

imdea energy institute



research for a **sustainable**
energy development

institute
iMdea
energy

a n n u a l r e p o r t

2017

w w w . e n e r g y . i m d e a . o r g

annual report 2017

www.energy.imdea.org



David Serrano

Director of IMDEA Energy
Móstoles, September 2018

The current Annual Report collects the main activities and achievements of the IMDEA Energy Institute during 2017, in line with our principal mission of contributing to the transition towards a low-carbon energy system, facing the challenge of harmonizing sustainability and economic issues.

Scientific excellence, international relevance and cooperation with industry remain as the key drivers of the IMDEA Energy activities since its foundation about ten years ago.

The main topics studied and developed at IMDEA Energy include concentrated solar power; production of sustainable fuels; energy storage coupled to renewable energy and transport; smart management of electricity demand; energy systems with enhanced efficiency, valorization of CO₂ emissions and techno-economic evaluation of energy systems. These research activities are developed by a total of 8 Research Units, supported by the availability of modern and well-equipped laboratories, sophisticated scientific instrumentation and singular pilot plant infrastructures.

The staff of IMDEA Energy has reached by the end of 2017, a total of 97 persons, which represents a 24% growth with respect to the previous year. In addition, 61 B.Sc. and M.Sc. students from a variety of universities have collaborated and participated in the different research topics, pointing out that training of young scientists and engineers is also a priority for IMDEA Energy.

Collaboration with external research groups in the form of temporary exchange of researchers has been reinforced along the past year. Thus, 9 IMDEA Energy scientists have

performed secondments in international research groups, whereas the Institute has hosted a total of 28 visiting researchers along 2017, which denotes the increasing attraction of IMDEA Energy for researchers from other institutions.

The external funding executed by the institute in 2017 reached 3.36 M€, which represents a 15% increase compared to 2016. Those funds came from 42 ongoing research projects granted by public administrations, 21 contracts with private institutions and 27 personnel grants. In particular, international projects, including two prestigious ERC Consolidator Grants, were of special relevance since they contributed to about 39% of the overall external incomes. These figures have allowed the IMDEA Energy Institute to reach in 2017 a 50% self-funding ratio of its total budget.

Remarkable results have been obtained also in 2017 in terms of scientific indicators: 90 scientific works published in indexed journals, 127 communications presented in scientific congresses, 10 of them as invited conferences and 39 of them as posters, 5 PhD Thesis defended and 5 patents filed.

The 2017 figures evidence that IMDEA Energy has continued evolving as a reference research institution with high international reputation. These achievements are a direct consequence of the great work performed by the Institute's staff. Once again, I would like to acknowledge their impressive dedication and strong commitment with the IMDEA Energy activities, thanking also the continuous support received from the Regional Government of "Comunidad de Madrid".

A handwritten signature in blue ink, appearing to read "D. Irujo", with a long horizontal flourish extending to the right.

words from the director...

annual report 2017

www.energy.imdea.org

editor

imdea energy institute

graphic design

base 12 diseño y comunicación

D.L.

M-25369-2018

contents

	about us	6
our structure		8
	in figures	10
cooperation		12
	networking	14
research lines		16
	scientific facilities	18
research units		20
	annex	70
	R&D projects, contracts and grants	71
	scientific results	91
	training and dissemination activities	117

about us

The IMDEA Energy Institute is a research centre established 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.

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.



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

about us



The building and laboratories of IMDEA Energy Institute are located at the Technological Park of Mostoles, Madrid, on a land with 12,500 m².

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

10,500 m²

8 scientific labs

2 pilot plants

office work areas and
an auditorium for 130 people



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

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 new 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.



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
Professor
Institute for Environmental Engineering and Energy Economics
Hamburg University of Technology, Germany

Mr Rafael van Grieken
Vice-president of the Foundation
Regional Minister of Education and Research
Comunidad de Madrid, Spain

REGIONAL ADMINISTRATION REPRESENTATIVES

Mr. Alejandro Arranz
General Director of Research and Innovation
Comunidad de Madrid, Spain

Mr. Rafael García
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

Dr. Ramón Gavela
General Director
Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas, CIEMAT, Spain.

