques: GC, HPLC equipped with different columns and detectors (IR, MS, UVVIS, HPAEC-PAD), electrophoresis instrumentation for recombinant DNA technology, protein purification and analysis.



scientific facilities



Simulation and Modelling Tools

- Aspen Plus for chemical process analysis and optimization.
- SuperPro designer: simulation of biochemical processes.
- EBSILON Professional for simulation of thermodynamic cycle processes and power plants.
- STEC/TRNSYS for dynamic simulation of solar thermal power plants.
- Simapro 7.2 Professional for life cycle assessment (LCA) and carbon footprinting.
- GaBi Professional and DEA-Solver Pro for sustainability analysis.
- LEAP software for energy planning and thermal fluid dynamics.
- Matlab-Simulink for process simulation and data processing.
- PLECS: simulation of circuits in power electronics.
- LabVIEW for data acquisition, process control and calorimetric loops.
- SolidWorks for 3D computer-aided design.
- COMSOL Multiphysics for CFD analysis.
- Tracepro for ray tracing simulation of solar systems.
- Chemcraft, GAUSSIAN® and VASP® for computational chemistry.

Pilot Plants Facilities

High-flux solar simulators of 7 and 42 kW. Surface treatment and synthesis of materials. Advanced solar concentration optics. Solar receivers and reactors. Thermal fluids for high temperature applications. Characterisation techniques for high radiation fluxes, high temperatures and simulation tools.

Smart energy integration lab. Real-time emulation of AC and DC power networks and microgrids. Development of optimal dispatch algorithms for energy resource management. Stability analysis, power quality and control strategies for microgrids and power electronics converters. Renewable and storage integration to power network.

Test installation for batteries and electrochemical capacitors with various assay protocols in DC and AC. Simulation of demand cycles in powers from 0.3 to 30 kW under controlled temperature and humidity.

Production and conversion of biomass in open and closed photobioreactors with versatile and flexible configuration. Pyrolysis (thermal or catalytic) on fluidised bed reactor and hydrodeoxygenation on fixed bed reactor.

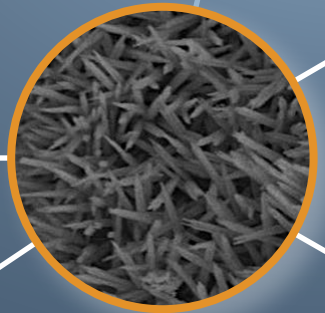
Solar field consisting of 169 heliostats, 3 m² each, with an experimental platform located on top of a 18 m height tower. This facility allows testing receivers, reactors and materials up to 250 kW thermal power under irradiances above 2500 kW/m².

research units

**Thermochemical
Processes Unit**



**Electrochemical
Processes Unit**



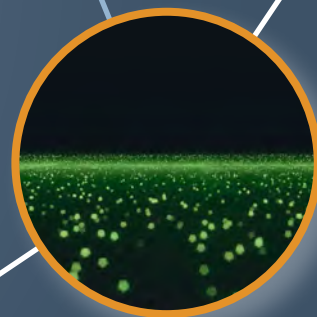
**High Temperature
Processes Unit**



**System Analysis
Unit**



**Biotechnological
Processes Unit**



**Photoactivated
Processes Unit**



**Electrical Systems
Unit**



**Advanced Porous
Materials Unit**



Thermochemical Processes Unit



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



Dr. Juan Miguel Moreno
Senior Researcher



Dr. Patricia Pizarro
Associated Senior
Researcher



Dr. Javier Feroso
Senior Assistant
Researcher

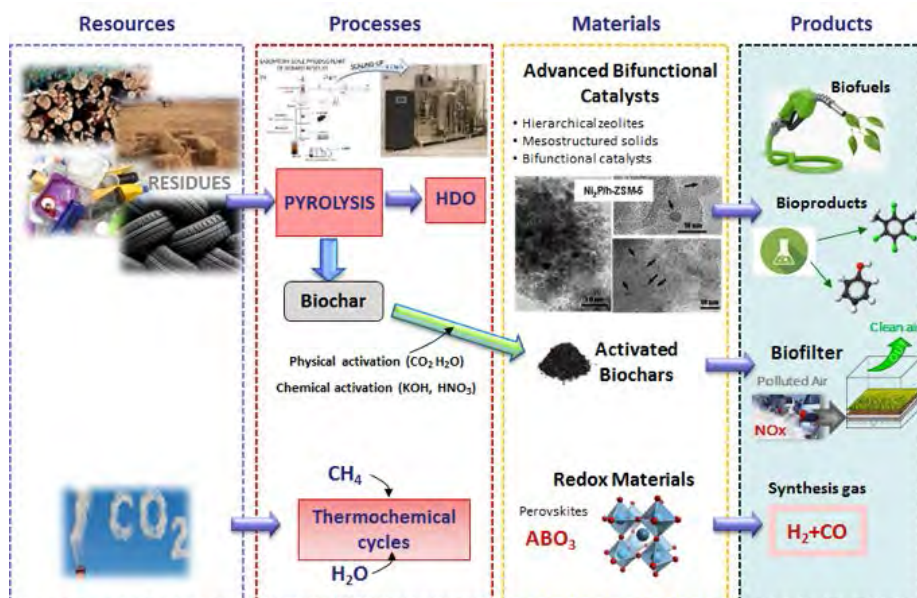


R&D Objectives

- Development of materials (mainly catalysts and redox solids) and thermochemical processes for the valorization of biomass, CO_2 and solid wastes.
- Development of sustainable biofilters from pyrolytic biochars for NO_x adsorption

Research lines

- Production of advanced biofuels and valuable chemical compounds from biomass wastes.
- Valorization of plastic and other non-renewable organic wastes.
- Application of pyrolysis biochars as bio-filters for air decontamination (NO_x , PMs, VOCs) in urban environments
- Redox materials for the production of solar fuels through Chemical Looping Reforming of methane with CO_2 .



Relevant projects and networking

In 2019 the TCPU has participated in a total of 8 research projects, all of them related with the valorisation of different types of organic wastes (lignocellulose, organic fraction of municipal solid wastes, plastics and tires) into fuels, chemicals and NO_x adsorption biofilters. 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 Comunidad de Madrid) and 2 industrial doctorates. The national government supports 3 research projects: BIOLIGWASTE, REDEFINERY and BIOCASCHEM. Finally, the TCPU participates in the H2020 European NONTOX project.

The main objectives of the above-mentioned projects are:

BIOCASCHEM: It is aimed to study new routes of valorisation of lignocellulosic biomass from agroforestry residues by means of the cascade combination of thermo-catalytic treatments, in order to maximise the production of valuable compounds, such as aromatic hydrocarbons and phenolics, among others.

BIOCHARFILT: The goal of this project is to develop biochar-based materials to be used as active elements in biofilters for air decontamination (NO_x, PMs, VOCs) in urban environments.

BIO3: In this project the UPTQ participates in the tasks related with the catalytic pyrolysis of bio-wastes and the hydrodeoxygenation of the produced bio-oil.

Industrial doctorate with PID: The objective of the project is the development and validation of a laboratory-scale prototype for the study of catalytic pyrolysis (ex situ) with continuous regeneration of the catalyst.

RESUCAP (Industrial Doctorate with Repsol): It is aimed to the development of a process for the elimination of pollutants (oxygen, metals, halogens, etc.) in the oils obtained by pyrolysis of the CSR fraction (solid recovered fuel) of municipal solid waste.

BIOLIGWASTE: The main objective of TCPU in this project is focused on the thermocatalytic valorisation, within a biorefinery concept, of a lignin-rich residue proceeding from the extraction of the hollocellulose biopolymers of wastes coming from the pruning and cleaning of gardens.

REDEFINERY: In this project TCPU participates in the tasks of physicochemical characterization and pre-treatment of feedstocks (plastics and biogenic organic residues) and their valorisation through thermal conversion processes using thermal and catalytic pyrolysis and hydrotreatment of pyrolysis oils.

NONTOX: The objective of TCPU in this project is the thermochemical conversion of non-target plastics, with a high halogen content, into hydrocarbons of suitable composition for use as fuels, industrial solvents or monomers.

On the other hand, the TCPU is involved in different associations such as the European Energy Research Alliance (EERA) of Bioenergy, the Biobased Industries Joint Undertaken (BBIJU) and the Spanish Platform of Sustainable Chemistry (SUSCHEM). The Head of the unit has been during 2019 member of the Governing Board of the Spanish Catalysis Society (SECAT), of the Advisory Council of the German Biomass Research Centre (DBBZ), and of the Synthesis Commission of the International Zeolite Association (IZA), as well as President of the Spanish Zeolite Group (GEZ).

Facilities

Raw Materials conditioning

- Biomass milling and sieving.
- Oven for biomass drying.

Synthesis and characterization of catalysts

- Lab equipment for catalyst and materials preparation by different routes such as sol-gel, hydrothermal and co-precipitation.
- Methods for dispersing active phases on porous supports.
- Tubular muffle furnace for thermal treatment under controlled atmosphere.
- Characterization techniques available in IMDEA Energy (gases physisorption, ICP-OES, elemental analysis, TPD-TPR, thermogravimetry, XRD, SEM, Raman, FTIR, among others). Access to techniques at University Rey Juan Carlos (TEM, FEG-SEM, NMR, XRF)

Lab scale reactors for testing catalytic activity

- 2 Stirred tank high pressure batch reactors (P_{\max} 150 bar).
- 1 High pressure continuous fixed-bed reactor (P_{\max} 50 bar).
- 1 High temperature continuous fixed-bed reactor for testing redox materials (T_{\max} 1500 °C).

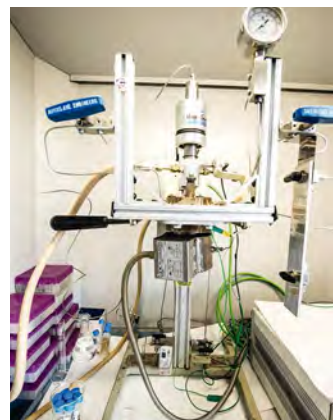
- 3 Downdraft fixed-bed pyrolysis reactors.
- 1 Continuous feeding pyrolysis reactor.
- 1 setup for monitoring NO adsorption in fixed-bed biofilters.

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.

Analysis of raw materials and reactions products

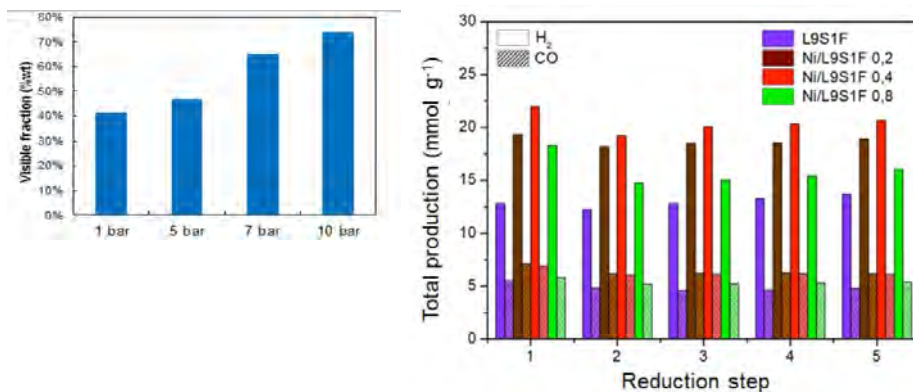
- Elemental CHNS-O analysis, Karl Fischer titration, potentiometric titration for carbonyl determination in bio oils.
- AOD decomposition system.
- NO_x chemiluminescence analyzer.
- Chromatographic analysis: 1 GC-MS, 2 GC (FID, TCD), 2 gc, Py-GC-MS.
- Metal analysis by ICP-OES.
- Thermogravimetric analysis.
- Spectroscopic techniques (FTIR, XRD).



Scientific activities and results

Production of advanced biofuels and valuable chemical compounds from biomass wastes

- Lab-scale pyrolysis set-ups have been modified to maximize products recovery and their quantification, improving the mass-balance fitting.
- Catalytic pyrolysis of lignin has been studied setting the temperature for maximum liquid production and catalyst selection that increases the content of the most valuable components (alkyl-phenols) in the pyrolysis oil.
- Modifications in the batch lab-scale pyrolysis reactor for operating under pressure successfully carried out. Reactions of both thermal and catalytic pyrolysis of lignocellulosic biomass at pressures ranging from 1-10 bar have been run. Higher pressures increase the bio-oil fraction detected by GC-MS (higher depolymerization).
- Regarding acylation of bulky phenolic compounds from bio-oil, it has been found that the activity of zeolites is improved by increasing their external surface or mesoporosity.



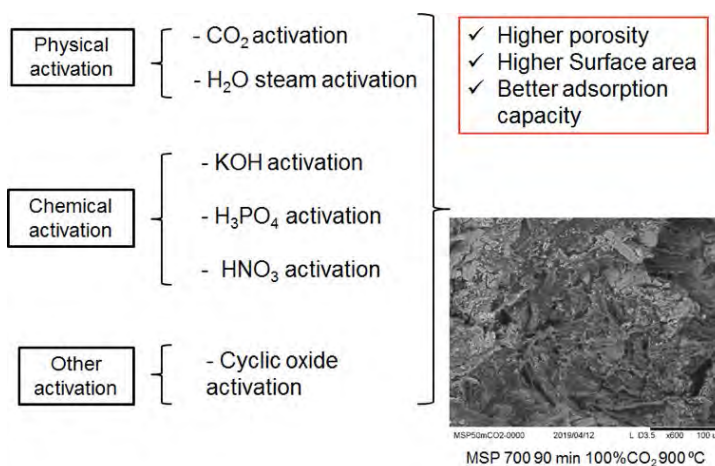
Redox materials for the production of solar fuels through decomposition of CO₂ and H₂O and by Chemical Looping Reforming with methane and CO₂

- The characterization and evaluation of La_{0,9}Sr_{0,1}FeO₃ perovskite modified by supporting onto YSZ or impregnating Ni has been completed. A remarkable improvement on both the activity and stability during successive redox cycles compared to the parent perovskite has been attained.



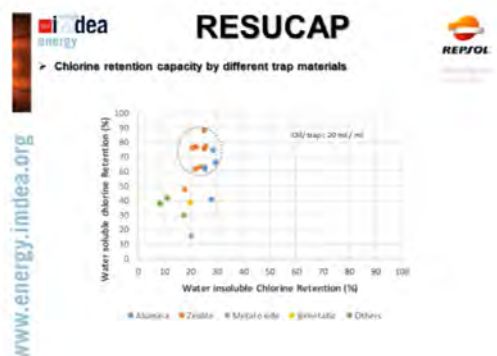
Application of pyrolysis biochars as bio-filters for air decontamination (NO_x, PMs, VOCs) in urban environments

- Biochars have been obtained by slow pyrolysis of lignocellulosic biomass and subsequently activated, either physically (CO₂, steam) at different temperatures, or chemically with KOH, to improve their textural properties.
- The lab-scale facility for NO adsorption tests has been constructed and tuned-up. Preliminary adsorption tests show very promising results of activated biochars as NO_x filters in comparison with reference carbon materials.



Valorization of plastic and other non-renewable organic wastes

- Pretreatment of PVC containing WEEE wastes at 300 °C under inert atmosphere efficiently removes (~90 % wt.) chlorine previously to pyrolysis reactions.
- Characterization (XRF, TGA, FT-IR, AOD-IC), pre-treatment and selection of different non mechanically recyclable WEEE residues.
- Experimental studies of washing and adsorption for removing chloride from pyrolysis oils.
- Tire wastes have been characterized and thermally pyrolyzed. Due to the high amounts of char generated, co-pyrolysis with lignocellulose and other residues will be explored.





High Temperature Processes Unit

annual report
2019



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



Dr. Manuel Romero
Research Professor



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 and dispatchability, and urban integration.
- Solar receivers and reactors (volumetric and particle).
- Thermal energy storage: materials, modelling and test bed for characterization.
- Solar fuels and chemicals production by solar thermal routes.
- Power Conversion Unit integration, heat recovery & environmental impact (advanced cycles, water, glint, glare).



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 concentration. In 2019, HTPU maintains its active role as key player in this field in the regional, national and international arena. It currently leads this topic in the *Comunidad de Madrid* (CM) by the regional research programme ACES2030-CM (2019-2022), an ambitious follow-up of ALCCONES (2014-2018) gathering 5 universities (URJC, UPM, UC3M, URJC, and UNED), two public research bodies (CIEMAT and CSIC) and one Foundation and 6 industrial entities relevant in the termosolar and energy sectors (Abengoa Energy, Repsol, Rioglass Solar, Grupo Cobra, Protermosolar, and Empresarios Agrupados). HTPU is actively involved in the most recent developments on production of solar fuels (EU H2020 Sun-to-Liquid project), new heat transfer fluids and solar receivers (EU H2020 NEXT-CSP, ES Retos ARROPAR-CEX and CDTI-Innterconnecta EFECTO), and solar thermal industrial pro-

cess heat (EU H2020 INSHIP). Besides it takes part of the Research Infrastructure Programme Horizon 2020 SFERA III project (Solar Facilities for the European Research Area – Third Phase) that gathers 15 partners from 9 EU member countries. Here HTPU contributes with its unique facilities specially designed to support industrial developments on component for applications in concentrated solar energy

Besides HTPU participates at the European Energy Research Alliance (EERA AISBL) within the Joint Programmes (JP) on Concentrated Solar Power (EERA JP-CSP) and on Energy Storage. In the national arena, HTPU is also involved in the Spanish technological platform on CSP (Solar Concentra) 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 on solar thermochemistry as well as national and international associations on Solar Energy (ISES).



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 kWe 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.
- Vertical solar furnace with three independent heating zones (up to 1500 °C).

Singular facilities for components and prototypes testing

- 42 kWe high-flux solar simulator equipped with a three-axis positioning system with a static load capacity of 250 kg.

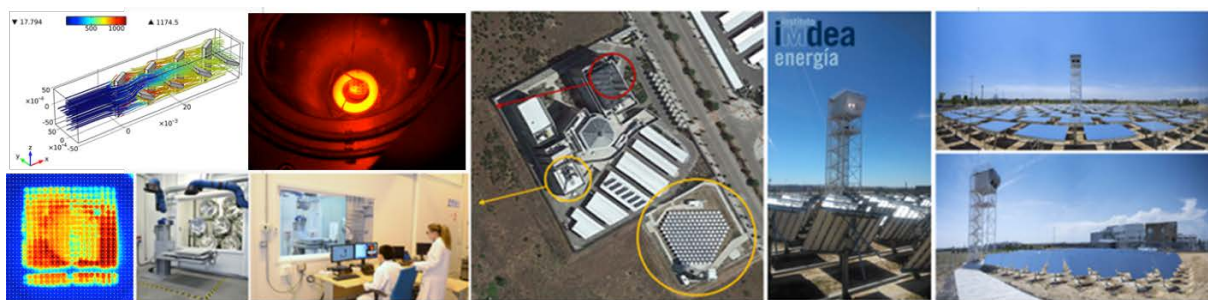
- 250 kW solar tower facility composed of 169 heliostats and two testing platforms.

Specific test rigs

- Aerothermal characterization of volumetric absorbers at 1 and 10 kW scale.
- Thermal storage in packed and fluidized beds.
- Outdoor test rig for small heliostats qualification.

Computational design lab for high temperature processes

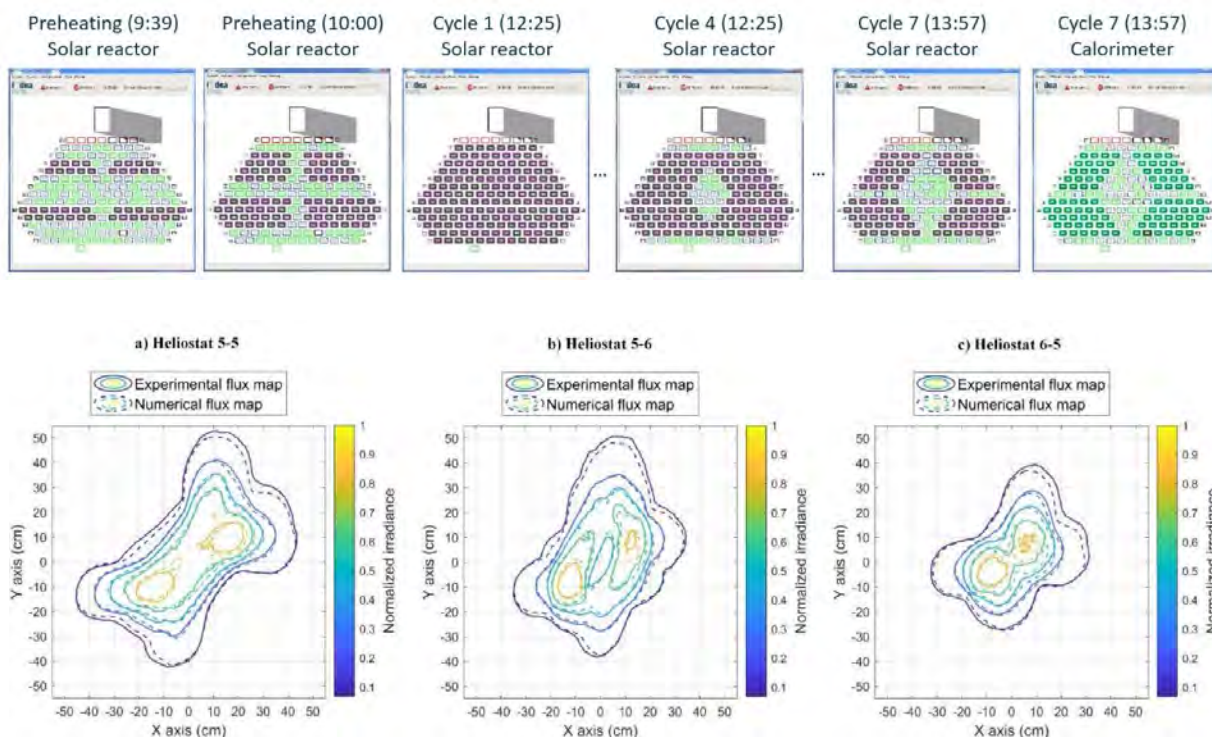
- Workstations.
- Specific software for computer-aided design, computational fluid dynamic modelling, illumination design & optical analysis, data treatment and process control and monitoring, chemical process and power plant design.



Scientific activities and results

Innovative modular concepts with minimum environmental impact

- Investigation on deformation of heliostat's facet developed at IMDEA Energy using customised ray-tracing software and irradiance maps. The study concluded no-visible deformation during heliostat operation.
- Customized solar field with flexible SCADA and modular design developed by IMDEA Energy has demonstrated high flux/high temperature unique performance establishing a new design suitable for solar. The routine operation has produced a fruitful learning curve and led to repetitive and reliable daily testing reaching 8 cycles per day.



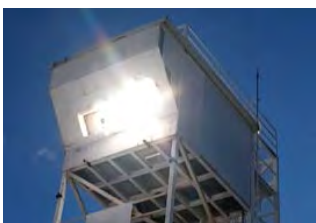
Solar Receivers & New Heat Transfer Fluid

- Investigation on new techniques for temperature and irradiance measurement in solar receivers based on optical fibers.



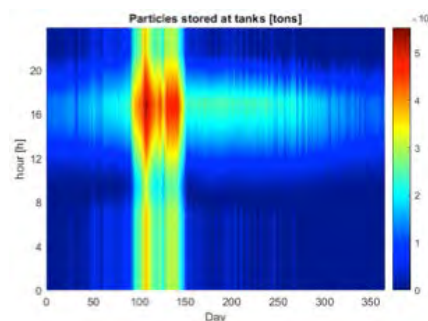
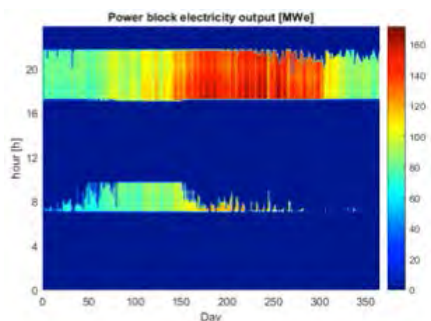
Energy Storage & Solar Thermo-chemistry

- First time ever the production of liquid fuel directly from a 100% solar syngas in a fully integrated system including solar field, thermochemical solar reactor and GTL plant and the realization of as many as 169 redox cycles has been performed. This achievement represents a worldwide record and a big step forward in the Sun-To-Liquid technology.
- Development of Ceria based materials shaped as pellets, reticulated porous foams and monoliths and testing of these shaped materials for solar fuels production by mean of thermochemical cycles in oven at 10kW scale.
- New advances on materials for thermochemical heat storage based on doped calcium manganites and encapsulated CaO. Synthesized perovskites show an oxidation temperature of around 900 °C and energy storage density higher than 150 J/g.



High Temperature Processes Integration & Environmental impact

- Analysis of annual performance of central receiver solar thermal power plants based on dense particle suspensions and supercritical fluids as heat transfer fluids in several dispatching scenarios.
- Analysis on Combined Heat/Cooling and Power Generation Using Hybrid Micro Gas Turbine in a CST Plant for Residential Off-grid Applications.