Prof. Dr. Máximo León
Full 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

SCIENTIFIC TRUSTEES

Prof. Dr. Nazim Muradov
Research Professor
Florida Solar Energy Center, University of Central Florida, USA

Prof. Dr. Adriano García-Loygorri
Polytechnic University of Madrid, Spain

Prof. Dr. Antonio Monzón
Director of the Chemical Engineering and Environmental Technologies Department
University of Zaragoza, Spain

Dr. Iacovos Vasalos
Emeritus Professor
Chemical Process Engineering Research Institute, Greece

Prof. Dr. Francesc Castells
Emeritus Professor
Rovira and Virgili University, Spain

EXPERT TRUSTEES

Dr. José Jacinto Monge
Rey Juan Carlos University
Spain

Mr. Íñigo Sabater
Vice President of Global Business Development, VESTAS
Spain

COMPANIES TRUSTEES

Ms. Adriana Orejas
Repsol, S.A.
Director of Downstream Technology Projects
Spain

Pending to be appointed
Iberdrola España, S.A.U.
Spain

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
Director of the Institute for Environmental Engineering and Energy Economics
Hamburg University of Technology, Germany

Prof. Dr. Nazim Muradov
Research Professor
Florida Solar Energy Center, University of Central Florida, USA

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
Professor of Renewable Energy Carriers at the ETH Zurich and Head of the Solar Technology Laboratory at the Paul Scherrer Institute, Switzerland

Prof. Dr. Iacovos Vasalos
Emeritus Research Professor
Chemical Process Engineering Research Institute, Greece

Prof. Dr. Adriano García-Loygorri
Polytechnic University of Madrid, Spain

Dr. Francisco Gírio
Coordinator of the Bioenergy Unit
National Laboratory of Energy and Geology, Portugal

Prof. Dr. Francesc Castells
Emeritus Professor
Rovira and Virgili University, Spain

Prof. Dr. Manuel Berenguel
Research Professor
Computer Science Department
University of Almería, Spain

Prof. Dr. Michael Froeba
Professor
Department of Applied Inorganic Chemistry
University of Hamburg, Germany

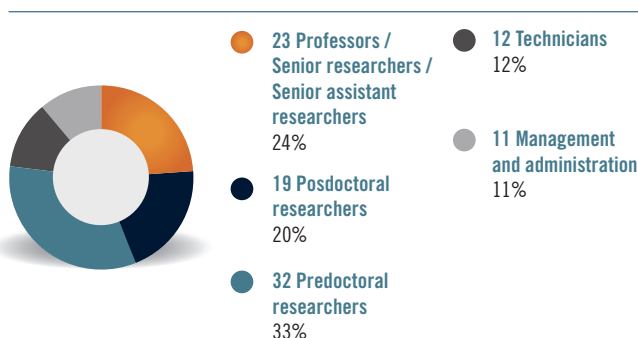
in figures

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.

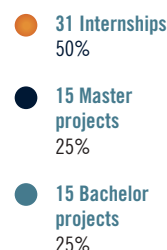
human resources



Human resources distribution by the 31st of December of 2017



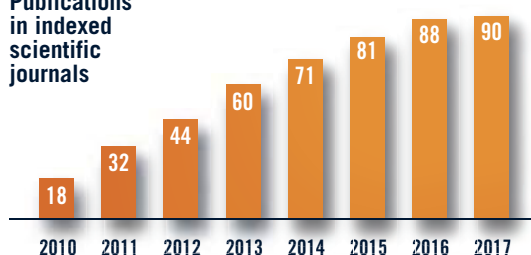
61 students in connection with the IMDEA Energy Institute in 2017



Mobility actions in 2017

9 Secondments of Imdea Energy researchers
28 visiting researchers

Publications in indexed scientific journals



2017

78 congress communications,
10 invited conferences
and 39 poster communications.