Electrochemical Processes Unit

annual report
2019



Dr. Jesús Palma
Senior Researcher
Head of the Unit



Dr. Rebeca Marcilla
Senior Researcher



Prof. Dr. Marc A. Anderson
Scientific Advisor



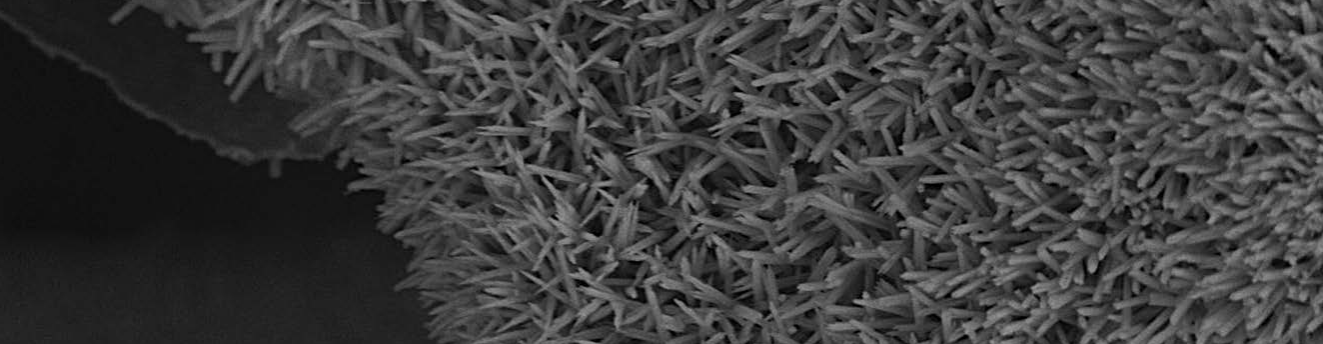
Dr. Enrique García - Quismondo
Senior Assistant Researcher



Dr. Edgar Ventosa
Senior Assistant Researcher



Dr. Andreas Mavrantonakis
Senior Assistant Researcher



R&D Objectives

- Electrochemical energy storage to increase the dispatchability of renewable sources and for the electrification of transport.
- Energy-efficient electrochemical devices for energy and environmental applications.

Research lines

- **Electrochemical capacitors**
Develop supercapacitors with improved performance maintaining power density, cycle life and charge-discharge efficiency.
- **Capacitive deionization**
Design and scale-up capacitive deionization processes to produce fresh water from high-salinity natural or waste water.
- **Redox flow batteries**
Design and build flow batteries with novel chemistries to improve the technology in two ways: (1) increasing energy density and (2) reducing costs per kWh stored.
- **Metal-air batteries**
Research on materials and designs to develop rechargeable metal-air batteries.
- **Metal-ion batteries**
Research on materials and components to improve the performance and recyclability of metal-ion batteries.
- **Testing protocols**
Establish new testing methodologies for batteries, supercapacitors and other electrochemical devices.



Relevant projects and networking

In 2019 the Electrochemical Processes Unit (ECPU) has participated in 14 research projects ranging from fundamental to industrial research. The regional government of Comunidad de Madrid supports four personnel grants (through the *"Talent Attraction Program"*, 2 young PhDs and 2 experienced PhDs, respectively), one lab technician and one predoctoral researcher with the *"Industrial doctorates programme"*. The Spanish Research Agency (AEI) supports three projects that belong to the applied research programme identified as *"Retos Colaboración"* and two that belongs to the fundamental research programme, identified as *"Retos Investigación"*. Moreover, two *"Juan de la Cierva"* Personnel Grants were granted in the modality of *"Incorporación"* and *"Formación"*, respectively. The European Research Council is funding one ERC Consolidator Grant awarded to Dr. Rebeca Marcilla, senior researcher of the ECPU. The H2020-Marie Skłodowska Curie Programme finances one Initial Training Network. Finally, the Unit has been involved in 5 research contracts funded directly by private companies.

The ECPU has expanded its network in 2019, resulting in a greater involvement in Spanish and European organizations. ECPU acted as deputy coordinator of the Electrochemical Energy Storage subprogramme in the Joint Programme on Energy Storage of the European Energy Research

Alliance (EERA). In addition, it is member of the Working Group on Energy Storage of the European Technology and Innovation Platform on Smart Networks for Energy Transition (ETIP-SNET); member of the Working Group on New Emerging Technologies of the European Technology and Innovation Platform on Batteries (Batteries Europe); vice-president of the Spanish Technology Platform on Energy Storage (BATTERYPLAT); member of the working group on New Technologies of the Spanish Association of Batteries and Energy Storage (AEPIBAL); and member of the Spanish network of excellence in Energy and Environmental Applications of Electrochemical Technologies (E3TECH).

In 2019, the ECPU has maintained cooperation agreements for training and mobility actions with foreign universities and research organizations such as the University of Salerno in Italy (Erasmus+ programme); the Federal University of Ceara in Brazil (Sandwich Doctorate). In addition to this, members of the ECPU have participated as lecturers in several Master courses organized by Rey Juan Carlos University (Master in Industrial Engineering), Polytechnic University of Madrid (Masters in Renewable Energy and Environment, and in Chemical Engineering), Carlos III University (Master in Functional Materials for Energy) and CIEMAT (Principles of Energy Storage).

Facilities

Synthesis and characterization of electroactive materials

- Light scattering for particle size and Z-potential analysis.
- 1 Glove box for synthesis in controlled atmosphere.
- Schlenk line for polymer synthesis.
- Pressurized reactors for hydrothermal synthesis.
- Probes for ultrasonic synthesis.
- Reactors and dialyzers for sol-gel synthesis.

Components fabrication and characterization

- Ink mixing: 1 ball mill, 1 vacuum and 3 high-shear mixers.
- Ink coating: 2 doctor blade coaters, 2 vacuum driers.
- Ink printing: 1 inkjet printer for micro-electrodes.
- Electrode consolidation: 1 roll press and 2 uniaxial presses.
- Coin cells: 1 puncher and 2 crimpers.
- Pouch sealing: 1 vacuum and 1 heat sealing machine.
- Chemical characterization: ion chromatography and semiautomatic titration.
- Physicochemical characterization: viscosity, density, conductivity, pH and ORP meters.
- Electrochemical characterization: multipotentiostats (50 channels $\pm 10V - 0.5A$); channel boosters 2 x 4A, 2 x 5A and 1 x 10A; impedance spectroscopy; rotating disk and rotating ring-disk electrodes; electrochemical crystal quartz microbalance.
- 2 Glove boxes for testing in controlled atmosphere.

Modelling

- Computational chemistry: electronic structure calculations (Density Functional Theory, Wave Function Theory, Molecular Dynamics), Chemcraft, GAUSSIAN ® and VASP ®.
- Computer fluid dynamics: COMSOL Multiphysics ®.
- Matlab-Simulink ® for dynamic modelling of batteries.

Prototyping

- 3D Design: SolidWorks ®.
- 3D Print Job Software: Kudo 3D.
- 3D Printers: Fused Deposition Modeling (1 x 4 Litres + 1 x 600 Litres) Stereolithography (1 x 1,2 Litres).
- 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.

Electrochemical devices testing

- Battery cycler: 3 channels x 8 kW, 120V – 200A max.
- Battery cycler: 4 channels x 300 W, 80V – 50A max.
- Cell cyclers: 48 channels x 30W, 5V – 6A max.
- Cell cyclers: 112 channels x 0,05 W, 5V – 10mA max.
- 5 climatic chambers (20, 100, 220, 250 and 4800 L) from -40 to +180°C and 10 to 98%H.
- Flow reactor test bed with controlled flow, temperature, pressure and measurement of pH, ORP and conductivity.
- LabView ® programmable control system.



Scientific activities and results

Electrochemical capacitors

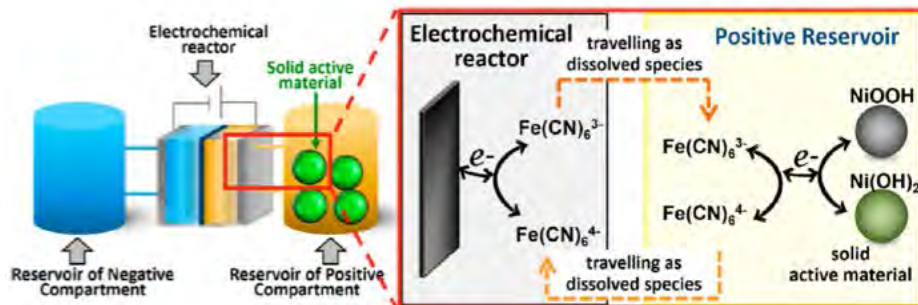
The activities in this research line has gradually decreased during the year 2019 with the end of a research project and of one PhD thesis. The main progresses have dealt with:

- Synthesis and characterization of composite materials for hybrid supercapacitors or “supercapbatteries” based on inorganic metal oxides or in polymers with conductive properties.
- Use of ex situ XRD and operando Raman spectroscopy to elucidate electro-activation processes and charge storage mechanism.
- Fundamental studies to obtain current collector-free all solid supercapacitors.

Water deionization

This research line has solidly progressed in two new subjects that have been initiated in 2019:

- Apply capacitive deionization with optimized electrodes (see Figure) to selective ion separation or removal of contaminants of emerging concern, with promising results in the separation of Na and Mg and in the removal of ibuprofen.
- Study the concept of faradaic deionization using battery-like concepts for ion capture and separation, with promising results with Lithium ions.



Redox flow batteries (RFB)

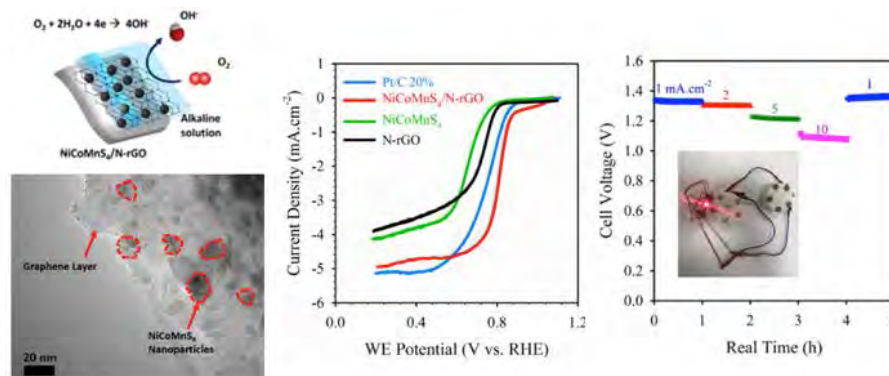
This has been the most active research line in 2019. The main outcomes were:

- Explore new chemistries and cell designs for membrane-free redox flow batteries: Immiscible electrolytes in MFreeB ERC Consolidator project and microfluidic designs.
- Design and manufacturing of membrane-free flow cell prototypes involving immiscible electrolytes or microfluidic concepts. Multiple microflow cell prototypes have been designed and 3D printed.
- Apply computational chemistry tools to investigate fundamental physicochemical and electrochemical properties of redox electrolytes and to accelerate the search of new active species alternative to Vanadium.
- A European patent on a new concept of symmetrical flow batteries using identical positive and negative electrolytes has been applied.
- An innovative concept has been proven to increase the energy density of redox electrolytes by means of chemical mediators. A European patent of this concept has been filed.

Metal-air batteries

This research line has progressed in two main subjects:

- Proof of concept of rechargeable Zinc-air batteries using laboratory prototypes of injectable anode-electrolyte blends.
- Developing of bifunctional electrocatalyst for rechargeable Zn-air batteries (see Figure).



Metal-ion batteries

In 2019 the activity in Aluminum-ion batteries (AIB) has declined while Lithium-ion batteries (LIB) studies have increased. The main results were:

- Investigation of graphite-based positive electrode for the intercalation of $AlCl_4^-$ in AIB battery prototypes.
- Techno-economic studies about the impact of the type of current collector and the use of semi-solid electrodes in the overall cost and performance of AIB.
- Investigations on solid state Lithium-ion batteries with improved mechanical properties that provide flexibility and structural capacities.
- Redox polymers based on polycatechols as universal electrodes for lithium and post-lithium aqueous batteries such as sodium, magnesium, zinc and aluminum.
- Conjugated microporous polymers containing redox moieties as high performing cathodes for Li-ion batteries with fast kinetics and ultra-long cyclability.
- Injectable electrodes to produce reusable and recyclable Lithium-ion batteries.

Testing protocols

This line has remarkably progressed in 2019. The main results were:

- Development of new accelerated test protocols and models to predict service life of alkaline and lithium-ion batteries.
- Development of post-mortem techniques to assess the failure modes of Lithium-ion batteries under ultra-fast recharging conditions, and of defective alkaline batteries.
- Development of methodologies for accelerated evaluation of damages at the solid electrolyte interface of lithium-ion cells.



Biotechnological Processes Unit

annual report
2019



Dr. Cristina González
Head of the Unit



Dr. Elia Tomás
Senior Assistant
Researcher

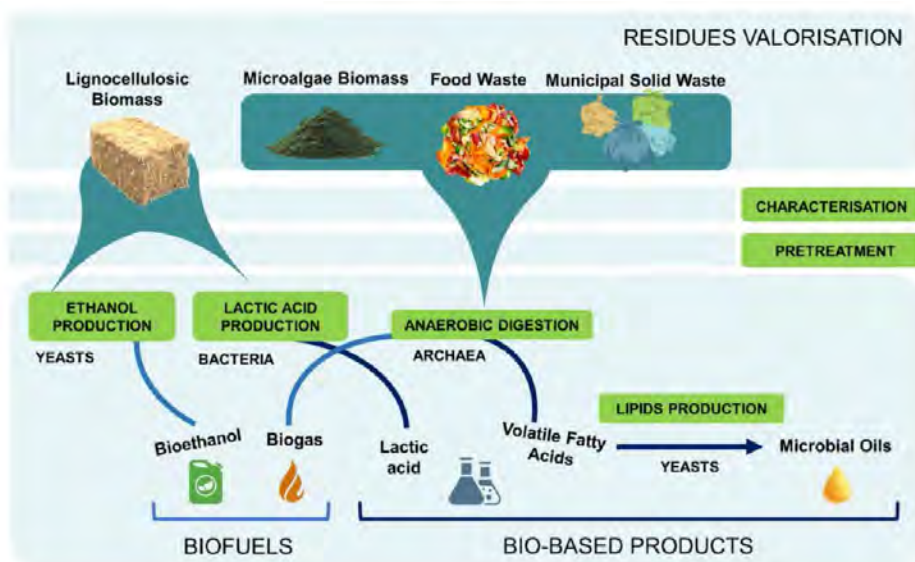


R&D Objectives

- To produce biofuels and bioproducts by developing biological processes using different residual substrates.

Research lines

- Microalgae in upstream processes: microalgae and aerobic bacteria consortia for anaerobic digestate treatment.
- Microalgae downstream processes: photosynthetic biomass anaerobic fermentation.
- Microbial oil production from the carboxylic platform (volatile fatty acids).
- Lignocellulose based biofuels and bioproducts.
- Anaerobic fermentation of waste streams for carboxylate and biogas production.



Relevant projects and networking

The Biotechnological Processes Unit (BTPU) participates in several national and international projects related with the use of photosynthetic microorganisms for digestate treatment and microalgae biomass valorization by anaerobic fermentative processes. In this sense, BTPU leads the European project EUALGAE (2015-2019), supported COST Action of H2020, which involves more than 180 investigators from 27 countries. Within the microalgae research field, the Unit is actively involved in BIOGASMENA (2017-2021) (ERANET MED), addressing key technological challenges to foster the development of biogas technology in both the EU and the Mediterranean region. More particularly, in this project, BTPU evaluates the potential of using microalgae based processes to treat anaerobic digestates. Also dealing with microalgae biomass, the Unit is involved in the regional project ALGATEC (2019-2022) via their services offered in the BIOPEN Lab.

BTPU is also very active in the valorization of lignocellulosic biomass in the project BIO_LIGWASTE (2016-2019). Within this project, coordinated by a private company, the activity of BTPU is related to the production of lactic acid from lignocellulosic streams. Like-

wise, the unit is involved in the management committee of the COST Action-Euromicroph (2019-2023) related to the exploitation of low pH microbial systems. With regard to alternative waste streams, other than microalgae and lignocellulosic material, BTPU leads the national project ACMIBIO_AD (2017-2021) with the objective to produce microbial oils VFAs obtained by anaerobic digestion agri-food residues. Related to the use of yeast for microbial oil accumulation and the use of VFAs as alternative carbon sources, the Unit is coordinating the COST Action YEAST4BIO (2019-2023). Likewise, the Unit works with organic matter of urban wastes for biogas production purposes in the framework of WASTE2BIO (2017-2020) (ERANET+ BESTF3). In addition to the Ramon y Cajal fellowship held by the Head of the Unit, BTPU has been awarded with 2 personal fellowships obtained via national calls: 1 Pre-doctoral (FPI) and 1 Technician (Garantia Juvenil). As a result of the participation in the above mentioned projects, BTPU actively collaborates with leading Research Groups and companies along Europe. Besides, UBTP is member of EERA-Bioenergy, the Biobased Industries Consortia (BIC) and BIOPLAT.



Facilities

Biotechnology and microbiology lab

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

Chemical analytics lab

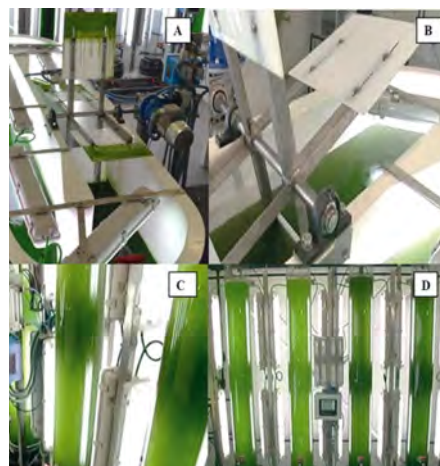
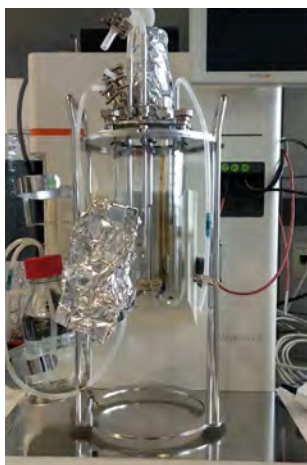
- Gas and liquid chromatographs with different detectors (FID, TCD, DAD, RI).
- Ionic chromatography.
- Equipment for routine analysis; TS/VS, pH, TNK, COD...
- Spectrophotometers: microplate and cuvette type.

Molecular biology lab

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

Pilot plants

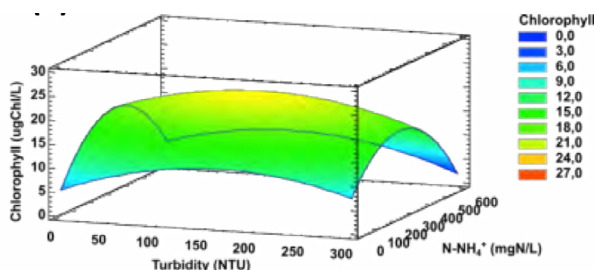
- Bioreactors.
- 3 modules of 4 bubbled columns each (1 m³ in total).
- 2 open raceways (1 m³ in total).



Scientific activities and results

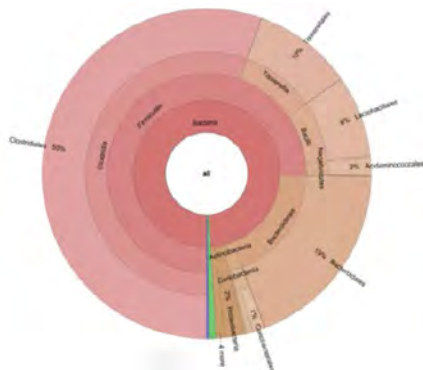
Microalgae in upstream processes: microalgae and aerobic bacteria consortia for digestate treatment

- Mixotrophic microalgae cultivation on the liquid fraction of digestate: assessment of turbidity and ammonium concentration impact on microalgae growth.
- Ammonia content exhibits higher negative influence than turbidity on microalgae growth.
- Organic carbon source has to be supplied in order to cover microalgae metabolic needs when grown in digestates.



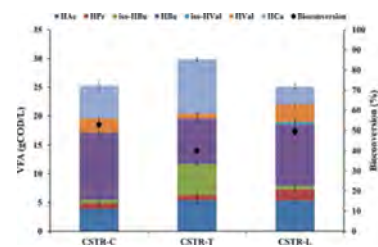
Microalgae downstream processes: photosynthetic biomass anaerobic fermentation

- Generation of alternative bioproducts (short chain fatty acids, SCFAs) as a platform molecule for green industry.
- Archaea inhibitions by means of thermal and chemical pretreatment of anaerobic inocula showed to be effective in batch assays but not in semicontinuous fermentation mode.
- Organic loading rate: a tool to increase volatile fatty acids production and recover microbial systems subjected to starvation.
- Microbial community are less diverse than the usually observed in digesters devoted to biogas.
- Firmicutes prevail at phylum level in the anaerobic microbiome.



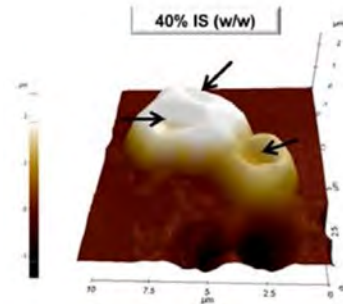
Anaerobic fermentation of waste streams for carboxylate and biogas production

- Methane yield attained from the residue of the stillage fermentation was shown to be similar to the raw feedstock. This fact highlight the possibility of using the organic fraction of urban residues to produce ethanol and biogas in a two-step fermentative process.
- High bioconversion yields (50–60%) were reached in batch and continuous reactors using agro-food wastes.
- Fermentation effluents display high content of long-chain VFAs.



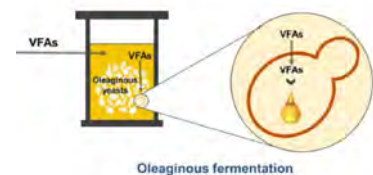
Lignocellulose based biofuels and bioproducts

- Insoluble solids are an important microbial stress factor that affect yeast cells at physical, physiological, and molecular levels.
- Reactive Oxygen Species tolerance and cell cycle arrest at molecular level is of utmost importance to fully comprehend and overcome the effect caused by insoluble solids in yeast cells.
- Lactic acid production from lignocellulosic sugars by *Lactobacillus pentosus* CECT4023T is enhanced when the oxygen presence is reduced.
- The suitability of adaptive laboratory evolution of *L. pentosus* to xylose-rich media has been demonstrated. Remarkable improvements in xylose uptake were found when culturing the evolved strain with and without pH control, even at acid initial pH.



Microbial oil production from the carboxylic platform (SCFAs)

- Anaerobic fermentation byproducts as a novel choice for producing microbial oils and biogas has been assessed.
- Oleaginous yeast growth is dependent on SCFAs concentration. However, carbon-recycling ratio is independent of the SCFAs concentration.
- Oleaginous yeast growth is dependent on SCFAs profile present in the cultivation media.





Electrical Systems Unit



Dr. Milan Prodanovic
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Dr. Javier Roldán
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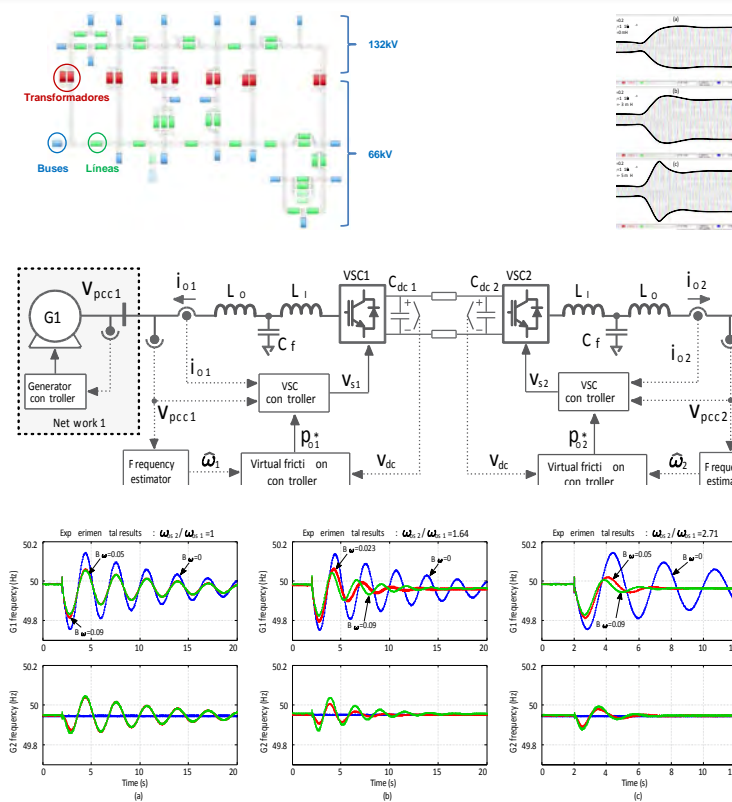


R&D Objectives

- Improved control, reliability 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

- Control of power converters for applications in electricity networks.
- Renewable and energy storage integration.
- Stability of power networks with high penetration of renewables.
- Reliability of power systems with high share of distributed generation and storage.
- Energy efficiency in systems for vibration testing.