24 Ph.D. thesis under development
and 5 Ph. D. thesis defended.

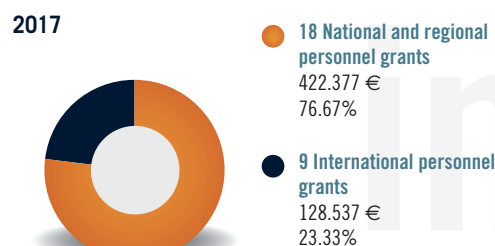
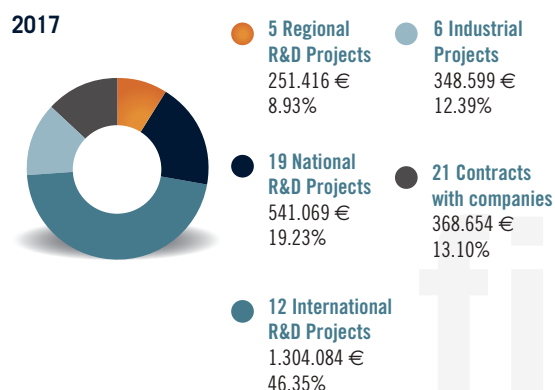
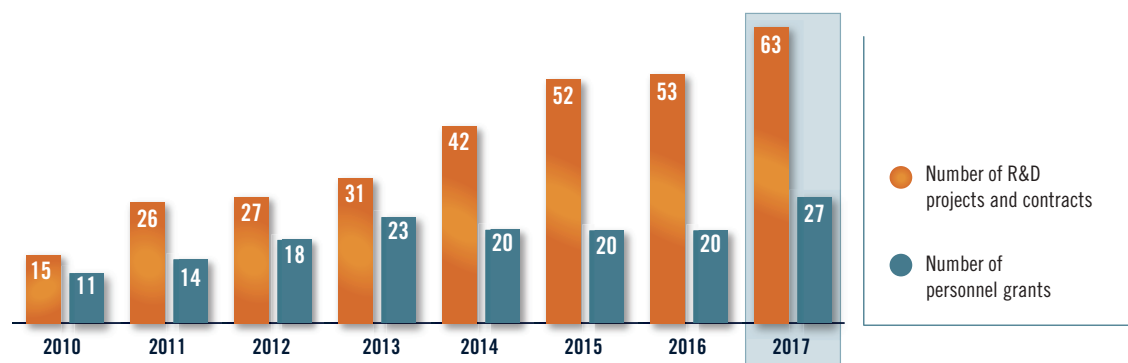
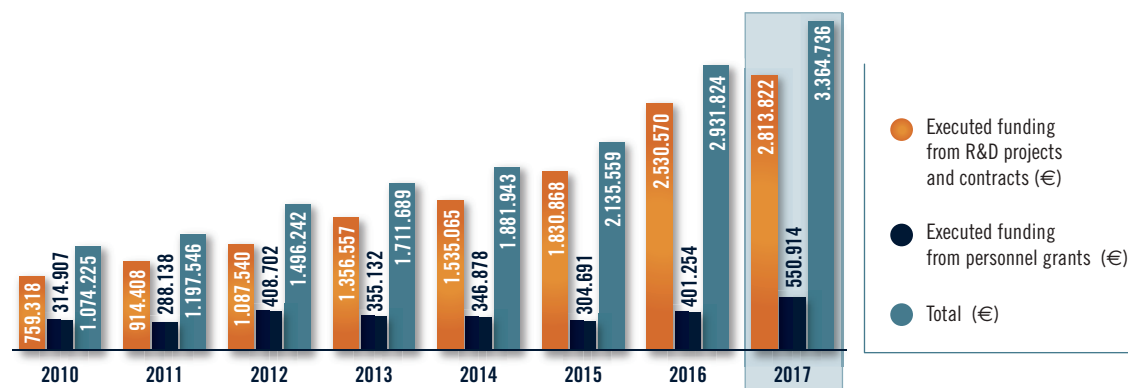
5 new patents applied and
1 patent granted.