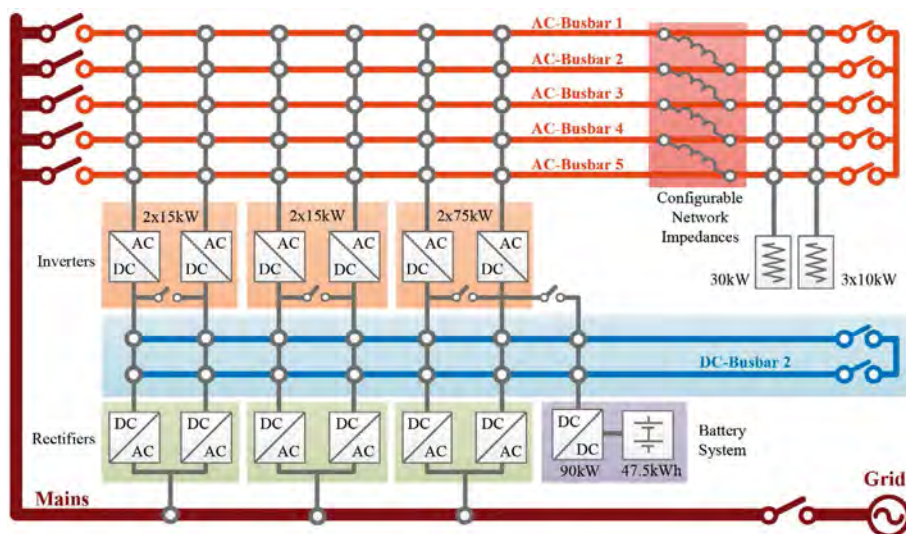
Relevant projects and networking

In 2019, Electrical Systems Unit (ESU) actively participated in several research and development projects. Principal research activities were performed within the framework of regional project PROMINT (2019-2022) and also within projects SinCortes and Cooralma funded by Iberdrola Foundation (2018-2019 and 2018-2020). These projects addressed reliability, stability and flexibility aspects of renewable and storage integration to power networks as well as control of power electronics interfaces in grid applications. With respect to industrial collaborations, the main projects were Microgrid-On-Chip (2018-2021) with NORVENTO developing control of battery interfaces for microgrids, LPT (2015-2019) with PVH for hybrid energy storage in PV applications and EEISVT (2011-2020) with IMV Corporation improving the efficiency of vibration test equipment. Research project RITSE (Reduced Inertia Transient Stability Enhancement, 2019-2020) funded by Red



Eléctrica de España was developed in collaboration with SuperGrid Institute, Lyon. Also, the research unit collaborated with SINTEF, Norway, in European project Marinet2 developing the technology of offshore generation connection to mainland via HVDC links.

ESU participated in activities of the Spanish Platform for Power Networks (FUTURED) within two workgroups: Power Electronics and Energy Storage. In 2019 ESU continued its role in the Spanish Platform on ICT applications in Energy Efficiency (EnerTIC) as an associated member.



Facilities

Smart energy integration lab (SEIL)

- 4 x 15 kVA and 2 x 75 kVA converters.
- 2 x 30 kW remotely controllable programmable loads.
- 47.5 kWh battery system.
- 75 kW bidirectional battery interface.
- 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

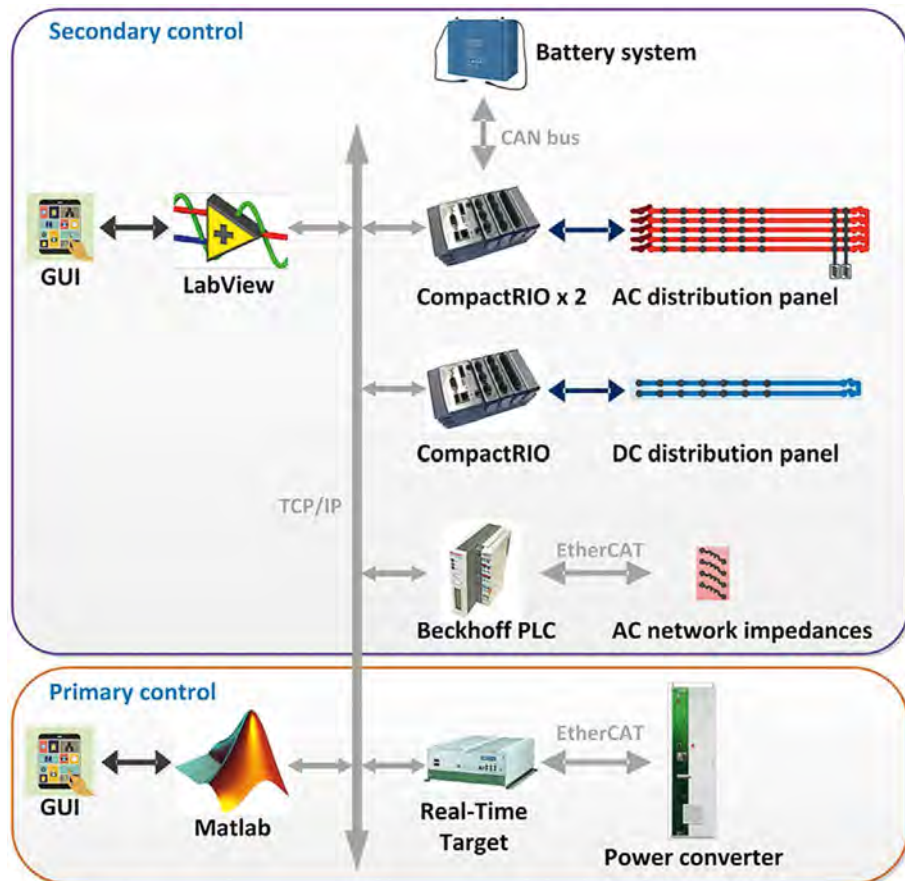
- KNX (Siemens) based technology.
- Sensors and actuators.

Modelling and simulation tools

- Matlab, PowerWorld, IPSA, PLECS.

Acquisition and control platforms

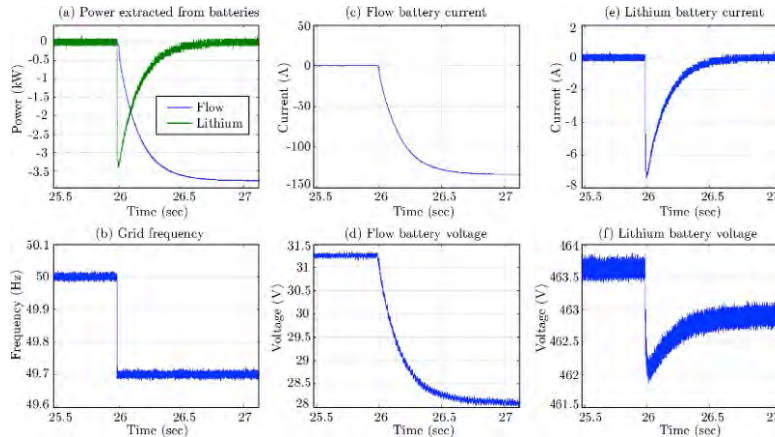
- LabView (NI), Beckhoff, Texas Instruments etc.
- Oscilloscopes, bench power supplies, function generators etc.



Scientific activities and results

Renewable and energy storage integration

- New control features for energy storage interfaces in power systems and microgrids.
- Coordinated management of aggregated and distributed storage applications.
- Hybrid storage management and operation (Li-Ion and flow-batteries).



Energy efficiency in systems for vibration testing

- Development of control boards for power converters and switching power amplifiers in vibration system applications.
- Development of a 20kW bi-directional, isolated and modular industrial power supply.
- Improved management algorithms for Intelligent Shaker Manager.



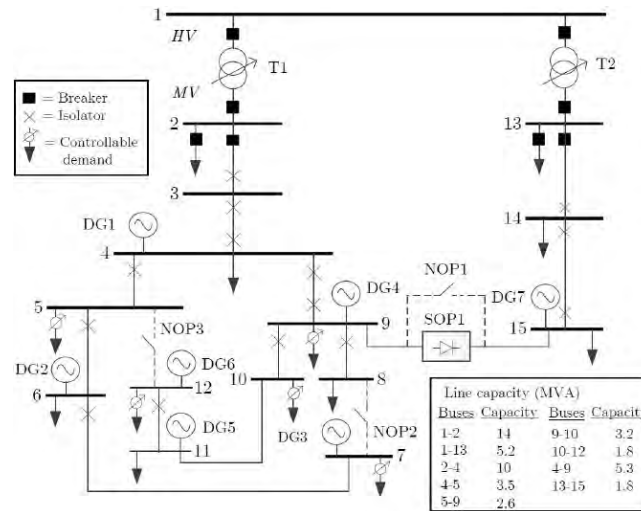
Stability of power networks with high penetration of renewables

- Small-signal modelling of AC, DC and hybrid power networks.
- Transient and frequency stability analyses of power networks.
- Evaluation of the interaction between power electronic converters and the grid.
- Application of “virtual inertia” in HVDC and distribution networks.
- Bifurcation theory in Power Grids.



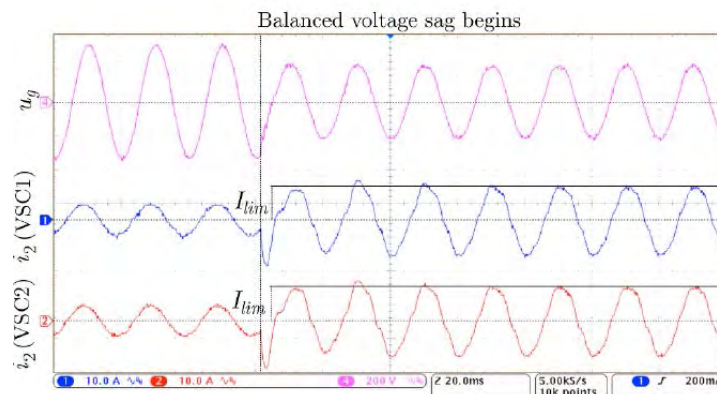
Reliability of power systems with high share of distributed generation and storage

- Development of analytic methods for reliability assessment of distribution networks and islanded microgrids with high share of renewable and energy storage technologies.
- Evaluation of combined impact of Active Network Management techniques (SNOP, OLTC, DLC, etc.) on network reliability.
- Economic benefits produced by operating networks in both grid-connected and islanded modes.



Control of power converters for applications in electricity networks

- A novel “virtual friction” concept for control of HVDC links.
- Implementation aspects of Virtual Synchronous Machine.
- Improvement of primary, secondary and tertiary control algorithms for power converters in AC and DC microgrids.
- Power converter design and control improvements for grid applications (improved noise filtering, damping etc.).
- Control of multi-terminal DC networks for power transmission and distribution applications.





System Analysis Unit

annual report
2019



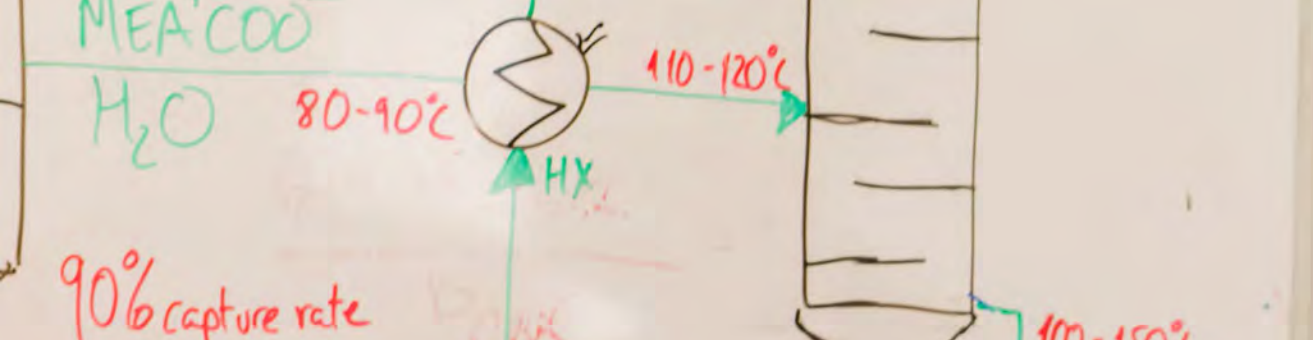
Dr. Javier Dufour
Research Professor
Head of the Unit



Dr. Diego Iribarren
Senior Researcher



Dr. José Luis Gálvez
Senior Assistant
Researcher

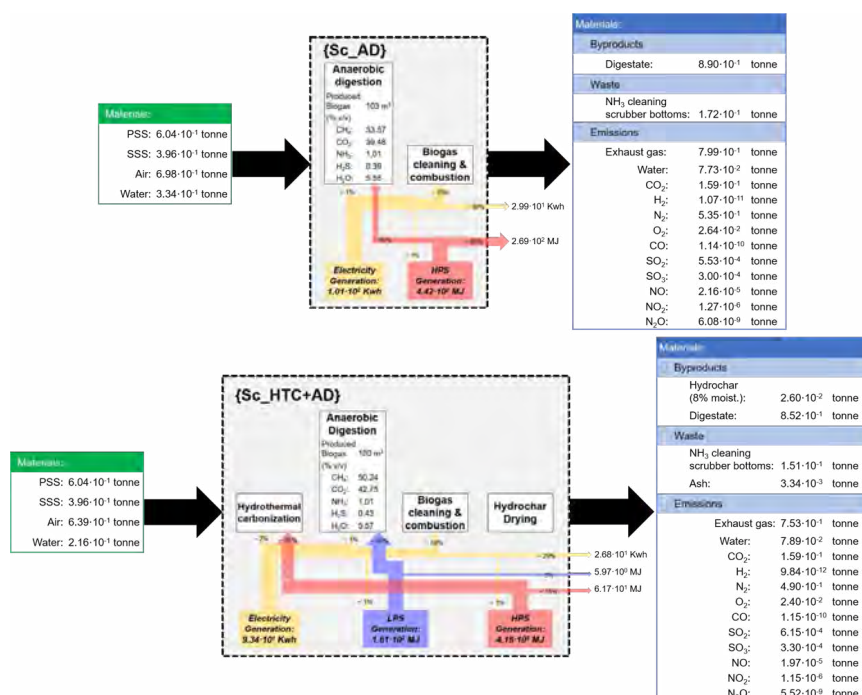


R&D Objectives

- Sustainability assessment of energy systems; process design, simulation and optimisation; and energy systems modelling for energy planning.

Research lines

- Life Cycle Assessment of energy systems: environmental LCA, harmonisation protocols for LCA, life cycle costing, social life cycle assessment, life cycle sustainability assessment, and multi-criteria decision analysis (LCA + DEA).
- Assessment of the feasibility of energy processes through simulation, thermodynamic analysis (energy and exergy balances), optimisation and techno-economic and environmental evaluation.
- Prospective analysis of energy scenarios: development of energy systems models; integration of sustainability indicators and geographic information systems.

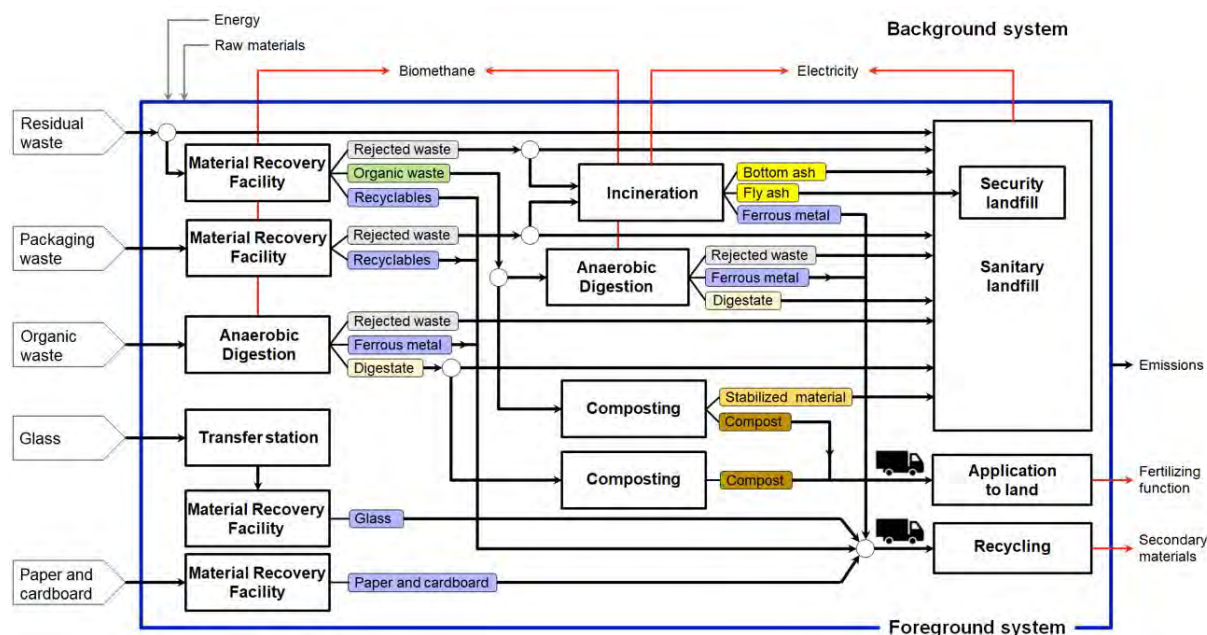


Relevant projects and networking

During 2019, the Systems Analysis Unit (SAU) completed its participation in the European projects EU H2020 Sun-to-Liquid, related to solar fuels, EU FCHJU HyTechCycling, with activities focused on the deployment of end-of-life strategies for fuel cells and hydrogen technologies, and EU MSCA SUSADES about the development of a methodological framework for the feasibility assessment of novel and existing electricity generation technologies in future energy systems. As well, it continued collaborating in the EU CEF ECO-GATE project about the deployment of compressed and liquid natural gas infrastructure for transportation.

At domestic level, SAU began the REDEFINERY project, where new concepts of waste management and bio-refineries are mixed to apply the approach used in

oil refineries to optimise the waste treatment plants involved in the management systems from the environmental and economic points of view. The PICASO project was completed and the Spanish alternative mobility model was finished. At the regional level, SAU collaborated in the FotoArt programme, where the research team simulated different photo-electro-catalytic and photo-catalytic systems and studied their scalability. Moreover, SAU has developed six research contracts with several institutions dealing with process simulation (2), feasibility studies (2), life cycle assessment (1), and circular economy modelling (1). Regarding networking, Javier Dufour, head of SAU, has been the Vice-chair of Cross-cutting Research Activities of Hydrogen Europe Research. Diego Iribarren has been 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.
- Social life cycle assessment, life cycle costing and eco-efficiency assessment.
- Harmonised LCA and life cycle sustainability assessment.

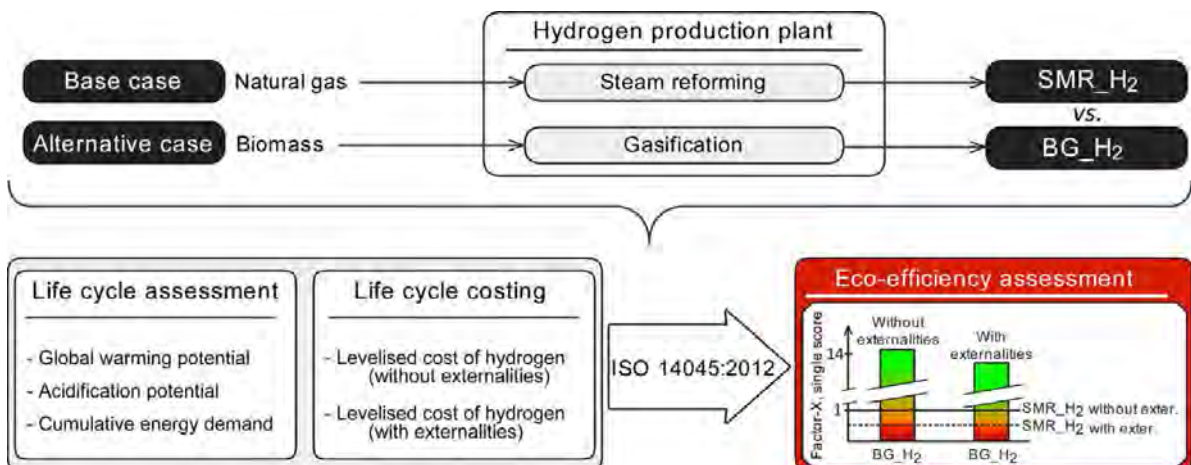
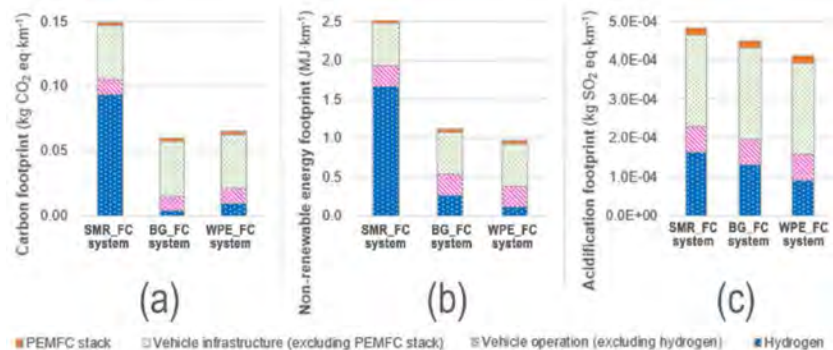
- Circular economy energy modelling
- Energy and exergy analyses.
- Conventional economic analysis and externalities.

Energy planning

- Development of national and regional energy models (Spain, Region of Madrid, cities...).
- Evolution of techno-economic and sustainability indicators in prospective energy scenarios, and demand projection.
- Integration of geographic information systems.

Feasibility of energy processes

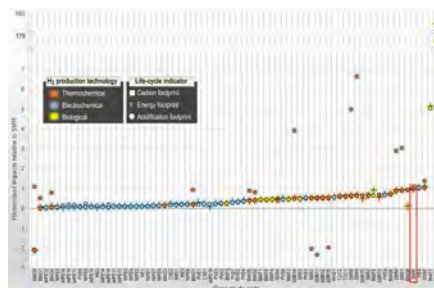
- Process design, simulation and optimization.



Scientific activities and results

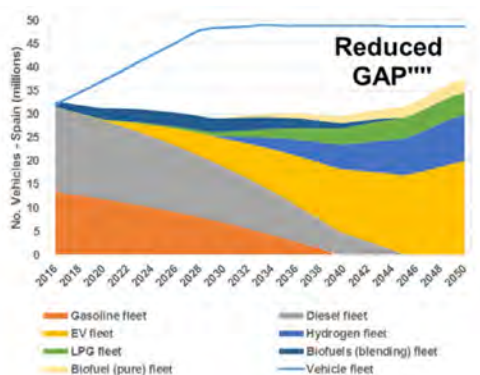
Sustainability assessment methodology

- Life cycle sustainability assessment of hydrogen from biomass gasification.
- Software solution for the computation of harmonised life-cycle indicators of hydrogen systems (GreenH₂armony®).
- Combined use of data envelopment analysis and life cycle assessment for operational and environmental benchmarking in the service sector.
- Life cycle costing and eco-efficiency assessment of fuel production by coprocessing biomass in crude oil refineries.
- Eco-efficiency assessment of calcium sulfoaluminate clinker production.
- Sustainability assessment of solar fuels.
- Environmental assessment of volatile fatty acids production from adapted anaerobic digestion processes.



Energy systems modelling

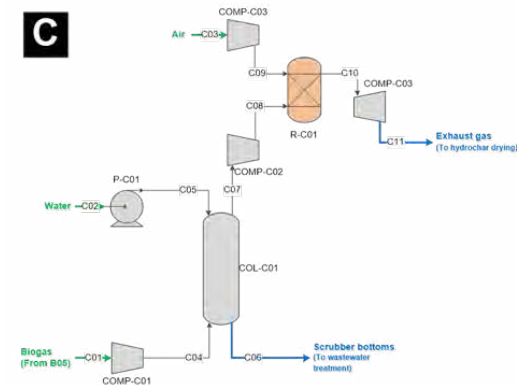
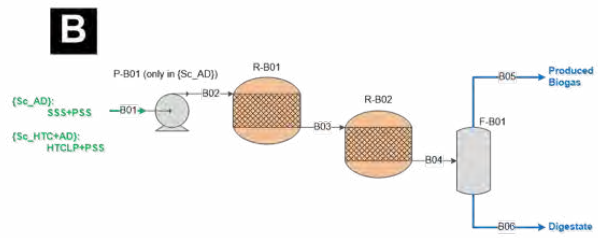
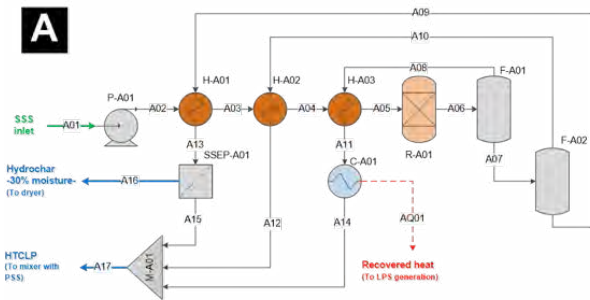
- Enhanced prioritisation of prospective scenarios for power generation in Spain.
- Database of techno-economic parameters of road transportation fuels.
- Prospective techno-economic and environmental assessment of a national hydrogen production mix for road transport.
- Defining scenarios for the road transport sector in Spain from a fuel demand perspective: a focus on natural gas.





Feasibility of energy processes

- Definition of long-term opportunities for electricity production through municipal solid waste incineration.
- Modelling, simulation and life-cycle assessment of the use of bio-oil and char in conventional refineries.
- Development of tools for the joint environmental and economic optimisation of computer-based process models.
- Development of carbonization and liquefaction models of biomass and related wastes.
- Prospective environmental assessment of end-of-life alternatives for traction batteries.
- Definition of inventories of Li-ion batteries recycling processes.
- Development of the model for the material flow analysis and environmental life cycle assessment of regional waste management systems.
- Techno-economic assessment of CO₂ capture and utilization alternatives.
- Techno-economic assessment of indoor air cleaning devices for office buildings.
- Scalability of photo-electro-catalytic and photo-catalytic systems.





Photoactivated Processes Unit



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

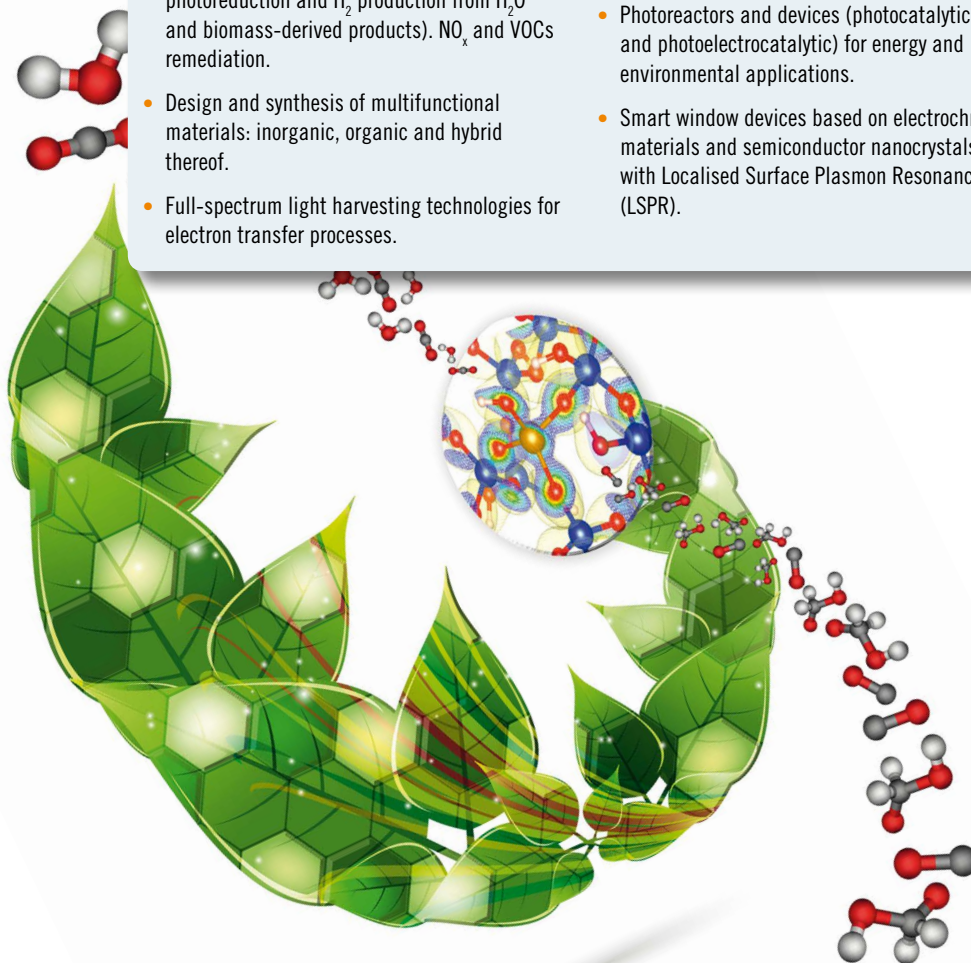


Dr. Marta Liras
Senior Assistant
Researcher



Dr. Fernando Fresno
Senior Assistant
Researcher

photoactivated



R&D Objectives

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

Research lines

- Development of photoactivated processes for energy and environment: Solar fuels production by artificial photosynthesis (including CO_2 photoreduction and H_2 production from H_2O and biomass-derived products). NO_x and VOCs remediation.
- Design and synthesis of multifunctional materials: inorganic, organic and hybrid thereof.
- 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).

Relevant projects and networking

In 2019 the Photoactivated Processes Unit (PAPU) has participated in 6 research projects 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 corresponding to the call ERC-2014-CoG (Topic ERC-CoG-2014 - ERC Consolidator Grant) of the European Research Council (ERC). Along 2019 PAPU has been awarded with an ERC – Proof of concept project (NanoCPPs) about Manufacture of nanostructured Conjugated Porous Polymers for energy applications. In addition, Víctor A. de la Peña O'Shea is the Spanish contact in the SUNRISE project (FET Flagship Agreement No 816336).

At national level, PAPU is funded and supported through several projects such as Ra-PHUEL (2017-2019) and SOL-PAC (2018-2020) as well as by a Ramón y Cajal Programme project (2015 call) and a Juan de la Cierva Formación grant (2017 call). In the regional framework, the unit is coordinating the FotoArt program (New Generation of Multifunctional Materials for Artificial Photosynthesis). In addition, PAPU counts with the project Art-Leaf, funded by Fundación Ramón Areces. Also, at industrial level, PAPU

holds a project with the Mercedes company. Besides, PAPU has coordinated the Network FOTOFUEL, which promotes synergies and networking of national top research groups devoted to the development of materials and devices for efficient solar fuels production. In addition, PAPU participates in the Spanish CO₂ technological platform (PTECO2). At the same time, three grants funded by “Comunidad de Madrid and Garantia Juvenil Program” at different levels (technician, predoctoral researcher and postdoctoral researcher) have been driven during 2019 together with a technician grant funded by the Ministry program.



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.

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 (Nd:YAG plus OPO and extended UV).
- Time-resolved fluorescence spectrometer.
- Electro- and photoelectrochemical characterisation in three and two electrode cell configurations.
- *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 under illumination at different gas atmospheres and pressures up to 25 mbar.

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.

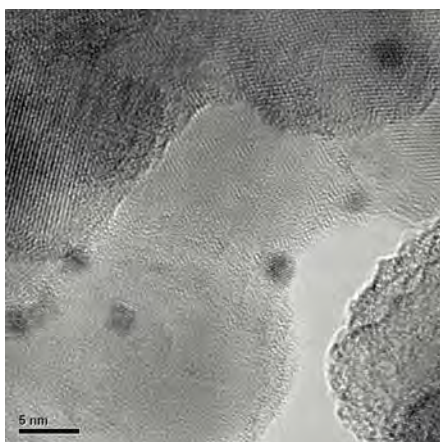
Theoretical calculations and modelling

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

Scientific activities and results

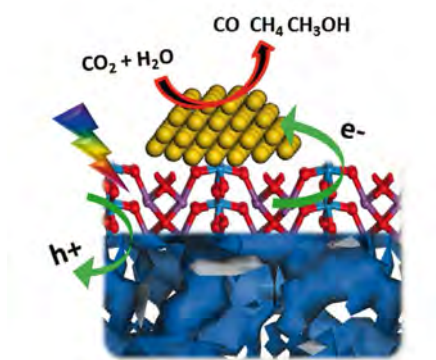
Development of novel inorganic photocatalysts

- 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 oxide-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.
- Synthesis of colloidal metal oxides nanoparticles as well as doping of them to prepare smart windows.



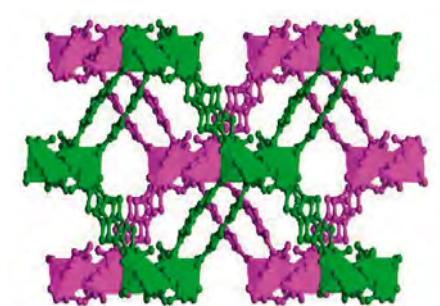
Design and synthesis of conjugated porous polymers and its hybrids

- Design and synthesis of new building blocks: monomers and ligands.
- Synthesis and design of conjugated porous polymers (based on DTT, Benzodithiophenes, truxenes, anthraquinones, BODIPYs, BOPHY and pphenylene, moieties).
- Synthesis and design of Covalent Organic Frameworks (COFs) as well as thin films thereof by interfacial synthesis.
- Synthesis of conjugated porous polymer nanostructures by miniemulsion and electropolymerization techniques in order to achieve thin films.
- Prepare and characterize hybrid materials based on conjugated porous polymers and inorganic semiconductors.
- Prepare electron and ions conductive polymer to design dual membranes.



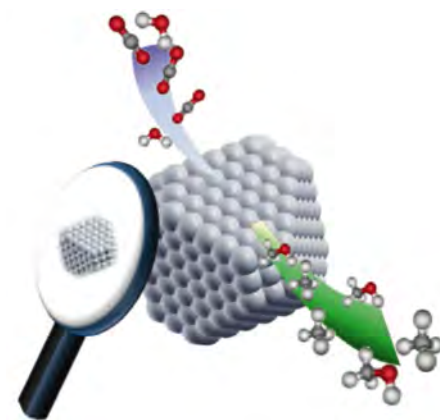
MOFS

- Design and synthesis of novel UV- and visible-light-absorbing building blocks as organic MOF linkers.
- Design and synthesis of MOFs based on group-5 metals.
- Post-functionalization including metal nanoparticles, redox coordination compounds and organic polymers.



Fundamental studies of reaction mechanisms

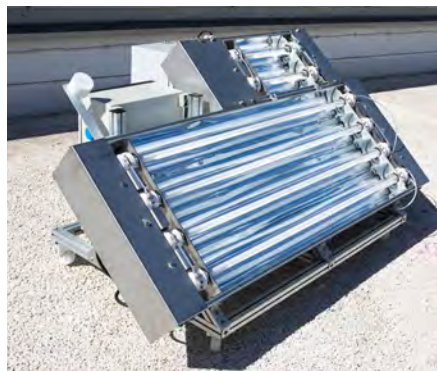
- Determined the structural, textural and morphological properties of multifunctional materials.



- Optoelectronic characterization by time-resolved optical techniques including transient absorption spectroscopies to correlate these intrinsic properties with the efficiency of the devices for light-driven technologies.
- *In-situ* characterization under working conditions both laboratory and synchrotron radiation based techniques.
- *Ab-initio* and QM Theoretical calculation.

Process evaluation and scale-up

- Synergistic improvement of solar fuels production using hybrid photocatalysts.
- Implemented tunable selectivity of CO₂ photoreduction with metal nanoparticle co-catalysts.
- H₂ production from biomass derivatives in real matrices.
- Performed scalability studies for CO₂ photoreduction catalysts.
- Preparation of thin films of all the new synthesised materials and evaluation as photoelectrodes in photoelectrochemical cells.
- Preparation of thin films and design of smart windows devices.





Advanced Porous Materials Unit



Dr. Patricia Horcajada
Senior Researcher
Head of the Unit

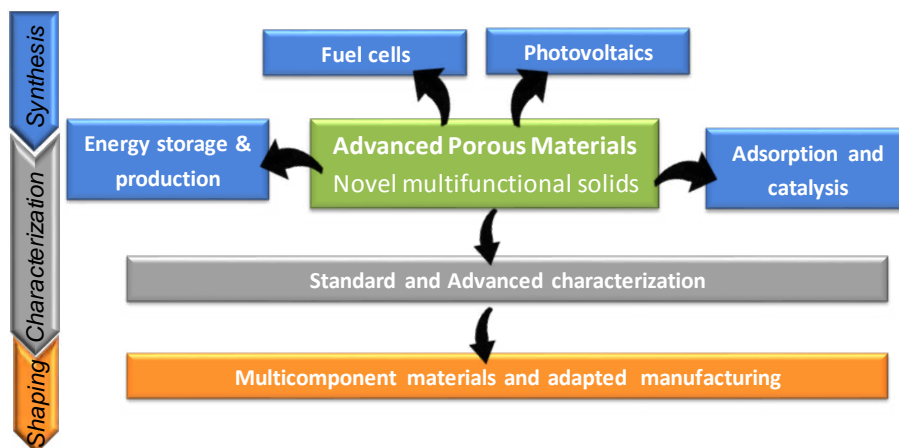


R&D Objectives

- 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 2019 the Advanced Porous Materials Unit (APMU) has been involved in 5 national and 1 regional projects: Raphuel project (12.2016-12.2019), funded by MINECO, focused on the development of new multifunctional materials for CO₂ photoconversion; project funded by BBVA Leonardo call (09.2017-03.2019, PolyMOF), dedicated to the preparation of new conducting polymer@MOF composites for energy storage; Ramón Areces project (04.2019-04.2022), which aims to develop fuel cells based on novel composite MOFs; project funded by Iberdrola Foundation (09.2017-08.2018; CESOLMAT) that is aimed to develop green 1D perovskites as novel absorbents for solar fuel cells. A collaboration networking dealing with the development of multifunctional metallodrugs in diagnosis and therapy (2019-2023) was initiated. It started also the regional funding Madrid-PV2-CM (01.2019-12.2022) dealing with the investigation of materials, devices and

technologies for the development of the photovoltaic industry.

An additional European project “Heating triggered drug release from nanometric inorganic-metal organic framework composites (HeatNMof)” H2020-MSCA-ITN-2019 has been accepted for starting in March 2020. In addition, APMU has been awarded with 5 personal fellowships: 1 national “Ramón y Cajal” and 4 regional grants (2 Junior Postdoctoral Talento, Predoctoral and Technician fellows). An additional grant, belonging to the Cofund project Energy Got Talent program, has recently been accepted for starting in March 2020 in collaboration with the Universidad Rey Juan Carlos. APMU is also involved in the MATERPLAT platform, promoting innovation in advanced materials Spanish system, and in different chemical-related associations (RSEQ, AEBIN, etc.).



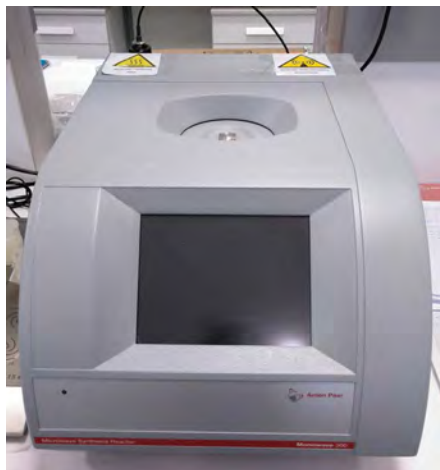
Facilities

Synthesis

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

Manufacturing

- Supercritical CO₂ extraction system (material purification, adsorption, shaping).
- Press-molding and monoliths.
- Spin-coating (thin films, membranes).



Characterization

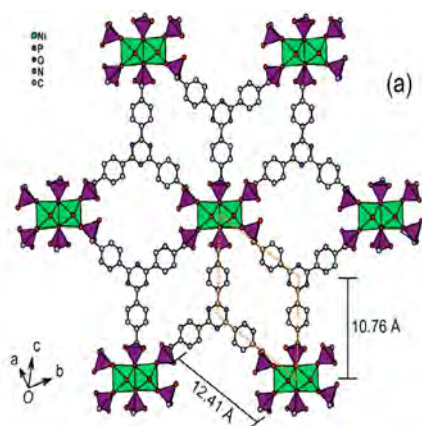
- Standard techniques available at IMDEA Energy (physi- and chemi-sorption, XRD, IR, Raman, UV-Vis, EDX-SEM, TGA, DLS, elemental analysis, ICP, AFM, etc.) and URJC (TEM, FEG-SEM, NMR, etc.).
- High-through put filtration system coupled with multi-sample XRPD.
- *In situ* structural characterization (XRD, IR) as a function of temperature, adsorbate and pressure.
- Experimental crystalline structure determination and refinement.
- Chemical, structural, mechanical and colloidal stability tests.
- Computation of properties of periodic structures using state-of-art density functional theory methods (ORCA, Dmol3, CASTEP, VASP codes) and atomistic modelling.
- High performance liquid chromatography (HPLC) coupled with a photodiode array (PDA) detector.
- Permeation chambers.
- Cell culture facilities.



Scientific activities and results

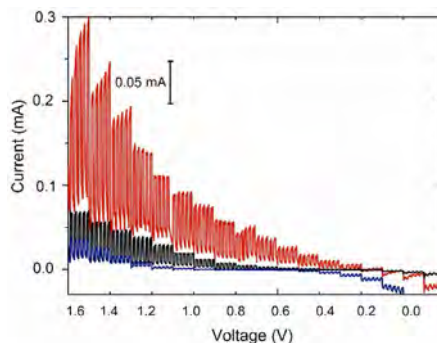
Proton conducting materials: fuel cells

- Design and synthesis of new multifunctional MOFs based on phosphonate ligands. In particular, 4 new crystalline structures (from IEF-7 to IEF-10) were prepared and patented based on a pyrene derivative and different cations (Cu^{2+} , Bi^{3+} , Zr^{4+}), exhibiting not only a good proton conductivity but also a relevant photocatalytic activity.
- Improved the cyclability of the ionic conductivity of a robust Zr-MOF via the insertion of lysine as a proton carrier.
- Applied experimental and simulation techniques to investigate the water adsorption of porous solids together with the preferential proton conductive pathways in order to understand their conductivity performances.
- Synthesis and characterization of a new MOF (IEF-13) based on a triazine phosphonate derivative and Ni with excellent thermal and chemical stability.



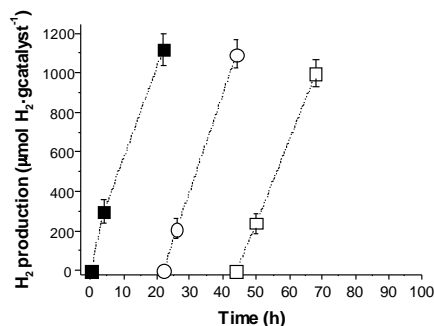
Semiconducting materials: photovoltaics

- Design and synthesis of a n-type semiconducting Bi-coordination polymer (IEF-3) based on the electroactive squarate ligand, exhibiting photocurrent response.
- Full characterization of lead-free organic-inorganic materials based on 1D $[\text{Bi}_m\text{I}_n]$ anions and the benzimidazole cation, exhibiting an exceptional stability under working conditions (temperature and humidity). Dehydration of the solid induces structural changes associated with the modification of its light absorption properties ($E_g = 1.8\text{-}2.2$ eV).



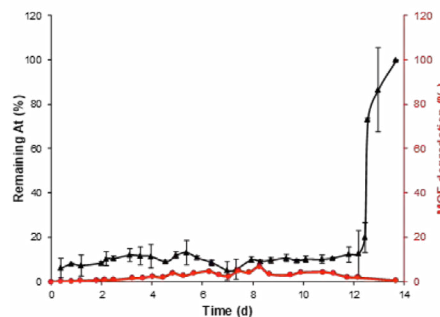
Electroactive materials: energy storage and production

- Green energy production via biodiesel transesterification using enzyme-immobilized MOFs.
- Macromolecules nanostructuration using porous materials. Upon the removal of the porous matrix, the resulting nanostructured conducting polymer shows improved capacitance.
- Integration of inorganic species into porous materials. In situ synthesis of metal nanoparticles (Au, Ag) into porous photoactive MOFs as proved antifouling photo-bactericidal solids.
- Thermoplasmonic effect of aqueous-stable Au-nanostar @MOF, useful for controlling release inside living cells under Near Infra-red irradiation.
- Significant hydrogen production of the novel Ni triazine phosphonate (IEF-13) in absence of any cocatalyst.



Adsorbent and catalytic materials

- Incorporation of active ingredients (AI) in porous MOFs. Efficient nucleic acid entrapping into the mesoporosity of bio-compatible nanoscaled MOFs.
- Upon demonstrating for the first time the interest of Fe-MOFs as efficient oral detoxifying agents, a porous Ti-MOF has proven to be orally robust and biosafe.
- Water decontamination using selective adsorbents based on porous MOFs. Improved removal (99%) of an emerging pollutant (atenolol) in tap and river water using a Ni-MOF based device working under continuous flow (92%, 12 consecutive days).



annex

R&D projects,
contracts and grants

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scientific results

93

training and
dissemination activities

116

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: 2019-2022

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: 2019-2022

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: 2019-2022

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: 2019-2022

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: 2019-2022

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 bio-products 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: 2019-2022

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: 120.434 € €

1.2. National R&D projects

1. Title/Acronym: Multidisciplinary analysis of indirectly-heated particles receivers/reactors for solar applications in extreme conditions / ARROPAR-CEX (ENE2015-71254-C3-1-R)

Partners: IMDEA Energy Institute (Coordinator); CIEMAT; Nanoker Research; Abengoa Research

Period: 2016-2019

Funding Institution/Program: Ministry of Economy and Competitiveness / Research, Development and Innovation Oriented Challenges of the Society. Research Challenges 2015

IMDEA Energy Institute external funding: 189.970 €

2. Title/Acronym: Innovative materials for application in advanced supercapacitor / MAT-CAP (MAT2015-64167-C2-1-R)

Partners: IMDEA Energy Institute (Coordinator); CIC Energune; Repsol; Solvionic; AVANZARE Innovacion Tecnologica

Period: 2016-2019

Funding Institution/Program: Ministry of Economy and Competitiveness / Research, Development and Innovation Oriented Challenges of the Society. Research Challenges 2015

IMDEA Energy Institute external funding: 145.200 €





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

Partners: IMDEA Energy Institute (Coordinator); Repsol; Plataforma Tecnológica del CO₂; Gas Natural Fenosa; Korea Research Institut of Chemical Technology

Period: 2016-2019

Funding Institution/Program: Ministry of Economy, Industry and Competitiveness / Research, Development and Innovation Oriented Challenges of the Society. Research Challenges 2016

IMDEA Energy Institute external funding: 223.850 €€

4. Title/Acronym: Planning the implementation of alternative fuels in the Spanish energy sector towards a sustainable transport system / PICASO (ENE2015-74607-JIN)

Partners: IMDEA Energy Institute

Period: 2017-2019

Funding Institution/Program: Ministry of Economy, Industry and Competitiveness / Research, Development and Innovation Oriented Challenges of the Society. Modality young researchers 2015

IMDEA Energy Institute external funding: 203.280 €€

5. Title/Acronym: New challenges in the production of solar fuels / FOTOFUEL-2 (ENE2016-82025-REDT)

Partners: IMDEA Energy Institute (Coordinator); ICP-CSIC; Polytechnic University of Valencia; IMDEA Materials Institute; Consorci per a la Construcció, Equipament i Exploració del Laboratori de llum de Síncrotró; Universidad de Barcelona; Universitat Jaume I de Castelló; Fundació Institut de Recerca de l'Energia de Catalunya; ICIQ; PSA

Period: 2017-2019

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" 2016

IMDEA Energy Institute external funding: 7.508 €€

6. Title/Acronym: New materials based on porous metal-organic networks and conductive polymers for energy storage / PolyMOF (IN[17]_CBB_QUI_0197)

Partners: IMDEA Energy Institute

Period: 2017-2019

Funding Institution/Program: Fundación BBVA / Becas Leonardo a Investigadores y Creadores Culturales 2017

IMDEA Energy Institute external funding: 39.960 €€

7. 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: 2018-2020

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 €

8. Title/Acronym: Solar fuels production in wide-spectrum photoactivated catalytic devices / SOLPAC (ENE2017-89170-R)

Partners: IMDEA Energy Institute; Repsol

Period: 2018-2020

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: 217.800 €€

9. Title/Acronym: Fire-Safe Structural Batteries / STRUBAT

Partners: IMDEA Energy Institute; IMDEA Materials Institute

Period: 2018-2020

Funding Institution/Program: IMDEA Materials Institute

IMDEA Energy Institute external funding: 49.861 €€

10. Title/Acronym: Advanced tools for smart distribution network planning to guarantee optimal continuity of supply / SinCortes

Partners: IMDEA Energy Institute

Period: 2018-2019

Funding Institution/Program: Fundación Iberdrola España /Call for research funding in energy and environment 2018-2019