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 2017 the Institute was hosting two Consolidator Grants awarded by the European Research Council with a total budget of 4.5 M€, and it was coordinating an European Project with 17 partners and a total budget over 9 M€.

external funding



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 in R&D&i with companies is one of the main objectives of the IMDEA Energy Institute. In this sense,

the Institute maintains an intense activity aimed to attract companies and collaborations with industrial partners, and a strong presence in international networks and platforms with industrial participation. During 2017 IMDEA Energy has maintained meetings with more 90 companies and has participated actively in 11 industrial events.

COOPERATION WITH COMPANIES 2017

ABENGOA



Outotec



XXENTRIA



Seenso renewal





COOPERATION WITH RESEARCH INSTITUTIONS 2017

COOPERATION WITH UNIVERSITIES 2017

networking

The 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.



NATIONAL



INTERNATIONAL



networking



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 supercapacitors.

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.

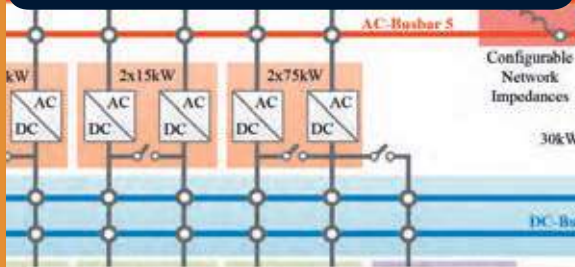
Concentrated solar power



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.

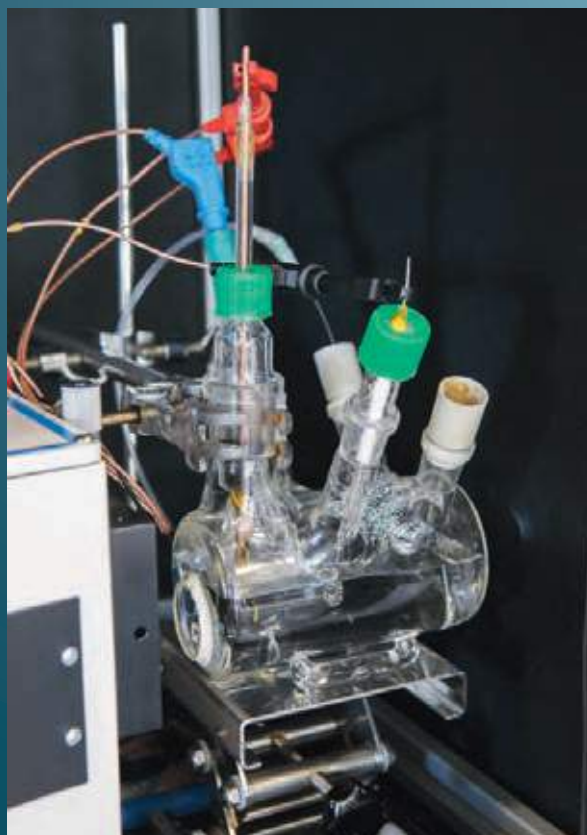
research lines



scientific facilities

Instrumental Techniques

- 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.
- 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.
- 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.