IMDEA Energy Institute external funding: 20.000 €€

11. Title/Acronym: Circular economy perspectives for the management of electric car batteries at their end-of-life / BATTMAN

Period: 2018-2019

Funding Institution/Program: Fundación Iberdrola España / Call for research funding in energy and environment 2018-2019

IMDEA Energy Institute external funding: 20.000 €€

12. 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: 2018-2019

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

13. 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 €€

14. 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 €€

15. Title/Acronym: Injectable batteries of semi-solid electrodes / InBat (RTI2018-099228-A-I00)

Partners: IMDEA Energy Institute

Period: 2019-2021

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: 121.000 €€

16. 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: 2019-2021

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 €€

17. 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: 2019-2021

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 €€

18. Title/Acronym: Coordination of distributed storage for improved continuity of supply in distribution networks / CoorAlma

Partners: IMDEA Energy Institute

Period: 2019-2020

Funding Institution/Program: Fundación Iberdrola España / Call for research funding in energy and environment 2019-2020

IMDEA Energy Institute external funding: 20.000 €€

19. Title/Acronym: Development of models for the techno-environmental assessment of the recycling of car batteries / SIMBATT

Partners: IMDEA Energy Institute

Period: 2019-2020

Funding Institution/Program: Fundación Iberdrola España / Call for research funding in energy and environment 2019-2020

IMDEA Energy Institute external funding: 20.000 €€

20. Title/Acronym: Through efficient solar cells: New environmentally friendly 1D perovskites / CESOLMAT

Partners: IMDEA Energy Institute

Period: 2019-2020

Funding Institution/Program: Fundación Iberdrola España / Call for research funding in energy and environment 2019-2020

IMDEA Energy Institute external funding: 20.000 €€

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: 2018-2020

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: 2018-2020

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: 2019-2021

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

IMDEA Energy Institute external funding: 89.000 € €

4. Title/Acronym: Innovative storage for stationary applications based on aluminum / ALIENA (RTC-2015-4471-3)

Partners: Albufera Energy Storage (Coordinator); ALEASTUR; GFM; ITMA; IMDEA Energy Institute

Period: 2015-2019

Funding Institution/Program: Ministry of Economy and Competitiveness / Research, Development and Innovation Oriented Challenges of the Society. Collaboration Challenges 2015

IMDEA Energy Institute external funding: 128.088 € €



5. Title/Acronym: The total photovoltaic platform – LPT. Project to equip the photovoltaic plants with a platform that allows their maximum level of energy management / LPT (RTC-2015-4153-3)

Partners: Ingenia Solar Energy (Coordinator); PV Hardware Solutions; Grupo Gransolar; IMDEA Energy Institute; Carlos III University of Madrid

Period: 2015-2019

Funding Institution/Program: Ministry of Economy and Competitiveness / Research, Development and Innovation Oriented Challenges of the Society. Collaboration Challenges 2015

IMDEA Energy Institute external funding: 416.900 €€

6. Title/Acronym: New strategies for the integration of microalgae-bacteria consortium in small size urban wastewater treatment plants / MICROALBAC (RTC-2015-3245-5)

Partners: FACSA (Coordinator); IMDEA Energy Institute; CSIC

Period: 2015-2019

Funding Institution/Program: Ministry of Economy and Competitiveness / Research, Development and Innovation Oriented Challenges of the Society. Collaboration Challenges 2015

IMDEA Energy Institute external funding: 160.926 €€

7. Title/Acronym: New biorefinery concept based on the production of bioethanol and other by-products from pruning waste and gardening residues / BIO_LIGWASTE (RTC-2016-5281-5)

Partners: TETma (Coordinator); IMDEA Energy Institute; Centre VERD; CIEMAT

Period: 2016-2019

Funding Institution/Program: Ministry of Economy, Industry and Competitiveness / Research, Development and Innovation Oriented Challenges of the Society. Collaboration Challenges 2016

IMDEA Energy Institute external funding: 102.132 €€

8. 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: 2018-2021

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: 255.476 €€

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

Partners: Norvento Energía Distribuída (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: 92.310 €€

1.4. International R&D projects

1. Title/Acronym: European network for algal-bioproducs / EUALGAE (oc-2014-1-18912)

Partners: IMDEA Energy Institute (Coordinator); more than 180 researchers of 113 companies, universities, research centres, associations, from all over the world

Period: 2015-2019

Funding Institution/Program: European Union / COST actions

IMDEA Energy Institute external funding: 64.558 €€

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

Partners: IMDEA Energy Institute

Period: 2015-2021

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

IMDEA Energy Institute external funding: 2.506.738 €€

3. Title/Acronym: SUNlight-to-LIQUID: Integrated solar-thermochemical synthesis of liquid hydrocarbon fuels / SUN-to-LIQUID (654408)

Partners: Bauhaus Luftfahrt (Coordinator); Eidgenoessische Technische Hochschule Zuerich; Deutsches Zentrum für Luft- und Raumfahrt; IMDEA Energy Institute; HyGear Technology and Services; Abengoa Research; ARTTIC

Period: 2016-2019

Funding Institution/Program: European Union/H2020. Call H2020-LCE-2015-1-two-stage (LCE-11-2015)

IMDEA Energy Institute external funding: 955.921 €€

4. Title/Acronym: New technologies and strategies for fuel cells and hydrogen technologies in the phase of recycling and dismantling / HYTECHCYCLING (700190)

Partners: Fundacion para el desarrollo de nuevas tecnologías del hidrógeno en Aragón (Coordinator); Univerza V Ljubljani; IMDEA Energy Institute; Industrias López Soriano; Parco Scientifico e Tecnologico per l'ambiente - Environment Park

Period: 2016-2019

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

IMDEA Energy Institute external funding: 90.162 €€

5. 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: 2016-2020

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

IMDEA Energy Institute external funding: 199.791 €€

6. Title/Acronym: Valorization of urban wastes to new generation of bioethanol / WASTE-2BIO (PCIN-2016-121)

Partners: Imecal (Coordinator); Cimat; Exergy; IMDEA Energy Institute

Period: 2016-2019

Funding Institution/Program: Ministry of Economy, Industry and Competitiveness / Cofund ERA-NET BESTF3 joint call/ APCIN 2016

IMDEA Energy Institute external funding: 42.000 €€

7. Title/Acronym: Integrating national research agendas on solar heat for industrial processes / INSHIP (731287)

Partners: Fraunhofer (Coordinator); Cimat; Aee Intec; Fondazione Bruno Kessler; Universidade de Evora; The Cyprus Institute; Centre for renewable energy sources and saving; ETH Zürich; CEA; Middle East Technical University; EERA Aisbl; CNRS; DLR; ENEA; CNR; Università degli Studi di Palermo, Università degli Studi di Napoli Federico II; Università degli Studi di Firenze; Lneg; Associacao do Instituto Superior Tecnico para a Investigacao e Desenvolvimento; Cener-Cimat; IMDEA Energy Institute; Centro Tecnológico Avanzado de Energías Renovables de Andalucía; Tecnalia; Ik4-tekniker; University of Seville; Cic Energigune; Cranfield University

Period: 2017-2020

Funding Institution/Program: European Union / H2020. Call H2020-LCE-2016-ERA (LCE-33-2016)

IMDEA Energy Institute external funding: 10.000 €€

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

Partners: IMDEA Energy Institute

Period: 2017-2022

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

IMDEA Energy Institute external funding: 1.998.407 €€

9. Title/Acronym: 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 Energy; GASNAM; Inversora Melofo; Autoridad Portuaria de Huelva; SOLTEL IT Solutions; Universidad de Santiago de Compostela; Port Authority of Gijon; 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; San-José López

Period: 2017-2019

Funding Institution/Program: European Union / H2020. Call CEF-Transport-2016-MAP General

IMDEA Energy Institute external funding: 20.654 €€

10. Title/Acronym: Demonstration of dry fermentation and optimization of biogas technology for rural communities in the MENA region / BIOGASMENA (PCIN-2017-065)

Partners: University of Hohenheim (Coordinador); University of Verona; Agricultural University of Athens (AUA), Nireas-IWRC (University of Cyprus), EGE University, Université des Sciences et Technologies d'Oran (USTO), Laboratoire de Biotechnologie de L'Eenvironment (LBE of INRA), IMDEA Energy, Centre de Biotechnologie de Sfax (CBS), University of Cairo, Nenufar, ERM, Talos, Euromarket, FnBB e.V.

Period: 2017-2020

Funding Institution/Program: Ministry of Economy, Industry and Competitiveness / ERANETMED 2nd joint call / APCIN 2017

IMDEA Energy Institute external funding: 99.865 €€



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

Partners: Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT) (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: 466.918,75 €€

12. Title/Acronym: Solar energy for a circular economy / SUNRISE (816336)

Partners: Universiteit Leiden (Coordinator); Commissariat à l'énergie atomique et aux énergies alternatives; Consiglio nazionale delle ricerche; eidgenössische materialprüfungs-und forschungsanstalt; Uppsala Universitet; Fundacion IMDEA Energía; Fraunhofer Gesellschaft Zur Foerderung Der Angewandten Forschung; Forschungszentrum Julich; Imperial College of Science Technology and Medicine; Energy materials industrial research initiative aisbl; Siemens Aktiengesellschaft; Turun Yliopisto; Uniwersytet Warszawski; Ustav fyzikalni chemie j. heyrovského av cr, v.v.i.; Johnson matthey; Fundacio privada institut catala d'investigacio quimica; Alliance europeenne de recherche dans le domaine de l'énergie; Norges teknisk-naturvitenskapelige Universitet NTNU; Université Catholique de louvain; ENGIE

Period: 2019-2020

Funding Institution/Program: European Union / H2020-FETFLAG-2018-2020 (FETFLAG-01-2018)

IMDEA Energy Institute external funding: 17.750 €€

13. 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 €€

14. 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; Université Catholique de Louvain; Politecnico di Torino; Fundación IMDEA Energía; Lithops; Université de Pau et des Pays de l'Adour; Aalto Korkeakoulusäätiö; Kemijärvi-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 €€

15. 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)

1.5. Contracts with companies and other organizations

1. Title/Acronym: Energy efficiency in systems for vibration testing

Company: IMV Corporation (Japan)

Period: 2010-2020

IMDEA Energy Institute external funding: 286.536 € €

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

Company: Mercedes Benz España (Spain)

Period: 2018-present

IMDEA Energy Institute external funding: 12.650 €€

3. Title/Acronym: In-situ measurement system of concentrated solar flux in solar towers / EFECTO

Company: Cobra Instalaciones y Servicios (Spain)

Period: 2018-2019

IMDEA Energy Institute external funding: 50.000 €€

4. Title/Acronym: In-situ measurement system of concentrated solar flux in solar towers / EFECTO

Company: Egatel (Spain)

Period: 2018-2019

IMDEA Energy Institute external funding: 50.000 €€

5. Title/Acronym: Research on electrochemical technologies for seasonal energy storage / AE3

Company: Inversiones Financieras Perseo (Spain)

Period: 2018-2019

IMDEA Energy Institute external funding: 15.000 €€

6. Title/Acronym: Testing of primary batteries for wireless devices / TEBAWI

Company: Securitas Direct España (Spain)

Period: 2018-2019

IMDEA Energy Institute external funding: 26.900 €€

7. Title/Acronym: Techno-economic and environmental assessment of alkaline-based carbon capture and utilization / TEECCU

Company: EWL-Ecological World for Life España (Spain)

Period: 2018-2019

IMDEA Energy Institute external funding: 11.500 €€

8. Title/Acronym: Development and integration of flexible Li-ion batteries into vehicle's components / BATFLEX

Institution: IMDEA Materials Institute and private company (Spain)

Period: 2018-2019

IMDEA Energy Institute external funding: 77.000 €€

9. Title/Acronym: Transient Stability Enhancement / RITSE (Gc2017_P2)

Company: Red Eléctrica de España (Spain) / Grid2030 Program

Period: 2019-2020

IMDEA Energy Institute external funding: 183.000 €€

10. Title/Acronym: Support on Carbon Capture and Utilization Research / GORDCCU

Company: GORD-Gulf Organisation for Research & Development (Qatar)

Period: 2019

IMDEA Energy Institute external funding: 12.888 €€

11. Title/Acronym: Development and scale up of a Redox Flow Battery with electrolyte of organic or organometallic origin / BAF03

Company: Energy Storage Solutions (Spain)

Period: 2019

IMDEA Energy Institute external funding: 119.074 €€

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

Company: Securitas Direct España (Spain)

Period: 2019-2020

IMDEA Energy Institute external funding: 24.600 €€

13. Title/Acronym: Circularity in Chemicals

Company: The Catalyst Group Resources (USA)

Period: 2019

IMDEA Energy Institute external funding: 4.453 €€

14. Title/Acronym: Heat exchange cooling devices for high temperature electronic systems / DICREAT20

Company: CEDRION (Spain)

Period: 2019-2020

IMDEA Energy Institute external funding: 14.000 €€

15. Title/Acronym: Development of a circularity model for the Community of Madrid / SupBIO3

Institution: Rey Juan Carlos University (Spain)

Period: 2019

IMDEA Energy Institute external funding: 4.500 €€

16. Title/Acronym: Process feasibility studies / EcoSim2

Institution: Rey Juan Carlos University (Spain)

Period: 2019

IMDEA Energy Institute external funding: 4.500 €€

17. Title/Acronym: Evaluation of Li Plating in battery cells at high C-rates / LIPLAT

Company: Kreisel Electric (Austria)

Period: 2019

IMDEA Energy Institute external funding: 1.330 €€

18. Title/Acronym: Support on technoeconomic assessment of calcium sulfoaluminate cement production / GORDCSA

Company: GORD-Gulf Organisation for Research & Development (Qatar)

Period: 2019-2020

IMDEA Energy Institute external funding: 7.588 €€

19. Title/Acronym: Critical review of life cycle assessment / REVACV

Institution: Rey Juan Carlos University (Spain)

Period: 2019

IMDEA Energy Institute external funding: 2.850 €€

20. Title/Acronym: Updated technological capacities map of Spanish organizations in the area of Energy Storage / CAP-BatteryPlat

Company: AEPIBAL (Spain)

Period: 2019-2020

IMDEA Energy Institute external funding: 4.500 €€

21. Title/Acronym: Organization/leveraging of the work group on technologies within the Spanish technology platform on energy storage / DIN-BatteryPlat

Company: AEPIBAL (Spain)

Period: 2019-2020

IMDEA Energy Institute external funding: 3.500 €€

22. 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: 2019-2020

IMDEA Energy Institute external funding: 75.000 €€

23. Title/Acronym: Assessment of the impact of carbon capture on the energy efficiency and indoor air quality of public buildings / AQUAPUB

Company: EWL-Ecological World for Life España (Spain)

Period: 2019-2020

IMDEA Energy Institute external funding: 8.500 €€

24. Title/Acronym: Teaching in an energy course and visit to IMDEA Energy facilities / CuEVa

Company: Sustainable Innovations Europe (Spain)

Period: 2019-2020

IMDEA Energy Institute external funding: 1.500 €€



1.6. Researcher grants

1. Program: Ramón y Cajal 2014

Project: Linking wastewater bioremediation by means of microalgae cultivation and energy production out of this biomass (RYC-2014-16823)

Period: 2016-2020

Funding Institution: Ministry of Economy and Competitiveness

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

Dr. Cristina González

2. 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

3. 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

4. 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

5. Program: Recruitment of research assistants and laboratory technicians 2016 (PEJ16/AMB/AI-1748)

Period: 2017-2019

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 45.000 €

Mr. Carlos Lirio

6. Program: Recruitment of research assistants and laboratory technicians 2016 (PEJ16/IND/TL-1874)

Period: 2017-2019

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 38.000 €

Ms. Eva Álvarez

7. Program: Recruitment of research assistants and laboratory technicians 2016 (PEJ16/AMB/TL-1886)

Period: 2017-2019

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 38.000 €

Mr. Alejandro Aguilar

8. Program: Recruitment of research assistants and laboratory technicians 2016 (PEJ16/AMB/TL-1497)

Period: 2017-2019

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 37.167 €

Mr. Álvaro Pérez

9. Program: Call for Predoctoral and Postdoctoral Researchers 2016 (PEJD-2016/IND-2828)

Period: 2017-2019

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 25.000 €

Ms. Ana Arenas

10. Program: Call for Predoctoral and Postdoctoral Researchers 2016 (PEJD-2016/AMB-2184)

Period: 2017-2019

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 25.000 €

Mr. Antonio Molina

11. 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: 82.000 €

Mr. Mario Sánchez

12. Program: Juan de la Cierva-Formación 2016 (FJCI-2016-30567)

Period: 2018-2019

Funding Institution: Ministry of Economy, Industry and Competitiveness

IMDEA Energy Institute external funding: 50.000 €

Dr. Mariam Barawi

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

Project/Acronym: Batteries based on semi-solid fluids / BASS (2017-T1/AMB-5190)

Period: 2018-2022

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 110.000 € (Total: 307.076 €)

Dr. Edgar Ventosa

14. 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 Mavrantoukakis

15. Program: Call for Predoctoral and Postdoctoral Researchers 2017 (PEJD-2017-PRE/AMB-4505)

Period: 2018-2020

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 25.000 €

Mr. Ioan Robert Istrate

16. Program: Call for Predoctoral and Postdoctoral Researchers 2017 (PEJD-2017-PRE/AMB-4951)

Period: 2018-2020

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 25.000 €

Mr. Alejandro Martínez

17. Program: Recruitment of research assistants and laboratory technicians 2017 (PEJ-2017-TL/IND-7448)

Period: 2018-2020

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 26.756 €

Ms. Miriam Bravo

18. Program: Recruitment of young doctors 2017 (Modality 2) (2017-T2/IND-5149)

Period: 2018-2022

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 80.000 €

Dr. Sara Rojas

19. Program: H2020-MSCA-IF-2017

Project/Acronym: Sustainability assessment of advanced energy systems: towards new methodological approaches / SUSADES (799439)

Period: 2018-2019

Funding Institution: European Union

IMDEA Energy Institute external funding: 85.999 € (Total 106.326 €)

Dr. Anna Skorek-Osikowska

20. 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 € €

Mr. Giacomo Armani

21. 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

22. Program: Recruitment of young doctors 2018 (Modality 2) (2018-T2/AMB-12025)

Period: 2019

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 12.712 € €

Dr. Nicola Boaretto

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

Period: 2019-2023

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 80.000 € €

Dr. Tania Hidalgo

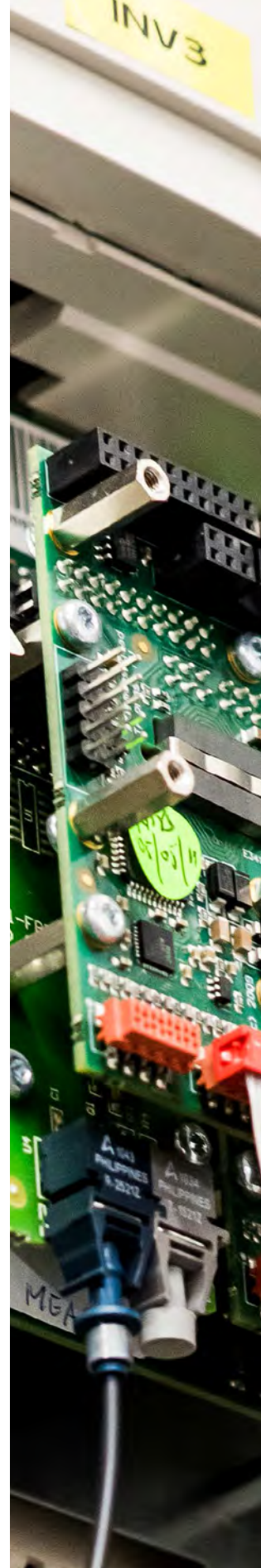
24. Program: Call for Predoctoral and Postdoctoral Researchers 2018 (PEJD-2018-POST/AMB-8688)

Period: 2019-2020

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 35.000 € €

Dr Teresa Naranjo





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

Period: 2019-2020

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 25.000 € €

Mr. Pablo Rodríguez

26. Program: Call for Predoctoral and Postdoctoral Researchers 2018 (PEJD-2018-PRE/IND-8666)

Period: 2019-2020

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 25.000 € €

Mr. Marcos González

27. 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

28. Program: Call for Predoctoral and Postdoctoral Researchers 2018 (PEJD-2018-PRE/IND-8674)

Period: 2019-2020

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 25.000 € €

Ms. Laura Gómez

29. 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

30. 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: 38.000 € €

Ms. Raquel Martín

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

Period: 2019-2021

Funding Institution: Ministry of Science, Innovation and Universities

IMDEA Energy Institute external funding: 35.800 € €

Mr. Christian Sánchez

32. 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: 35.800 € €

Mr. Gonzalo Castro

33. 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: 35.800 € €

Ms. Laura Buceta

34. Program: Recruitment of laboratory technicians 2018 (PEJ2018-004795-A)

Period: 2019-2021

Funding Institution: Ministry of Science, Innovation and Universities

IMDEA Energy Institute external funding: 39.200 € €

Ms. Natalia Joga

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

Period: 2019-2021

Funding Institution: Ministry of Science, Innovation and Universities

IMDEA Energy Institute external funding: 35.800 € €

Mr. Manuel Ortega

36. 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 € €

Mr. Sergio Morales



2. Scientific Results

2.1. Indexed publications (SCOPUS)

1. Álvarez-Rodríguez, C.; Martín-Gamboa, M.; Iribarren, D. "Sustainability-oriented management of retail stores through the combination of life cycle assessment and dynamic data envelopment analysis". *Science of the Total Environment*, **2019**, 683, 49-60.
2. Álvarez-Rodríguez, C.; Martín-Gamboa, M.; Iribarren, D. "Combined use of data envelopment analysis and life cycle assessment for operational and environmental benchmarking in the service sector: a case study of grocery stores". *Science of the Total Environment*, **2019**, 667, 799-808.
3. Arenas-Vivo, A.; Amariei, G.; Aguado, S.; Rosal, R.; Horcajada, P. "An Ag-loaded photoactive nano-metal organic framework as a promising biofilm treatment". *Acta Biomaterialia*, **2019**, 97, 490-500.
4. Arroyo, M.; Briones, L.; Escola J.M.; Serrano, D.P. "Conversion of stearic acid into bio-gasoline over Pd/ZSM-5 catalysts with enhanced accessibility". *Applied Sciences-Basel*, **2019**, 9 (11), art. no. 2386.
5. Barawi, M.; Fresno, F.; Pérez-Ruiz, R.; de la Peña-O'Shea, V.A. "Photoelectrochemical hydrogen evolution driven by visible-to-ultraviolet photon upconversion". *ACS Applied Energy Materials*, **2019**, 2 (1), 207-211.
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8. Boaretto, N.; Almenara, J.; Mikhanchan, A.; Marcilla, R.; Vilatela, J.J. "A route to high-toughness battery electrodes". *ACS Applied Energy Materials*, **2019**, 2 (8), 5889-5899.
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10. Carrillo, A.J.; González-Aguilar, J.; Romero, M.; Coronado, J.M. "Solar energy on demand: a review on high temperature thermochemical heat storage systems and materials". *Chemical Reviews*, **2019**, 119, 4777-4816.
11. Carrillo, C.; Martínez, R.; Navarro, M.; Pelaz, B.; Polo, E.; Arenas, A.; Olgiati, A.; Taboada, P.; Soliman, M.; Sola, R.; Fernandez, S.; Catalan, U.; Parak, W.; Horcajada, P.; Alvarez, R.; del Pino, P. "Aqueous Stable Gold Nanostar/ZIF 8 Nanocomposites for Light Triggered Release of Active Cargo Inside Living Cells". *Angewandte Chemie International Edition*, **2019**, 58 (21), 7078-7082.
12. Cubas-Cano, E.; González-Fernández, C.; Ballesteros, M.; Tomás-Pejó, E. "*Lactobacillus pentosus* CECT 4023 T coutilizes glucose and xylose to produce lactic acid from wheat straw hydrolysate: Anaerobiosis as a key factor". *Biotechnology Progress*, **2019**, 35 (1), art. no. e2739.