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



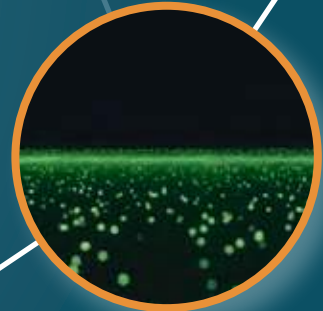
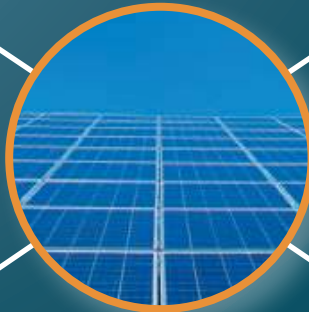
High Temperature
Processes Unit



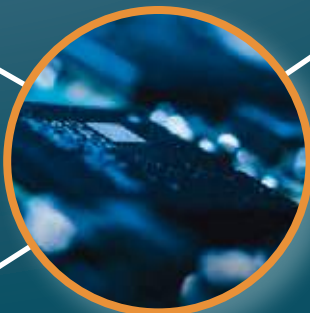


**Biotechnological
Processes Unit**

**System Analysis
Unit**



**Photoactivated
Processes Unit**



**Electrical Systems
Unit**



**Advanced Porous
Materials Unit**



Thermochemical Processes Unit

annual report
2017



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



Dr. Juan M. Coronado
Senior Researcher



Dr. Juan Miguel Moreno
Senior Researcher



Dr. Patricia Pizarro
Senior Associated
Researcher

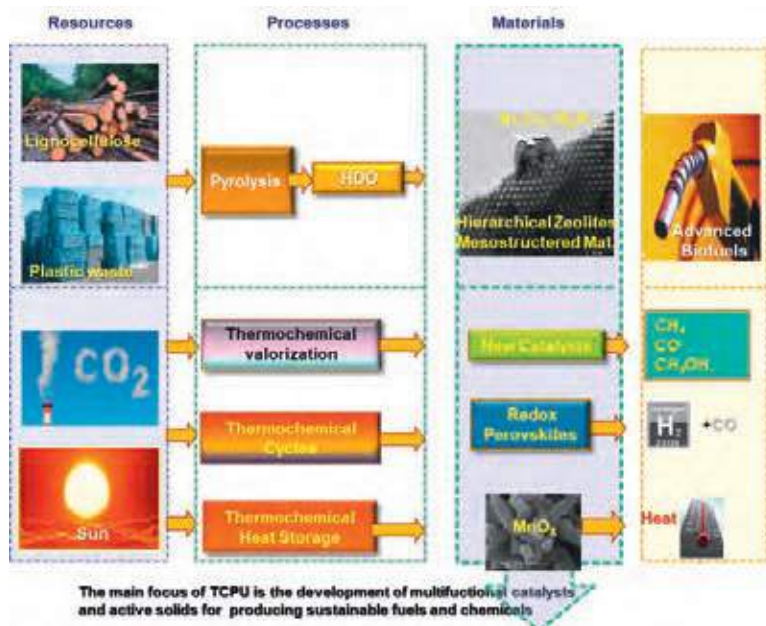


R&D Objectives

- Development of materials, mainly catalysts, and thermochemical processes for biomass, CO₂ and solid wastes valorization to fuels and chemicals.

Research lines

- Production of advanced biofuels and bio-based chemicals from lignocellulosic biomass: catalytic pyrolysis and bio-oil upgrading via hydrotreatments.
- Valorization of wastes: co-processing of agriculture/forestry residues and plastic wastes.
- Thermochemical energy storage at medium and high temperatures.
- Production of solar fuels based on redox materials: CO₂ and water splitting and chemical looping reforming of methane and CO₂ splitting.



Relevant projects and networking

The Thermochemical Processes Unit (TCPU) has coordinated the project CAS-CATBEL of the call FP7-NMP-2013-LARGE-7 (Topic: NMP.2013.1.1-1), which has been developed with the participation of 17 partners of both academic and industrial institutions, with the aim to design, optimize and scale-up a novel multi-step process for the production of second-generation liquid biofuels from lignocellulosic biomass. In the same research line, the TCPU also has participated in the project CATPLASBIO of the Spanish Ministry of Economy and Competitiveness and RES-TOENE2 of the Madrid Regional Government. The research activities related to

thermochemical storage and the production of solar fuels have been funded by the project SOLARKITE of the Ramon Areces Foundation.