13. Cubas-Cano, E.; González-Fernández, C.; Tomás-Pejó, E. "Evolutionary engineering of *Lactobacillus pentosus* improves lactic acid productivity from xylose-rich media at low pH". *Bioresource Technology*, **2019**, *288*, art. no. 121540.
14. Cuéllar-Bermúdez, S.P.; Magdalena, J.A.; Muylaert, K.; González-Fernández, C. "High methane yields in anaerobic digestion of the cyanobacterium *Pseudanabaena* sp". *Algal Research*, **2019**, *44*, art. no.101689.
15. Cruz, P.L.; Iribarren, D.; Dufour, J. "Life cycle costing and eco-efficiency assessment of fuel production by coprocessing biomass in crude oil refineries". *Energies*, **2019**, *12* (24), art. no. 4664.
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18. Escalera, A.; Castronuovo, E.D.; Prodanović, M.; Roldán-Pérez, J. "Reliability assessment of distribution networks with optimal coordination of distributed generation, energy storage and demand management". *Energies*, **2019**, *12* (16), art. no.12163202.
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23. García-Muñoz, P.; Zussblatt, N.P.; Pliego, G.; Zazo, J.A.; Fresno, F.; Chmelka, B.F.; Casas, J.A. "Evaluation of photoassisted treatments for norfloxacin removal in water using mesoporous Fe2O3-TiO2 materials". *Journal of Environmental Management*, **2019**, *238*, 243-250.
24. García-Quismondo, E.; Almonacid, I.; Cabañero Martínez, M.A.; Miroslavov, V.; Serrano, E.; Palma, J.; Alonso Salmerón, J.P. "Operational experience of 5 kW/5 kWh all-vanadium flow batteries in photovoltaic grid applications". *Batteries*, **2019**, *5* (3), art. no. 52.
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2.2. Intellectual property

2.2.1. Patents

Granted patents

1. Patent: ES2684052A1, title: “Polímeros conjugados porosos, materiales que los comprenden, método de preparación y uso de los mismos”. Date of application: 28/03/2017 (OEPM) (Application number: P201730445). Date of grant: 10/07/2019. Holders: Fundación IMDEA Energía. Inventors: de la Peña-O’Shea, V.A.; Liras, M.; Fresno, F.; García, A.; García-López, C.; Reñones, P.

2. Patent: ES2684057B1, title: “Uso de una composición que comprende una combinación de nanopartículas fluorescentes”. Date of application: 28/03/2017 (OEPM) (Application number: P201730451). Date of grant: 27/06/2019. Holders: Universidad Rey Juan Carlos; Fundación IMDEA Energía; Universidad Autónoma de Madrid. Inventors: Moyano Rodríguez, E.; Caamaño Fernández, A.J.; Rojo Álvarez, J.L.; Ramos López, F.J.; Ramiro Bargueño, J.; de la Peña-O’Shea, V.A.; Jaque García, D.

3. Patent: ES2694653B2, title: “Electrode for capacitive deionization”. Date of application: 22/06/2017 (OEPM) (Application number: P201730828). Date of grant: 20/05/2019. Holders: Fundación IMDEA Materiales; Fundación IMDEA Energía. Inventors: Vilatela, J.J.; Santos, C.; García-Quismondo, E.; Palma, J.

4. Patent: ES2678594B1, title: “Sistema de generación de energía eléctrica mediante turbomaquinaria híbrida”. Date of application: 13/02/2017 (OEPM) (Application number: P201730170). Date of grant: 16/05/2019. Holders: Fundación IMDEA Energía. Inventors: Reyes-Belmonte, M.A.; González-Aguilar, J.; Romero, M.

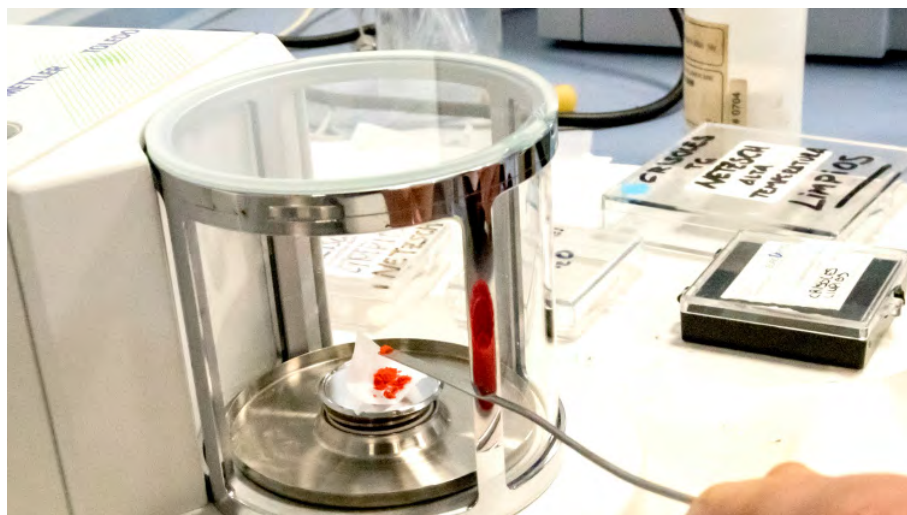
Submitted patents

1. Application number: P201931095, title: “Redes metal-orgánicas a base de pireno-fosfonato”. Date of application: 11/12/2019 (OEPM). Holders: Fundación IMDEA Energía. Inventors: Horcajada, P.; Salcedo, P.; Rojas, S.; Felipe-Vilela, S.

2. Application number: PCT/EP2019/086203. (extension PCT), título: “Redox-flow battery for energy storage”. Date of application: 19/12/2019. Holders: Fundación IMDEA Energía. Inventores: Ventosa, E.; Páez, T.; Palma, J.

2.2.2. Software

1. Computer program 16/2019/3274, title: “GreenH2armony”. Date of application: 15/01/2019 (Application number: M-000336/2019). Date of grant: 05/06/2019. Holders: Fundación IMDEA Energía.



2.2.3. Brands

1. Brand nr. 4000569, title: "GreenH2armony". Date of application: 16/01/2019 (Application number: M4000569). Date of grant: 02/07/2019. Holders: Fundación IMDEA Energía

2.3. Books/Chapters of books/Other publications

1. Arenas-Vivo, A.; Horcajada, P. (2019). "Anti-microbial Metal Organic Frameworks". In: Metal Organic Frameworks. Ed. Central West Publishing. ISBN: 978-1-925823-57-8.

2. Senokos, E.; Marcilla, R.; Vilatela, J.J. (2019). "Materials science of multifunctional supercapacitors based on nanocarbon networks". In: Carbon Based Nanomaterials for Advanced Thermal and Electrochemical Energy Storage and Conversion. Ed. Elsevier. ISBN: 978-0-12-814083-3.

3. Anuario de la Innovación en España 2018. INNOVASPAIN: El periódico líder de la innovación en español. Ed. Novus Innovación Digital S.L., pp. 52-57, ISBN: 978-84-608-1364-4. May 2019.

4. "Hacia un mundo sin contaminación". Journal: "El MADRID social: fundaciones y RSC" de madridiario.es, pp. 76-78. May 2019.

5. "SUN-to-LIQUID: producción de combustible líquido neutro en carbono a partir de agua, CO₂ y energía solar concentrada". Journal: Energética XXI, nr. 189, pp. 62-64. September 2019.

2.4. PhD Thesis

1. Title: Graphene-based hybrid materials with metal compounds and their application in electrochemical energy storage devices

Author: Jaime Sánchez Sánchez

Director: Dr. Afshin Pendashteh and Dr. Rebeca Marcilla

Venue: Autónoma University of Madrid, Spain

Date: 26 July 2019

2. Title: Reliability Assessment Tools for Future Power Distribution Systems

Author: Alberto Escalera Blasco

Director: Dr Milan Prodanovic (IMDEA Energy) and Prof. Edgardo Castronuovo (UC3M)

Venue: Carlos III University of Madrid, Spain

Date: 3 September 2019

3. Title: Catalytic fast-pyrolysis of lignocellulosic residues for advanced biofuels production: development of multifunctional catalysts, optimisation and bench-scale demonstration

Author: Héctor Hernando Marcos

Director: Prof. David Serrano and Dr. Javier Feroso

Venue: Rey Juan Carlos University, Spain

Date: 5 September 2019

4. Title: Caracterización de los consorcios microalgas-bacterias en el tratamiento de agua residual urbana

Author: Santiago Barreiro Vescovo

Director: Dr. Mercedes Ballesteros, Dr. Cristina González and Dr. Ignacio de Godos

Venue: Complutense University of Madrid, Spain

Date: 5 November 2019





2.5. Congress communications

2.5.1. Invited lectures

1. Title: Redes Metal-Orgánicas porosas en medicina

Author: Horcajada, P.

Congress: The seventh edition of the Meeting on Nanochemistry and Nanotechnology (NANOUCO)

Venue: Córdoba, Spain

Date: 21-22 January 2019

Organizer: University of Córdoba

2. Title: Towards the development of membrane-free redox flow batteries by using immiscible electrolytes

Author: Marcilla, R.

Congress: 257th ACS Spring 2019 National Meeting & Exposition

Venue: Orlando, Florida, USA

Date: 31 March-4 April 2019

Organizer: American Chemical Association

3. Title: Recent advances in the design of catalyst for biomass pyrolysis and bio-oil upgrading

Author: Serrano, D.P.

Congress: 10th International Symposium on Feedstock Recycling of Polymeric Materials (ISFR2019)

Venue: Budapest, Hungary

Date: 26-29 May 2019

Organizer: Renewable Energy Group of the MTA Research Centre for Natural Sciences

4. Title: Organo-inorganic hybrid materials based on sulphur poly conjugated ligands with photo(electro)catalytic activity

Author: García, A.; Liras, M.; Fresno, F.; Barawi, M.; Gómez, M.; Gutiérrez-Puebla, E.; Monge, A.; Gándala, F.; de la Peña-O'Shea, V.A.

Congress: XXXVII Congress Bienal de la Real Sociedad Española de Química (RSEQ2019)

Venue: San Sebastián, Spain

Date: 26-30 May 2019

Organizer: RSEQ

5. Title: Metal-free and membrane-free redox flow batteries by using immiscible electrolytes based on organic redox molecules

Author: Marcilla, R.

Congress: Organic battery days 2019

Venue: Jena, Germany

Date: 3-5 June 2019

Organizer: Friedrich Schiller University Jena

6. Title: Investigación en energía: progreso vs circularidad

Author: Serrano, D.P.

Congress: XIII Young Science Symposium 2019

Venue: Madrid, Spain

Date: 5-7 June 2019

Organizer: Castilla-La Mancha University

7. Title: Photocatalytic CO₂ reduction on Pt/TiO₂ catalysts: selectivity towards CH₄

Author: Fresno, F.; Tasbihi, M.; Simon, U.; Villar, I.J.; de la Peña-O'Shea, V.A.

Congress: 6th European Conference on Environmental Applications of Advanced Oxidation Processes (EAAOP-6)

Venue: Portoroz, Slovenia

Date: 26-30 June 2019

Organizer: National Institute of Chemistry, Ljubljana; Section for Catalysis of the Slovenian Chemical Society

8. Title: Polímeros de coordinación porosos para el tratamiento de sobredosis

Author: Rojas, S.

Congress: XI Reunión Científica de Bioinorgánica

Venue: Lugo, Spain

Date: 30 June-03 July 2019

Organizer: Grupo SUPRABIOIN; Universidade de Santiago de Compostela; AEBIN

9. Title: Nuevos desafíos en la producción de combustibles solares por fotosíntesis artificial

Author: De la Peña-o'Shea, V.

Congress: Aportando valor al CO₂

Venue: Madrid, Spain

Date: 2-3 October 2019

Organizer: PTECO₂; SusChem

10. Title: From Lab to market: Crossing the valley of death

Author: Palma, J.

Congress: 1st Sustainable energy storage days in Madrid (SESDIM 2019)

Venue: Madrid, Spain

Date: 8-11 October 2019

Organizer: Polymer Composite Group-CSIC

11. Title: Multifunctional materials for solar fuels production by artificial photosynthesis

Author: De la Peña-O'Shea, V.A.

Congress: nanoGe Fall Meeting

Venue: Berlín, Germany

Date: 4-8 November 2019

Organizer: Park Systems

12. Title: Concentrated solar power and tower systems

Author: Romero, M.

Congress: ISES Solar World Congress

Venue: Santiago de Chile, Chile

Date: 4-7 November 2019

Organizer: ISES

13. Title: Battertia-Control del sistema de batería para mejorar la estabilidad transitoria de redes eléctricas

Author: Roldán-Pérez, J.

Congress: VI Congress Smart Grids

Venue: Madrid, Spain

Date: 12 December 2019

Organizer: Tecma Red Group

2.5.2. Oral communications

1. Title: One-pot conversion of phenol into cyclohexylphenol catalyzed by bifunctional CoP/BETA

Author: Gutiérrez-Rubio, S.; Moreno, I.; Coronado, J.M.; Serrano, D.P.

Congress: 4th Euro Asia Zeolite Congress (4th EAZC)

Venue: Taormina, Italy

Date: 27-30 January 2019

Organizer: Italian Zeolite Association

2. Title: Design and analysis of a current-controlled virtual synchronous machine for weak grids

Author: Roldán-Pérez, J.; González-Cajigas, A.; Rodríguez-Cabero, A.; Prodanovic, M.

Congress: IEEE Applied Power Electronics Conference and Exposition (APEC 2019)

Venue: Anaheim, USA

Date: 17-21 March 2019

Organizer: IEEE

3. Title: CO₂ photoreduction by artificial photosynthesis using hybrid multifunctional materials

Author: García-Sánchez, A.; Reñones, P.; García, C.; Alonso, E.; Collado, L.; Pérez-Ruiz, R.; Barawi, M.; Villar-García, I.J.; Liras, M.; Fresno, F.; De la Peña-O'Shea

Congress: 257th ACS Spring 2019 National Meeting & Exposition

Venue: Orlando, Florida, USA

Date: 31 March-4 April 2019

Organizer: American Chemical Association

4. Title: A novel Ag loaded nanoMOF as promising biofilm treatment

Author: Arenas, A.; Horcajada, P.

Congress: IV Jornadas de promoción de la investigación básica para estudiantes de ciencias e ingenierías

Venue: Móstoles, Madrid, Spain

Date: 4-5 April 2019

Organizer: Rey Juan Carlos University

5. Title: Robust monolithic metal-organic framework with hierarchical porosity

Author: Salcedo, P.; Vilela, S.F.M.; Michron, L.; Solla, E.L.; Yot, P.G.; Horcajada, P.

Congress: IV Jornadas de promoción de la investigación básica para estudiantes de ciencias e ingenierías

Venue: Móstoles, Madrid, Spain

Date: 4-5 April 2019

Organizer: Rey Juan Carlos University

6. Title: Kluyveromyces marxianus CECT 10875: efficient non-conventional yeast for lignocellulose conversion

Author: Tomás-Pejó, E.; González-Fernández, C.
Congress: 46th Annual Conference on Yeasts
Venue: Smolenice, Slovakia
Date: 7-10 May 2019
Organizer: Slovak University of Technology

Congress: 4th International Conference on Capacitive Deionization & Electrosorption (CDI&E)
Venue: Beijing, China
Date: 20-23 May 2019
Organizer: Tsinghua University

7. Title: Challenges and hurdles in the operation of a capacitive deionization pilot plant
Author: García-Quismondo, E.; Anderson, M.A.; Lado, J.J.; Palma, J.
Congress: 25th Topical ISE Meeting
Venue: Toledo, Spain
Date: 12-15 May 2019
Organizer: ISE

12. Title: DC-Link voltage control strategies in MTDC grids based on virtual synchronous machines
Author: Roldán-Pérez, J.; Rodríguez-Cabero, A.; Prodanovic, M.
Congress: 3rd International Conference on DC Microgrids (ICDCM 2019)
Venue: Matsue, Japan
Date: 20-23 May 2019
Organizer: IEEE

8. Title: Towards high-energy alkaline flow batteries
Author: Páez, T.; Palma, J.; Ventos, E.
Congress: 25th Topical ISE Meeting
Venue: Toledo, Spain
Date: 12-15 May 2019
Organizer: ISE

13. Title: Volatile fatty acids from anaerobic digestate as a promising substrate for lipids accumulation via yeast fermentation
Author: Tomás-Pejó, E.; Llamas, M.; González-Fernández, C.
Congress: 14th Yeast Lipid Conference (YLC 2019)
Venue: Ljubljana, Slovenia
Date: 22-24 May 2019
Organizer: Institut Jozef Stefan

9. Title: Development of Membrane-Free Redox Flow Batteries by using Immiscible Electrolytes
Author: Marcilla, R.
Congress: 25th Topical ISE Meeting
Venue: Toledo, Spain
Date: 12-15 May 2019
Organizer: ISE

14. Title: Thermochemical Valorization of Polyethylene and Lignocellulose Mixtures Via Catalytic Co-pyrolysis Over HBeta Zeolite
Author: Moraes, K.L.; Jiménez-Sánchez, S.; Hernandez, H.; Pizarro, P.; Araujo, A.S.; Serrano, D.P.
Congress: 10th International Symposium on Feedstock Recycling of Polymeric Materials (ISFR2019)
Venue: Budapest, Hungary
Date: 26-29 May 2019
Organizer: Renewable Energy Group of the MTA Research Centre for Natural Sciences

10. Title: Magnesium recovery from brackish water by capacitive deionization
Author: Lado, J.J.; García-Quismondo, E.; Palma, J.; Anderson, M.A.
Congress: 25th Topical ISE Meeting
Venue: Toledo, Spain
Date: 12-15 May 2019
Organizer: ISE

15. Title: Selective biodiesel production using a green lipase@MIL-88A biocatalyst
Author: Arenas-Vivo, A.; Horcajada, P.
Congress: XXXVII Congress Biental de la Real Sociedad Española de Química (RSEQ2019)
Venue: San Sebastián, Spain

11. Title: Scale-up of a CDI system equipped with high mass-loading activated carbon electrodes: from laboratory cell to pilot plant
Author: Lado, J.J.; Wang, Y.; García-Quismondo, E.; Vázquez-Rodríguez, I.; Palma, J.; Anderson, M.A.; Gutiérrez, B.; Huertas, F.; Ordóñez, A.

Date: 26-30 May 2019

Organizer: RSEQ

16. Title: Design and synthesis of new CPPs based on Thienoacene moieties for solar fuels production

Author: López-Calixto, C.G.; Liras, M.; de la Peña-O'Shea, V.A.

Congress: XXXVII Congress Bienal de la Real Sociedad Española de Química (RSEQ2019)

Venue: San Sebastián, Spain

Date: 26-30 May 2019

Organizer: RSEQ

17. Title: Hybrid heterojunction based on Conjugated Porous Polymers and their use in Artificial Photosynthesis

Author: García, A.; Liras, M.; Reñones, P.; Fresno, F.; Barawi, M.; Villar, I.J.; Pérez-Ruiz, R.; de la Peña-O'Shea, V.A.

Congress: XXXVII Congress Bienal de la Real Sociedad Española de Química (RSEQ2019)

Venue: San Sebastián, Spain

Date: 26-30 May 2019

Organizer: RSEQ

18. Title: Life cycle assessment of a small-scale integrated biorefinery based on olive tree pruning biomass

Author: Susmozas, A.; Iribarren, D.; Manzanares, P.; Ballesteros, M.

Congress: 27th European Biomass Conference & Exhibition (EUBCE)

Venue: Lisboa, Portugal

Date: 27-30 May 2019

Organizer: Joint Research Centre

19. Title: Screening of oleaginous yeasts for lipid production using volatile fatty acids as novel substrate

Author: Llamas, M.; Tomás-Pejó, E.; Dourou, M.; Aggelis, G.; González-Fernández, C.

Congress: 27th European Biomass Conference & Exhibition (EUBCE)

Venue: Lisboa, Portugal

Date: 27-30 May 2019

Organizer: Joint Research Centre

20. Title: Evolutionary engineering to improve lactic acid production from xylose-rich hemicellulosic hydrolysates: Obtaining an acid pH tolerant *Lactobacillus pentosus* strain

Author: Cubas-Cano, E.; González-Fernández, C.; Tomás-Pejó, E.

Congress: 27th European Biomass Conference & Exhibition (EUBCE)

Venue: Lisboa, Portugal

Date: 27-30 May 2019

Organizer: Joint Research Centre

21. Title: Investigation of the redox chemistry of phenazines using Density Functional Theory

Author: De la Cruz, C.; Marcilla, R.; Mavrantakis, A.

Congress: 2019 Spring Meeting of the European Materials Research Society (E-MRS)

Venue: Niza, France

Date: 27-31 May 2019

Organizer: E-MRS

22. Title: Design of tandem photoelectrochemical cells based on Cu₂-xTe nanocrystals for water splitting

Author: Alonso, E.; Wang, M.; De Trizio, Luca; Barawi, M.; Villar, I.J.; Liras, M.; Manna, L.; de la Peña-O'Shea, V.A.

Congress: 2019 Spring Meeting of the European Materials Research Society (E-MRS)

Venue: Niza, France

Date: 27-31 May 2019

Organizer: E-MRS

23. Title: Tandem photoelectrochemical cell for hydrogen evolution based on a new nanostructured dithiophene conjugated porous polymer

Author: Barawi, M.; Alonso, E.; García, A.; López-Calixto, C.G.; Liras, M.; de la Peña-O'Shea, V.A.

Congress: 2019 Spring Meeting of the European Materials Research Society (E-MRS)

Venue: Niza, France

Date: 27-31 May 2019

Organizer: E-MRS

24. Title: Advances in life cycle sustainability assessment of hydrogen value chains

Author: Valente, A.; Iribarren, D.; Dufour, J.
Congress: 8th World Hydrogen Technologies Convention (WHTC 2019)
Venue: Tokyo, Japan
Date: 2-7 June 2019
Organizer: WHTC2019

25. Title: From hydrogen producers to retailers in japan: a combinatorial carbon footprint assessment

Author: Valente, A.; Iribarren, D.; Dufour, J.
Congress: 8th World Hydrogen Technologies Convention (WHTC 2019)
Venue: Tokyo, Japan
Date: 2-7 June 2019
Organizer: WHTC2019

26. Title: Evolutionary engineering to improve lactic acid production from xylose-rich hemi-cellulosic hydrolysates: Obtaining an acid pH tolerant *Lactobacillus pentosus* strain

Author: Cubas-Cano, E.; González-Fernández, C.; Tomás-Pejó, E.
Congress: XX Reunión de la red Lignocel
Venue: Madrid, Spain
Date: 4-5 June 2019
Organizer: Red Lignocel

27. Title: Guaiacol hydrodeoxygenation over Ni2P supported on 2D-zeolites

Author: Gutiérrez-Rubio, S.; Moreno, I.; Berenguer, A.; Pech, J.; Opanasenko, M.; Ochoa-Hernández, C.; Pizarro, P.; Ejka, J.; Coronado, J.M.; Serrano, D.P.

Congress: 8th Czech-Italian-Spanish Conference
Venue: Amantea, Italy
Date: 11-14 June 2019
Organizer: Società Chimica Italiana; La Chimica & L'Industria; EuChemS

28. Title: The role of life cycle assessment and energy systems modelling in supporting national energy policy-making

Author: Navas-Anguita, Z.; García-Gusano, D.; Iribarren, D.; Dufour, J.
Congress: ANQUE-ICCE-CIBIQ 2019
Venue: Santander, Spain
Date: 19-21 June 2019
Organizer: ANQUE; AQUIQÁN; CIBIQ; UC

29. Title: Planning the penetration of hydrogen vehicles in Spain: potential greenhouse gas emissions savings

Author: Navas-Anguita, Z.; García-Gusano, D.; Iribarren, D.; Dufour, J.
Congress: ANQUE-ICCE-CIBIQ 2019
Venue: Santander, Spain
Date: 19-21 June 2019
Organizer: ANQUE; AQUIQÁN; CIBIQ; UC



30. Title: New strategies for energy recovery from sewage: an integrated approach between hydrothermal carbonization and anaerobic digestion

Author: Medina-Martos, E.; Villamil, J.A.; Gálvez-Martos, J.L.; Mohedano, A.F.; Dufour, J.

Congress: ANQUE-ICCE-CIBIQ 2019

Venue: Santander, Spain

Date: 19-21 June 2019

Organizer: ANQUE; AQUIQÁN; CIBIQ; UC

31. Title: Fuel cells and hydrogen research in Europe

Author: Dufour, J.

Congress: ANQUE-ICCE-CIBIQ 2019

Venue: Santander, Spain

Date: 19-21 June 2019

Organizer: ANQUE; AQUIQÁN; CIBIQ; UC

32. Title: Harmonised life-cycle indicators of non-renewable hydrogen

Author: Valente, A.; Iribarren, D.; Dufour, J.

Congress: ANQUE-ICCE-CIBIQ 2019

Venue: Santander, Spain

Date: 19-21 June 2019

Organizer: ANQUE; AQUIQÁN; CIBIQ; UC

33. Title: Thermochemical water splitting in a ceria fixed bed tubular reactor: isothermal and thermal-cycling

Author: Sánchez-Redero, M.; Romero, M.; González-Aguilar, J.

Congress: ANQUE-ICCE-CIBIQ 2019

Venue: Santander, Spain

Date: 19-21 June 2019

Organizer: ANQUE; AQUIQÁN; CIBIQ; UC

34. Title: Comparison of CSTR and UASB reactor configuration using microalgae biomass as substrate: VFAs production and population dynamics

Author: Magdalena, J.A.; González-Fernández, C.

Congress: ANQUE-ICCE-CIBIQ 2019

Venue: Santander, Spain

Date: 19-21 June 2019

Organizer: ANQUE; AQUIQÁN; CIBIQ; UC

35. Title: Process stability and microbial community analysis upon OLR disturbances of a CSTR treating microalgae biomass

Author: Magdalena, J.A.; González-Fernández, C.

Congress: ANQUE-ICCE-CIBIQ 2019

Venue: Santander, Spain

Date: 19-21 June 2019

Organizer: ANQUE; AQUIQÁN; CIBIQ; UC

36. Title: Thermodynamic and environmental assessment of systems including the use of gas from manure fermentation in the context of the Spanish potential

Author: Skorek-Osikowska, A.; Gálvez-Martos, J.L.; García-Gusano, D.; Martín-Gamboa, M.; Iribarren, D.; Dufour, J.

Congress: ECOS 2019

Venue: Wroclaw, Poland

Date: 23-28 June 2019

Organizer: Silesian University of Technology; Wroclaw University of Science and Technology

37. Title: Characteristic of a system for the production of synthetic natural gas (SNG) for energy generation using electrolysis, biomass gasification and methanation processes

Author: Skorek-Osikowska, A.; Bartela, L.; Katla, D.; Gálvez-Martos, J.L.

Congress: ECOS 2019

Venue: Wroclaw, Poland

Date: 23-28 June 2019

Organizer: Silesian University of Technology; Wroclaw University of Science and Technology

38. Title: Evaluation of technological options for carbon dioxide utilisation

Author: Kalina, J.; Skorek-Osikowska, A.; Bartela, L.; Gładysz, P.; Lampert, K.

Congress: ECOS 2019

Venue: Wroclaw, Poland

Date: 23-28 June 2019

Organizer: Silesian University of Technology; Wroclaw University of Science and Technology

39. Title: Evaluation of conceptual energy storage systems based on the electrolysis process using gas expanders

Author: Bartela, L.; Katla, D.; Skorek-Osikowska, A.

Congress: ECOS 2019

Venue: Wroclaw, Poland

Date: 23-28 June 2019

Organizer: Silesian University of Technology; Wroclaw University of Science and Technology

40. Title: Materiales híbridos multifuncionales para la producción de combustibles solares por fotosíntesis artificial

Author: García, A.; López-Calixto, C.G.; Alonso, E.; Reñones, P.; Gómez, M.; Villar, I.J.; Barawi, M.; Fresno, F.; Liras, M.; de la Peña-O'Shea, V.A.

Congress: SECAT'19

Venue: Córdoba, Spain

Date: 24-26 June 2019

Organizer: SECAT; University of Córdoba

41. Title: Efecto de la adición de Ni a la perovskita $\text{LaO}_{0.9}\text{SrO}_{0.1}\text{FeO}_3$ para la producción de gas de síntesis en procesos cíclicos de reformado de CH_4 y disociación de CO_2

Author: Sastre, D.; Serrano, D.P.; Pizarro, P.; Coronado, J.M.

Congress: SECAT'19

Venue: Córdoba, Spain

Date: 24-26 June 2019

Organizer: SECAT; University of Córdoba

42. Title: Insoluble solids at high concentrations repress yeast's response against stress and increase intracellular ROS levels

Author: Moreno, D.; González-Fernández, C.; Tomás-Pejó, E.

Congress: 7th conference on physiology of yeasts and filamentous fungi

Venue: Milan, Italy

Date: 24-27 June 2019

Organizer: University of Milano-Bicocca

43. Title: Mediated alkaline flow batteries: bridging flow and static battery concepts

Author: Páez, T.; Palma, J.; Ventosa, E.

Congress: Power our future 2019

Venue: Vitoria-Gasteiz, Spain

Date: 2-5 July 2019

Organizer: CIC Energigune

44. Title: Injectable batteries based on semi-solid electrodes: a concept for increased sustainability

Author: Ventosa, E.; Pérez, D.; Palma, J.

Congress: Power our future 2019

Venue: Vitoria-Gasteiz, Spain

Date: 2-5 July 2019

Organizer: CIC Energigune

45. Title: Análisis de una Máquina Síncrona Virtual con Impedancia Virtual Conectada a una Red Débil

Author: Rodríguez-Cabero, A.; Roldán-Pérez, J.; Prodanovic, M.

Congress: Seminario Anual de Automatica, Electronica Industrial e Instrumentación (SAAEI 2019)

Venue: Córdoba, Spain

Date: 3-5 July 2019

Organizer: SAAEI

46. Title: Amortiguamiento Activo para Conexión a Red de Convertidores Fuente de Tensión con Filtros LTCL

Author: Roldán-Pérez, J.; Rodríguez-Cabero, A.; Prodanovic, M.

Congress: Seminario Anual de Automatica, Electronica Industrial e Instrumentación (SAAEI 2019)

Venue: Córdoba, Spain

Date: 3-5 July 2019

Organizer: SAAEI

47. Title: Validación del Modelo Comportamental Simplificado de la Impedancia de Entrada Aplicado al Análisis de Estabilidad en Sistemas Power-Hardware-In-the-Loop

Author: Sanz, M.; Santamargarita, D.; D'Arco, S.; Tedeschi, E.; Sánchez-Acevedo, S.; Roldán-Pérez, J.

Congress: Seminario Anual de Automatica, Electronica Industrial e Instrumentación (SAAEI 2019)

Venue: Córdoba, Spain

Date: 3-5 July 2019

Organizer: SAAEI

48. Title: Improving the efficiency of biomass catalytic pyrolysis by tailoring the physicochemical properties of technical ZSM-5 based catalysts

Author: Hernando, H.; Hernández-Giménez, A.M.; Ochoa-Hernández, C.; Bruijninx, P.C.A.; Pizarro, P.; Coronado, J.M.; Feroso, J.; Ejska, J.; Weckhuysen, B.M.; Serrano, D.P.

Congress: 19th International Zeolite Conference (IZC'19)

Venue: Perth, Australia

Date: 7-12 July 2019

Organizer: Curtin University; International Zeolite Association

49. Title: Merging flow and non-flow batteries: K₄Fe(CN)₆ electrolyte – Ni(OH)₂ solid material as proof of concept

Author: Páez, T.; Palma, J.; Ventosa, E.

Congress: Electrochemical Conference on Energy and the Environment: Bioelectrochemistry and Energy Storage (ECEE 2019)

Venue: Glasgow, Scotland

Date: 21-26 July 2019

Organizer: The Electrochemical Society

50. Title: Towards high-energy alkaline flow batteries by enabling charge storage in solid materials

Author: Páez, T.; Palma, J.; Ventosa, E.

Congress: 70th Annual Meeting of the International Society of Electrochemistry

Venue: Durban, South Africa

Date: 4-9 August 2019

Organizer: ISE

51. Title: A density functional theory study of the redox chemistry of phenazines

Author: Mavrantoukakis, A.; Marcella, R.; De la Cruz, C.

Congress: 70th Annual Meeting of the International Society of Electrochemistry

Venue: Durban, South Africa

Date: 4-9 August 2019

Organizer: ISE

52. Title: An input-output inventory model for application in the social life cycle assessment of the Portuguese pulp and paper sector

Author: Costa, D.; Martín-Gamboa, M.; Quinteiro, P.; Iribarren, D.; Dias, A.C.

Congress: 9th International Conference on Life Cycle Management

Venue: Poznan, Poland

Date: 1-4 September 2019

Organizer: Poznan University of Technology

53. Title: Potential implications of LCA methodological choices in energy planning: the case study of waste incineration when internalising external costs of electricity production

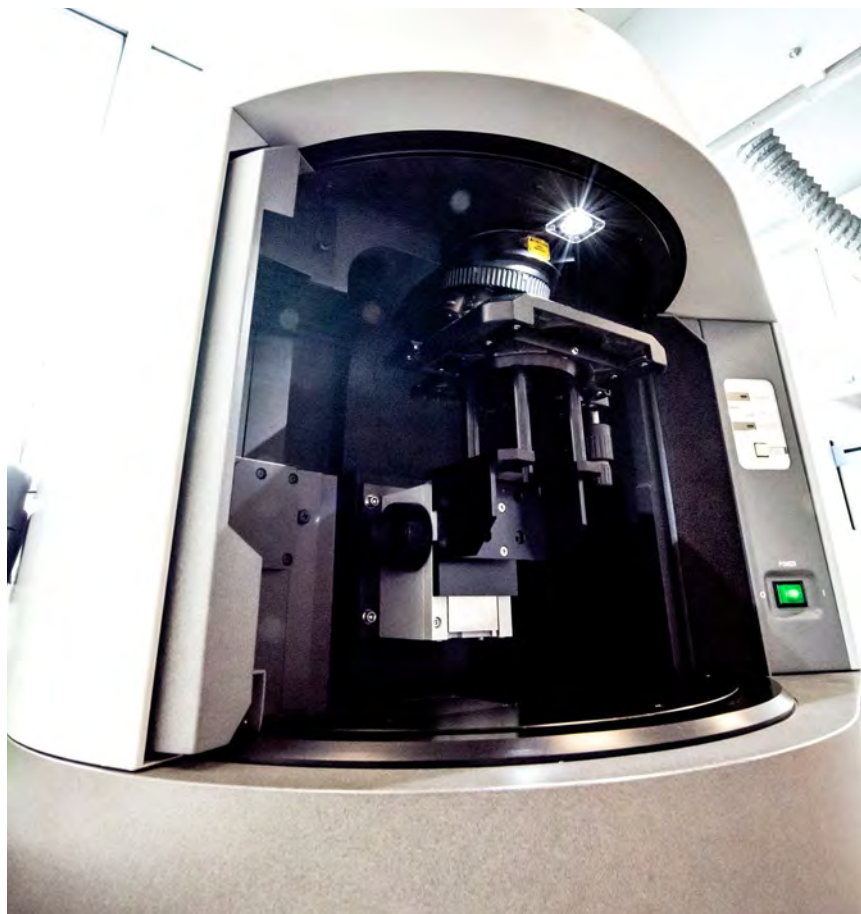
Author: Istrate, I.R.; García-Gusano, D.; Iribarren, D.; Dufour, J.

Congress: 9th International Conference on Life Cycle Management

Venue: Poznan, Poland

Date: 1-4 September 2019

Organizer: Poznan University of Technology





54. Title: Development of a municipal solid waste management planning tool for local and regional administrations: methodological approach and preliminary application to Madrid City

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

Congress: 9th International Conference on Life Cycle Management

Venue: Poznan, Poland

Date: 1-4 September 2019

Organizer: Poznan University of Technology

55. Title: Generation of Thymine Triplet State by Through-Bond Energy Transfer

Author: Gómez-Mendoza, M.

Congress: DNA Damage And Repair Workshop

Venue: Valencia, Spain

Date: 25-26 September 2019

Organizer: RSEQ

56. Title: Virtual Friction Control for Power System Oscillation Damping with VSC-HVDC Links

Author: Rodríguez Cabero, A.; Roldán Pérez, J.; Prodanović, M.; Are Suul, J.; D'Arco, S.

Congress: IEEE Energy Conversion Congress & Exposition (ECCE 2019)

Venue: Baltimore, EEUU

Date: 29 September-3 October 2019

Organizer: IEEE

57. Title: Robust lead-free one-dimensional bismuth halides as potential absorbers for tandem solar cells

Author: Babaryk, A.; Mosquera, M.E.G.; Horcujada, P.

Congress: Nanotechnology and Next Generation High Efficiency Photovoltaics International School and Workshop (NEXGEN 2019)

Venue: Palma de Mallorca, Spain

Date: 1-4 October 2019

Organizer: IREC; University of Barcelona; im2np

58. Title: Combined Heat/Cooling and Power Generation Using Hybrid Micro Gas Turbine in a CST Plant for a Residential Off-grid Application

Author: Rovense, F.; Reyes-Belmonte, M.A.; Romero, M.; González, J.

Congress: SolarPaces 2019

Venue: Daegu, South Korea

Date: 1-4 October 2019

Organizer: SolarPaces

59. Title: Short Mediterranean Ph.D School

Author: Valente, A.

Congress: Impacts of Climate Change and Sustainable Engineering Responses

Venue: Nápoles, Italy

Date: 7-12 October 2019

Organizer: Università degli Studi di Napoli Federico II

60. Title: Enhanced Capacitive Deionization Performance with Activated Carbon Loaded in Graphite Felt Framework

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

Congress: 236th ECS Meeting

Venue: Atlanta, USA

Date: 13-17 October 2019

Organizer: ECS

61. Title: Study of Applicability of Simple Closed Loop Input Impedance Model for Grid-Tie Inverters

Author: Santamargarita, D.; Huerta, F.; Sanz, M.; A. Lazaro; S. D'Arco; S. Sanchez; E. Tedeschi; Javier Roldan Perez.

Congress: Annual Conference of the IEEE Industrial Electronics Society (IECON 2019)

Venue: Lisboa, Portugal

Date: 14 October 2019

Organizer: Universidade Nova de Lisboa

62. Title: Solar fuels by artificial photosynthesis: from inorganic to hybrid multifunctional

Author: De la Peña-O'Shea, V.A.

Congress: First international conference on Unconventional Catalysis, Reactors and Applications (UCRA2019)

Venue: Zaragoza, Spain

Date: 16-18 October 2019

Organizer: University of Zaragoza; TUDelft

63. Title: A novel Ag loaded nanoMOF as promising biofilm treatment

Author: Arenas Vivo, A.; Horcajada, P.

Congress: IV Jornadas de promoción de la investigación básica para estudiantes de ciencias e ingenierías

Venue: Madrid, Spain

Date: 18 October 2019

Organizer: Complutense University of Madrid

Winner of the 3rd prize to the best oral communication

64. Title: A novel Ag loaded nanoMOF as promising biofilm treatment

Author: Hidalgo, T.; Alonso-Nocelo, M.; Bouzo, B.L.; Reimondez-Troitiño, S.; Abuin-Redondo, C.; de la Fuente, M.; Horcajada, P.

Congress: IV QuimBioQuim Meeting

Venue: Santiago de Compostela, Spain

Date: 23-25 October 2019

Organizer: University of Santiago de Compostela

65. Title: Enhancing the ionic conductivity in UPG-1: proton exchange strategy

Author: Salcedo-Abraira, P.; Vilela, S.M.F.; Salles, F.; Várez, A.; Horcajada, P.

Congress: XVI Simposio Jóvenes Investigadores Químicos RSEQ-Sigma Aldrich (Merck)

Venue: Valencia, Spain

Date: 4-7 November 2019

Organizer: RSEQ

66. Title: Solar-Driven thermochemical production of sustainable liquid fuels from H₂O and CO₂ in a heliostat field

Author: Romero, M.; González-Aguilar, J.; Sizmann, A.; Batteiger, V.; Falter, C.; Steinfeld, A.; Zoller, S.; Brendelberger, S.; Lieftink, D.

Congress: ISES Solar World Congress

Venue: Santiago de Chile, Chile

Date: 4-7 November 2019

Organizer: ISES

67. Title: Determination of gravity-induced deformation of heliostat structures through irradiance maps analyses

Author: Martinez, A.; Bravo Gonzalo, I.; Romero, M.; Gonzalez-Aguilar, J.

Congress: ISES Solar World Congress

Venue: Santiago de Chile, Chile

Date: 4-7 November 2019

Organizer: ISES

68. Title: Efficient Ray-Tracing Program to Simulate the Optical Performance of Heliostats in Concentrated Solar Power Facilities

Author: Bravo Gonzalo, I.; Martinez, A.; Romero, M.; Gonzalez-Aguilar, J.

Congress: ISES Solar World Congress

Venue: Santiago de Chile, Chile

Date: 4-7 November 2019

Organizer: ISES

69. Title: ¿Puede la Energía Solar Generar Combustibles?

Author: Alonso, E.

Congress: Jornadas de cambio climático contado por expertos

Venue: Madrid, Spain

Date: 10-12 December 2019

Organizer: UAM/UCM

2.5.3. Poster communications

1. Title: Hybrid multifunctional materials for solar fuels production by artificial photosynthesis

Author: García-Sánchez, A.; Reñones, P.; García, C.; Alonso, E.; Collado, L.; Pérez-Ruiz, R.; Barawi, M.; Villar-García, I.J.; Liras, M.; Fresno, F.; De la Peña-O'Shea

Congress: Artificial Photosynthesis Faraday Discussion

Venue: Cambridge, United Kingdom

Date: 25-27 March 2019

Organizer: University of Cambridge

2. Title: The role of hydrogen in the life-cycle performance of fuel cell electric vehicles

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

Congress: HYPOTHESIS XIV

Venue: Foz do Iguaçu, Brazil

Date: 24-26 April 2019

Organizer: CNR-ITAE

3. Title: Lipid production from volatile fatty acids: screening of oleaginous yeasts

Author: Llamas, M.; Tomás-Pejó, E.; Dourou, M.; Aggelis, G.; González-Fernández, C.

Congress: 14th Yeast Lipid Conference (YLC 2019)

Venue: Ljubljana, Slovenia

Date: 22-24 May 2019

Organizer: Institut Jozef Stefan

4. Title: Towards conductive Metal-Organic Frameworks: templated polymerization

Author: Salcedo-Abraira, P.; Santiago-Portillo, A.; Atienzar, P.; Bordet, P.; Salles, F.; Guillou, N.; García, H.; Navalón, S.; Horcajada, P.

Congress: XXXVII Congress Bienal de la Real Sociedad Española de Química (RSEQ2019)

Venue: San Sebastián, Spain

Date: 26-30 May 2019

Organizer: RSEQ

5. Title: Conjugated porous polymer based on BOPHY dyes as photoredox catalyst under visible light

Author: López-Calixto, C.G.; Cabrera, S.; Pérez-Ruiz, R.; Barawi, M.; Alemán, J.; de la Peña-O'Shea, V.A. Liras, M.

Congress: XXXVII Congress Bienal de la Real Sociedad Española de Química (RSEQ2019)

Venue: San Sebastián, Spain

Date: 26-30 May 2019

Organizer: RSEQ

6. Title: Photophysical characterization of new photocatalytic devices for solar fuels production

Author: Gómez, M.; Barawi, M.; Villar, I.J.; Fresno, F.; de la Peña-O'Shea, V.A.

Congress: XXXVII Congress Bienal de la Real Sociedad Española de Química (RSEQ2019)

Venue: San Sebastián, Spain

Date: 26-30 May 2019

Organizer: RSEQ

7. Title: The potential role of hydrogen in green methane production: a comparative life-cycle study

Author: Valente, A.; Martín-Claudio, M.I.; Iribarren, D.; Dufour, D.

Congress: 8th World Hydrogen Technologies Convention (WHTC 2019)

Venue: Tokyo, Japan

Date: 2-7 June 2019

Organizer: WHTC2019

8. Title: Macromolecular engineering of redox-active polymers bearing catechol pendants: promising paradigm towards high-performance organic batteries

Author: Patil, N.; Marcilla, R.

Congress: Organic battery days 2019

Venue: Jena, Germany

Date: 3-5 June 2019

Organizer: Friedrich Schiller University Jena

9. Title: Economic evaluation of energy storage used for reliability improvement in distribution networks

Author: Escalera, A.; Prodanovic, M.; Castro-nuovo, E.D.

Congress: CIRED 2019

Venue: Madrid, Spain

Date: 3-6 June 2019

Organizer: CIRED

10. Title: Assessing catalytic pyrolysis over nanocrystalline ZSM-5 zeolite for the thermochemical valorization of waste electrical and electronic equipment (WEEE)

Author: Marino, A.; Aloise, A.; Feroso, J.; Pizarro, P.; Migliori, M.; Giordano, G.; Serrano, D.P.

Congress: 8th Czech-Italian-Spanish Conference

Venue: Amantea, Italy

Date: 11-14 June 2019

Organizer: Società Chimica Italiana; La Chimica & L'Industria; EuChemS

11. Title: Virtual impedance design for power quality and harmonic sharing improvement in microgrids
Author: Gothner, F.; Midtgard, O.M.; Torres-Olguin, R.; Roldán-Pérez, J.

Congress: IEEE Workshop on Control and Modeling for Power Electronics (IEEE COMPEL 2019)

Venue: Toronto, Canada

Date: 17-20 June 2019

Organizer: IEEE; University of Toronto

12. Title: Photo-induced self-cleaning and hydrophilic properties of columnar TiO₂ nanostructures obtained by glancing-angle magnetron sputtering

Author: Fresno, F.; González, M.U.; Fernández-Castro, M.; Soler, J.; Martínez, L.; Huttel, Y.; Villar, I.J.; Reñones, P.; Luna, M.; de la Peña-O'Shea, V.A.; García-Martín, J.M.

Congress: 6th European Conference on Environmental Applications of Advanced Oxidation Processes (EAAOP-6)

Venue: Portoroz, Slovenia

Date: 26-30 June 2019

Organizer: National Institute of Chemistry, Ljubljana; Section for Catalysis of the Slovenian Chemical Society

13. Title: Enhancing Life Cycle Management through the symbiotic use of Data Envelopment Analysis: novel advances in LCA + DEA

Author: Álvarez-Rodríguez, C.; Martín-Gamboa, M.; Iribarren, D.

Congress: 9th International Conference on Life Cycle Management

Venue: Poznan, Poland

Date: 1-4 September 2019

Organizer: Poznan University of Technology

14. Title: Energy systems modelling and prospective life cycle assessment of the penetration of battery and fuel cell electric vehicles in Spain: a focus on the fuel production mix

Author: Navas-Angueta, Z.; García-Gusano, D.; Iribarren, D.

Congress: 9th International Conference on Life Cycle Management

Venue: Poznan, Poland

Date: 1-4 September 2019

Organizer: Poznan University of Technology

15. Title: Harmonised life-cycle indicators of hydrogen fuel options

Author: Valente, A.; Iribarren, D.; Dufour, J.

Congress: 9th International Conference on Life Cycle Management

Venue: Poznan, Poland

Date: 1-4 September 2019

Organizer: Poznan University of Technology

16. Title: A novel Ag loaded nanoMOF as promising biofilm treatment

Author: Arenas-Vivo, A.; Hidalgo, T.; Amariei, G.; Aguado, S.; Rosal, R.; Horcajada, P.

Congress: Workshop on Layered Materials 2019

Venue: Liblice, Czech Republic

Date: 2-6 September 2019

Organizer: Jiří Čejka

17. Title: Investigating the Redox Chemistry of Phenazines with High-Throughput Computational Techniques

Author: De la Cruz, C.

Congress: Big Data Summer School

Venue: Gerona, Spain

Date: 9-13 September 2019

Organizer: Max Planck research network

18. Title: Experimental and Numerical Evaluation of Drift Errors in a Solar Tower Facility with Tilt-Roll Tracking-Based Heliostats

Author: Martínez, A.; Bravo, I.; Romero, M.; González, J.

Congress: SolarPaces 2019

Venue: Daegu, South Korea

Date: 1-4 October 2019

Organizer: SolarPaces

19. Title: Polímeros conjugados porosos para la producción de combustibles solares en celdas fotoelectroquímicas

Author: Barawi, M.; Alonso, E.; García, D.; Lopez-Calixto, C.G.; Liras, M.; de la Peña O'Shea, V.A.

Congress: Aportando valor al CO₂

Venue: Madrid, Spain

Date: 2-3 October 2019

Organizer: PTECO2; SusChem



20. Title: Reducción de CO₂ sobre Perovskitas de Niobio y Tántalo modificadas con Plata

Author: Fresno, F.; Galdón, G.; Alfonso, E.; Barawi, M.; Huck-Iriart, C.; Escudero, C.; de la Peña O'Shea, V.A.

Congress: Aportando valor al CO₂

Venue: Madrid, Spain

Date: 2-3 October 2019

Organizer: PTECO2; SusChem

21. Title: Antifouling Photo-bactericidal Combined effect of an Ag@nanoMOF

Author: Arenas-Vivo, A.; Amariei, G.; Rosal, R.; Aguado, S.; Horcajada, P.

Congress: IV QuimBioQuim Meeting

Venue: Santiago de Compostela, Spain

Date: 23-25 October 2019

Organizer: University of Santiago de Compostela

22. Title: Nano-estructuración de un polímero conductor por efecto plantilla

Author: Armani-Calligaris, G.; Salcedo-Abraira, P.; Salles, F.; Guillou, N.; Bordet, P.; Atienzar, P.; Navalón, S.; Horcajada, P.

Congress: XVI Simposio Jóvenes Investigadores Químicos RSEQ-Sigma Aldrich (Merck)

Venue: Valencia, Spain

Date: 4-7 November 2019

Organizer: RSEQ

23. Title: Artificial Photosynthesis: Solar Fuels Generation using Solar Energy, CO₂ and Water

Author: Alfonso, E.; García, C.; Gómez, L.; García, A.; Barawi, M.; Oropeza, F.; Collado, L.; Gómez, M.; Fresno, F.; Liras, M.; de la Peña O'Shea, V.A.

Congress: UN Climate Change Conference, COP25

Venue: Madrid, Spain

Date: 5-7 December 2019

Organizer: COP

3. Training and dissemination activities

3.1. Mobility actions

IMDEA Energy Researchers

1. Antonio Valente

Stay at: Bauhaus Luftfahrt, Germany

Period: 3 months, 2019

Funding Institution: Sun-to-Liquid-Horizon 2020 and IMDEA Energy Institute

2. Santiago Gutierrez Rubio

Stay at: Max Planck Institut für Kohlenforschung, Switzerland

Period: 3 months, 2019

Funding Institution: IMDEA Energy Institute

3. Fernando Fresno García

Stay at: Institut de Chimie et Procédés pour L'Energie, L'Environnement et la Santé (ICPEES), France

Period: 2 months, 2019

Funding Institution: IMDEA Energy Institute

4. Javier Roldan Pérez

Stay at: SINTEF Energi (Trondheim), Norway

Period: 2 weeks, 2019

Funding Institution: MARINET2-Horizon 2020

5. Alberto Rodriguez Cabero

Stay at: Aalborg University, Denmark

Period: 4 months, 2019

Funding Institution: IMDEA Energy Institute

6. Carmen Garcia López

Stay at: Ludwig Maximilian Universität, Germany

Period: 3 months, 2019

Funding Institution: IMDEA Energy Institute

7. Enrique Cubas Cano

Stay at: Leibniz Institute for Agricultural Engineering and Bioeconomy (ATB), Germany

Period: 3 months, 2019

Funding Institution: IMDEA Energy Institute

8. Pablo Salcedo Fernández

Stay at: Institute des Materiaux Jean Rouxel, France

Period: 2 months, 2019

Funding Institution: IMDEA Energy Institute

Visiting Researchers

1. Vincenzo Cartolano, ERASMUS Student

Origin institution: University of Salerno, Italy

Host Unit: Electrochemical Processes Unit

Period: 4 months, 2019

2. Daniela Sciotti, ERASMUS Student

Origin institution: University of Nápoles Federico II, Italy

Host Unit: High Temperature Processes Unit

Period: 5 months, 2019

3. Ricardo Politelli, ERASMUS Student

Origin institution: University of Nápoles Federico II, Italy

Host Unit: High Temperature Processes Unit

Period: 5 months, 2019

4. Katerina Maragkou, ERASMUS Student

Origin institution: University of Patras, Greece

Host Unit: Electrical Systems Unit

Period: 3 months, 2019

5. Marco Stephan

Origin institution: ETH-Zürich, Switzerland

Host Unit: High Temperature Processes Unit

Period: 5 months, 2019

6. Mário Martin Gamboa

Origin institution: University of Aveiro, Portugal

Host Unit: Systems Analysis Unit

Period: 16 months (11 months in 2019 and 5 months in 2020)

7. Alessia Marino

Origin institution: Universidad Rey Juan Carlos, Spain and University of Calabria, Italy

Host Unit: Thermochemical Processes Unit

Period: 3 months, 2019

8. Santiago Sanchez Acevedo

Origin institution: Norwegian University of Science and Technology (NTNU), Norway

Host Unit: Electrical Systems Unit

Period: 1 week, 2019

9. Farouk Zaoui

Origin institution: Universidad Autónoma de Madrid, Spain and University of Oran

Host Unit: Advanced Porous Materials Unit

Period: 5 months, 2019

10. Nayeli Ibarra Díaz

Origin institution: Instituto Tecnológico de Veracruz (ITVer), México

Host Unit: Biotechnological Processes Unit

Period: 3 months, 2019

11. María Inés Infanzón

Origin institution: Instituto Tecnológico de Tecpic (ITTepic), México

Host Unit: Biotechnological Processes Unit

Period: 3 months, 2019

12. Mitja Mori Vanesa

Origin institution: University of Ljubjana, Faculty of Mechanical Engineering, Eslovenia

Host Unit: Systems Analysis Unit

Period: 1 week, 2019

13. Hector Hernando

Origin institution: Universidad Rey Juan Carlos, Spain

Host Unit: Thermochemical Processes Unit

Period: 12 months, (9 months in 2019 y 3 months in 2020)

14. Sara Raposo

Origin institution: Faculdade de Ciências e Tecnologia, University of Algarve, Portugal

Host Unit: Biotechnological Processes Unit

Period: 2 weeks, 2019

15. Belem Patricia Falcon Varela

Origin institution: University of Sonora, México

Host Unit: High Temperature Processes Unit

Period: 2 months, 2019

16. Luis Guerra Rosa

Origin institution: University de Lisboa - Instituto Superior Tecnico (IST Lisboa), Portugal

Host Unit: High Temperature Processes Unit

Period: 3 days, 2019

17. Fredrik Göthner

Origin institution: Norwegian University of Science and Technolgy (NTNU), Norway

Host Unit: Electrical Systems Unit

Period: 2 weeks, 2019

18. José Carlos Pereira

Origin institution: University of Lisboa - Instituto Superior Técnico (IST Lisboa), Portugal

Host Unit: High Temperature Processes Unit

Period: 2 weeks, 2019

19. Alba Martinez

Origin institution: Fundación Imdea Materiales, Spain

Host Unit: Advanced Porous Materials Unit

Period: 1 month

20. Vitor Faria a Sousa

Origin institution: University de Lisboa - Instituto Superior Técnico (IST Lisboa), DECivil, Portugal

Host Unit: Systems Analysis Unit

Period: 2 weeks

21. Ines Meireles

Origin institution: Aveiro University, Portugal

Host Unit: Systems Analysis Unit

Period: 2 weeks

22. Cleis Santos Santos

Origin institution: Fundación Imdea Materiales, Spain

Host Unit: Electrochemical Processes Unit

Period: 3 months

23. Gilmar Hanck da Silva

Origin institution: University Estadual Paulista, Brasil

Host Unit: Advanced Porous Materials Unit

Period: 12 months (2 months in 2019 y 10 months in 2020)

24. Rui Chen

Origin institution: Central South University, Changsha, Hunan, China

Host Unit: High Temperature Processes Unit

Period: 24 months (3 months in 2019, 12 months in 2020 y 9 in 2021)

25. Patricia Alves S. Rodrigues

Origin institution: University Federal de Rio Grande do Norte, Brasil

Host Unit: Thermochemical Processes Unit

Period: 10 months (2 months in 2019, 8 months in 2020)

26. Noelia Martínez Sanz

Origin institution: Universidad Rey Juan Carlos, Spain

Host Unit: High Temperature Processes Unit

Period: 12 months (3 months in 2019, 9 months in 2020)





3.2. Organization of scientific events

1. Smart Energy Congress 2019 “Digital Transformation, leading Energy Efficiency”

Venue: Madrid, Spain

Date: 3-4 April 2019

Organizer: enerTIC, IMDEA Energy (collaborator)

2. Encuentro con Empresarios Agrupados

Venue: Móstoles, Madrid, Spain

Date: 26 April 2019

Organizer: IMDEA Energy

3. FOTOFUEL Workshop: Current challenges in solar fuels production

Venue: Móstoles, Madrid, Spain

Date: 13-14 May 2019

Organizer: IMDEA Energy

4. 1st Annual Workshop Senior Researchers

Venue: Móstoles, Madrid, Spain

Date: 16 May 2019

Organizer: IMDEA Energy

5. Symposium S12. Light Symposium: Light controlled materials and processes, from medicine to artificial photosynthesis

Venue: San Sebastián, Spain

Date: 26-30 May 2019

Organizer: IMDEA Energía

6. PICASO: Planificación de la implementación de combustibles alternativos en el sector energético español para un transporte sostenible

Venue: Móstoles, Madrid, Spain

Date: 26 November 2019

Organizer: IMDEA Energy

7. 8th Annual Workshop of Young Researchers of IMDEA Energy

Venue: IMDEA Energy Institute, Madrid, Spain

Date: 12-13 December 2019

Organizer: IMDEA Energy

8. SUN TO LIQUID Demo event

Venue: IMDEA Energy Institute, Madrid, Spain

Date: 13 June 2019

Organizer: IMDEA Energy

3.3. Internal seminars

1. Design and development of a fluidized bed high temperature receptor

Speaker: Dr. Anna Skorek (IMDEA Energy)

Date: 25 January 2019

2. Hybrid Power Generation Technologies for Sustainable Future

Speaker: Mario Sánchez (IMDEA Energy)

Date: 25 January 2019

3. From Valencia to Móstoles: Scientific background

Speaker: Dr. Silvia Greses (IMDEA Energy)

Date: 22 February 2019

4. A new concept for battery regeneration

Speaker: Daniel Pérez (IMDEA Energy)

Date: 22 February 2019

5. “White light” fiber laser sources for non-invasive optical imaging techniques

Speaker: Dr. Iván Bravo (IMDEA Energy)

Date: 29 March 2019

6. Exploring waste-to-energy opportunities in a circular economy

Speaker: Ioan-Robert Istrate (IMDEA Energy)

Date: 29 March 2019

7. COST Action ES1408: EUALGAE.....What’s that?..”

Speaker: Dr. Cristina González (IMDEA Energy)

Date: 26 April 2019

8. Calibration and optical characterization of a heliostat field

Speaker: Alejandro Martínez (IMDEA Energy)

Date: 26 April 2019

9. Engineering porous materials for electrochemical energy conversion and storage

Speaker: Dr. Antoni Forner-Cuenca (Eindhoven University of Technology, Países Bajos)

Date: 17 May 2019

10. Controlling the physicochemical properties of nanoparticles: through macromolecule

Speaker: Dr. Tania Hidalgo (IMDEA Energy)

Date: 31 May 2019

11. Microfluidics applied to redox flow batteries

Speaker: Beatriz Oraá (IMDEA Energy)

Date: 31 May 2019

12. Insights into hydrogen bonded systems: from single molecule to the bulk

Speaker: Dr. Teresa Naranjo (IMDEA Energy)

Date: 28 June 2019

13. Microbial oil production from volatile fatty acids

Speaker: Mercedes LLamas (IMDEA Energy)

Date: 28 June 2019

14. Mentoring 101

Speaker: Prof. Marc Anderson (IMDEA Energy)

Date: 10 September 2019

15. Biofuels for aviation and maritime transport: why are they necessary. Opportunities and technological challenges for its production through the integration of biomass pyrolysis with existing infrastructure and refining products

Speaker: Dr. Juan Miguel Moreno (IMDEA Energy)

Date: 27 September 2019

16. Investigating the redox chemistry of phenazines with High-throughput Computational techniques

Speaker: Carlos de la Cruz (IMDEA Energy)

Date: 27 September 2019

17. Oleaginous yeasts: producing high-value products from organic wastes by single-cell organisms

Speaker: Dr. Elia Tomás (IMDEA Energy)

Date: 25 October 2019

18. Design and optimization of a continuous reactor for catalytic pyrolysis of biomass and the production of high-quality bio-oils

Speaker: Francisco Artillo (IMDEA Energy)

Date: 25 October 2019

19. Advanced Solar Energy Systems based on Brayton Cycle Technology

Speaker: Dr. Francesco Rovense (IMDEA Energy)

Date: 29 November 2019

20. Towards the development of a membrane free redox flow battery based on immiscible electrolytes

Speaker: Iciar Montes (IMDEA Energy)

Date: 29 November 2019

21. Solar Thermal Energy: From Power at Night to Renewable Jet Fuel

Speaker: Wojciech Lipiński (The Australian National University, Canberra)

Date: 16 December 2019

3.4. Participation in science dissemination activities

1. International Day of Women and Girls in Science

Activity: The Energy of Women

Venue: IMDEA Energy Institute, Madrid, Spain

Date: 11 February 2019

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

2. Madrid Fair for Science and Innovation

Venue: IFEMA, Madrid, Spain

Date: 27-31 March 2019

Organizer: Fundación para el conocimiento madri+d

3. Festival Pint of Science (PoS) 2019

Venue: Madrid, Spain

Date: 20, 21, 22 May 2019

Organizer: Asociación de Divulgación Científica "Pint of Science Spain"

4. European researchers' night 2019

Activity: Energy changes the world

Venue: IMDEA Energy Institute, Madrid, Spain
Date: 27 September 2019
Organizer: IMDEA Energy

5. Science Week of Comunidad de Madrid 2019
Activity: Energy, key to sustainability
Venue: IMDEA Energy Institute, Madrid, Spain
Date: 13-14 November 2019
Organizer: IMDEA Energy

6. COP25
Activity: Stand dedicated to presenting the European projects Hymap, Sunrise and Sun to Liquid aimed at converting CO₂ into solar fuels
Venue: IFEMA, Madrid, Spain
Date: 5-7 December 2019
Organizer: Ministry of the Environment, Government of Spain

3.5. Training activities

1. Lorenzo, Laura
B. Sc in Environmental Sciences, Rey Juan Carlos University
Internship work: Environmental sustainability study of waste treatment processes
Supervisor: Dr. Javier Dufour, SAU
Period: February-June 2019

2. Espí, Roberto
B. Sc in Electronic Engineering, Polytechnic University of Madrid -ETSIDI
Internship work: LabVIEW programming of FPGA for testing Li-Ion batteries
Supervisor: D. Ignacio Almonacid, ECPU
Period: February-May 2019

3. Lago, Adrián
M. Sc in Chemical Engineering, Rey Juan Carlos University
Internship work: Experimental research work in the line of thermocatalytic recovery of waste through processes of thermal and catalytic pyrolysis
Supervisor: Dr. Juan Miguel Moreno, TCPU
Period: February-July 2019

4. Román, Manuel
M. Sc in Chemical Engineering, Rey Juan Carlos University
Internship work: Incorporation of solid state electroactive materials in the external tanks, in such a way that the dissolved active species become charge mediators
Supervisor: Dr. Edgar Ventosa, ECPU
Period: April-June 2019

5. Cilleros, Alberto
B. Sc in Energy Engineering, Rey Juan Carlos University
Internship work: Experimental work in the pyrolysis line of thermochemical recovery of waste: carrying out reactions varying operating conditions, product analysis and characterization of the catalyst
Supervisor: Dra. Patricia Pizarro, TCPU
Period: July-October 2019

6. Bañegil, Alvaro
M. Sc in Industrial Engineering, Rey Juan Carlos University
Internship work: Control of PV plants to improve the stability of microgrids
Supervisor: Dr. Milan Prodanovic, ELSU
Period: September-December 2019

7. González, Jorge
Professional training, IES- Salesianos de Atocha
Internship work: Support tasks in the High Temperature Processes Unit
Supervisor: Dr. José González, HTPU
Period: March-June 2019

8. Guillen, Laura
Professional training, IES- Virgen de la Paloma
Internship work: Support tasks in the Biotechnological Processes Unit
Supervisor: Dr. Cristina González, BTPU
Period: March-June 2019

9. Castro, Gonzalo
Professional training, IES- Lope de Vega
Internship work: Support tasks in the Electrochemical Processes Unit
Supervisor: D. Guzman García, ECPU
Period: March-June 2019

10. Valladares, Alexander David

Professional training, IES- Palomeras Vallecas
Internship work: Support tasks in the Electrochemical Processes Unit

Supervisor: D. Guzman García, ECPU

Period: March-June 2019

11. Ortega, Jesus Manuel

Professional training, IES- Virgen de la Paloma
Internship work: Support tasks in the Photoactivated Processes Unit

Supervisor: Drs. Victor Peña and Marta Liras, PAPU

Period: March-June 2019

12. González, Jesus

Professional training, IES- Prado Santo Domingo
Internship work: Support tasks in the Photoactivated Processes Unit

Supervisor: Dr. Victor Peña, PAPU

Period: March-June 2019

13. Andrés, Carlos Hermán

Professional training, IES- Lope de Vega
Internship work: Support tasks in the Photoactivated Processes Unit

Supervisor: Dr. Marta Liras, PAPU

Period: March-June 2019

14. Sanchez, Christian

Professional training, IES- Lope de Vega
Internship work: Support tasks in the Central Laboratories

Supervisor: Dr. Marta Arroyo, LAB

Period: October-December 2019

15. Quillupangui, Fernando Paul

Professional training, IES- Benjamin Rua
Internship work: Support tasks in the Electrical Systems Unit

Supervisor: Dr. Javier Roldan, ELSU

Period: March-June 2019

16. Buceta, Laura Zeltia

Professional training, IES- Lope de Vega
Internship work: Support tasks in the Thermochemical Processes Unit

Supervisor: Dr. Juan Miguel Moreno, TCPU

Period: March-June 2019

17. Alonso, Cristina

Professional training, IES- Lope de Vega
Internship work: Support tasks in the Thermochemical Processes Unit

Supervisor: Dr. Juan Miguel Moreno, TCPU

Period: March-June 2019

18. Janaini, Amir

Professional training, IES- Lope de Vega
Internship work: Support tasks in the Thermochemical Processes Unit

Supervisor: Dr. Juan Miguel Moreno, TCPU

Period: October-December 2019

19. Corral, Daniel

B Sc. in Chemical Engineering and Energy Engineering, Rey Juan Carlos University

Project title: Design of an electricity production plant from lignocellulosic biomass

Supervisor: Dr. Abel Sanz, SAU

Date of defense: October 2019

20. Al Ridouan Kharchich Azzouz, Baraa

B Sc. in Energy Engineering, Rey Juan Carlos University

Project title: Simulation and benchmarking of combined cycle plants in Spain

Supervisor: Dr. Javier Dufour, SAU

Date of defense: March 2019

21. López, Víctor José

B Sc. in Chemical Engineering, Rey Juan Carlos University

Project title: Design and simulation of Pinus pinaster processing to obtain poly- and oligosaccharides

Supervisor: Dr. Javier Dufour, SAU

Date of defense: October 2019

22. Espinosa, Rafael

B Sc. in Energy Engineering, Rey Juan Carlos University

Project title: Predictive model of the effects of transportation on citizens

Supervisor: Dr. Diego Garcia, SAU
Date of defense: July 2019

23. Ocaña, Iván
B Sc. in Materials Engineering, Polytechnical University of Madrid - ETSICCP
Project title: Metallic nanoparticles associated with porous coordination polymers (MOFs) for energy storage
Supervisor: Dra. Patricia Horcajada, APMU
Date of defense: July 2019

24. Muñoz, Jorge
B Sc. in Materials Engineering, Complutense University of Madrid
Project title: Design and synthesis of optically activated semiconductors based on bismuth (III) halides for sustainable energy applications
Supervisor: Drs. Patricia Horcajada and. Artem Babaryk, APMU
Date of defense: June 2019

25. García, Jorge
B Sc. in Energy Engineering, Rey Juan Carlos University
Project title: Development of a hydrothermal carbonization model for the recovery of sewage sludge
Supervisor: Dr. Enrique Medina, SAU
Date of defense: October 2019

26. Arqueros, Cristina
B Sc. in Chemistry, Complutense University of Madrid
Project title: Multifunctional materials based on Porous Metalorganic Networks (MOFs)
Supervisor: Dra. Patricia Horcajada, APMU
Date of defense: July 2019

27. Fernández, José Manuel
B Sc. in Chemical Engineering, Polytechnical University of Madrid - ETSIDI
Project title: Optimization of the production of volatile fatty acids through anaerobic digestion
Supervisor: Dra. Cristina González, BTPU
Date of defense: September 2019

28. Miranda, Pablo
B Sc. in Chemical Engineering e Environmental Energies, Rey Juan Carlos University
Project title: Techno-economic analysis of a hydrothermal liquefaction process for the recovery of food waste
Supervisor: Dr. Enrique Medina, SAU
Date of defense: July 2019

29. Caro, Lara
B Sc. in Energy Engineering, Rey Juan Carlos University
Project title: Technoeconomic study of the catalytic reform of bioethanol and glicerol
Supervisor: Dr. José Luis Gálvez, SAU
Date of defense: October 2019

30. Pérez, Carlos
B Sc. in Energy Engineering, Rey Juan Carlos University
Project title: Solarization of the municipality of Villaviciosa de Odón thanks to solar thermal tower technology with storage of molten salts. Analysis of the life cycle of a central tower solar thermal power plant with thermal storage in molten salts for the solarization of the municipality of Villaviciosa de Odón
Supervisor: Dra. Anna Skorek-Osikowska, SAU
Date of defense: May and October 2019

31. González, Carlos
B Sc. in Chemical Engineering and Energy Engineering, Rey Juan Carlos University
Project title: Study on the optimization of the optical design of heliostat fields for third and fourth generation solar thermal power plants
Diseño de una planta para la producción de hidrógeno mediante energía solar concentrada
Supervisor: Drs. Manuel Romero and José González, HTPU
Date of defense: June and July 2019

32. Antona, Borja
B Sc. in Mechanical Engineering, European University of Madrid

Project title: Design of a test bench for the aero-thermal characterization of solar volumetric receivers

Supervisor: Drs. José Gonzalez and Alejandro Gonzalo de Alba, HTPU

Date of defense: July 2019

33. Gómez, Alejandro

M Sc. in Chemical Engineering, Rey Juan Carlos University

Project title: Metal-organic networks (MOFs) composed as components for fuel cells

Supervisor: Drs. Patricia Horcajada and Sergio Vilela, APMU

Date of defense: March 2019

34. González, Cristina

M Sc. in Chemical Engineering, Rey Juan Carlos University

Project title: Obtaining high added value products from pyrolysis bio-oils on zeolitic materials

Supervisor: Dra. Inés Moreno, TCPU

Date of defense: June 2019

35. Dávila, Beatriz

M Sc. in Energy, Complutense University of Madrid

Project title: Development of flexible lithium-ion batteries

Supervisor: Dr. Nicola Boaretto, ECPU

Date of defense: June 2019

36. Díaz, Francisco Javier

M Sc. in Energy, Complutense University of Madrid

Project title: Viability of CO₂ capture from air as carbonates

Supervisor: Dr. Jose Luis Galvez, SAU

Date of defense: February 2019

37. Ramos, María

M Sc. in Microbiology and Parasitology, Complutense University of Madrid

Project title: Oil yeast selection: use of volatile fatty acids for the production of microbial lipids

Supervisor: Dra. Elia Tomás Pejo, BTPU

Date of defense: July 2019

38. Amigo, Aitor

M Sc. in Industrial Engineering, Rey Juan Carlos University

Project title: Advanced studies to predict the durability of lithium-ion batteries for photovoltaic applications

Supervisor: Drs. Jesus Palma and Enrique García, ECPU

Date of defense: Noviembre 2019

39. Gómez, Laura

M Sc. in Energy and Fuels for the Future, Autónoma University of Madrid

Project title: Conversion of solar energy through photoelectrochemical cells based on hybrid electrodes

Supervisor: Drs. Marta Liras and Mariam Barawi, PAPU

Date of defense: September 2019

40. Escribano, Yaiza

M Sc. in Biotechnology, Complutense University of Madrid

Project title: AGVS production from fruit and vegetable waste

Supervisor: Dra. Cristina González, BTPU

Date of defense: July 2019

41. Torres, Ana

M Sc. in Science and Chemical Technologies, Complutense University of Madrid

Project title: Porous metal-organic networks (MOFs) as agents for water decontamination

Supervisor: Dra. Sara Rojas, APMU

Date of defense: September 2019

42. Garcia, Diego

M Sc. in Energy, Complutense University of Madrid

Project title: Synthesis of porous conjugated polymers for hydrogen photogeneration by photoelectrochemical processes

Supervisor: Drs. Marta Liras and Mariam Barawi, PAPU

Date of defense: September 2019

43. Lago, Adrian

M Sc. in Chemical Engineering, Rey Juan Carlos University

Project title: Thermochemical recovery of lignin by catalytic pyrolysis

Supervisor: Dr. Juan Miguel Moreno, TCPU

Date of defense: December 2019

44. Púa, Gema Maria

M Sc. in Chemical Engineering, Rey Juan Carlos University

Project title: Development of smart windows with selective brightness and temperature control for implementation in energy efficient buildings

Supervisor: Drs. Marta Liras and Mariam Barawi, PAPU

Date of defense: December 2019

45. Alfageme, Blanca

M Sc. in Electronic and Application Systems, Carlos III University of Madrid

Project title: Impact of Solar Power Integration in the Inertial Response of the Electrical System of El Hierro island

Supervisor: Dr. Javier Roldan, ELSU

Date of defense: September 2019

46. Neira, Adrian

M Sc. in Electronic and Application Systems, Carlos III University of Madrid

Project title: Emulation Techniques for Hardware-In-The-Loop Applied to Power Electronics Converters

Supervisor: Dr. Javier Roldan, ELSU

Date of defense: September 2019

47. Camuñas, Pedro Luis

M Sc. in Electronic and Application Systems, Carlos III University of Madrid

Project title: Control of Grid-Connected Renewable Energy Sources for Grid Code Compliance

Supervisor: Dr. Javier Roldan, ELSU

Date of defense: July 2019

48. Vincenzo Cartolano

Erasmus student, University of Salerno, Italy

Supervisor: Dr. Jesús Palma, EPU

Period: 4 months, 2019

49. Daniela Sciotti

Erasmus student, University of Napoles Federico II, Italy

Supervisor: Dr. José González, HTU

Period: 5 months, 2019

50. Ricardo Politelli

Erasmus student, University of Napoles Federico II, Italy

Supervisor: Dr. José González, HTU

Period: 5 months, 2019

51. Katerina Maragkou

Erasmus student, University of Patras, Greece

Supervisor: Dr. Milan Prodanovic, ESU

Period: 3 months, 2019





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