Besides the above, TCPU participates at the European Energy Research Alliance (EERA) of Bioenergy, Biobased Industries Joint Undertaken (BBIJU) and at the Spanish Platform of Sustainable Chemistry and Biofuels. In addition, the unit is in contact with a number of universities and research centers in Spain, Europe, Africa (South Africa) and USA.



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.
- Tubular muffle furnace for thermal treatment under controlled atmosphere.
- Determination of textural (Ar and N₂ physisorption), chemical (ICP, TPD-TPR, TG-DTG) and structural (XRD, SEM, Raman spectroscopy) properties.

Lab scale reactors for testing catalytic activity

- Stirred tank high pressure batch reactors.
- High pressure fixed bed continuous flow reactor.

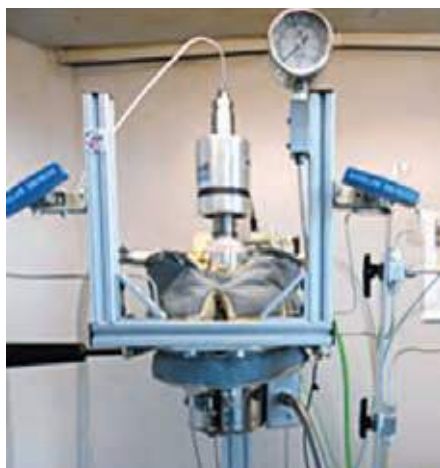
- High temperature fixed bed continuous flow reactor for testing redox materials.
- Downdraft fixed-bed pyrolysis reactors.
- Continuous feeding pyrolysis reactor.

Pilot scale reactor

- Continuous feeding fluidized bed pyrolysis reactor.
- Fixed bed continuous flow high pressure reactor.

Analysis of raw materials and reactions products

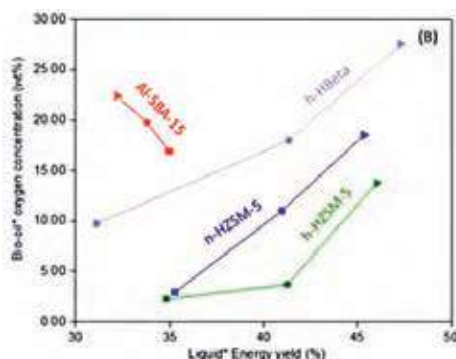
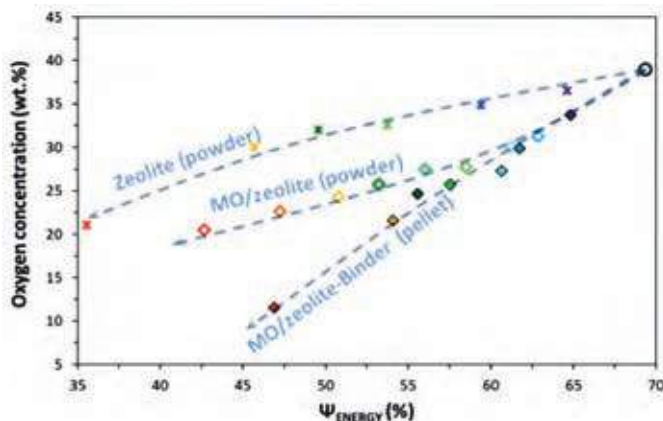
- Elemental CHNS-O analysis, Karl Fischer titration, potentiometric titration for carbonyl determination in bio oils.
- Chromatographic analysis: GC-MS, 2 GC (FID, TCD), 2 μ GC.
- Metal analysis in biochar and ash by ICP analysis.
- TG-DTG.



Scientific activities and results

Advanced biofuels

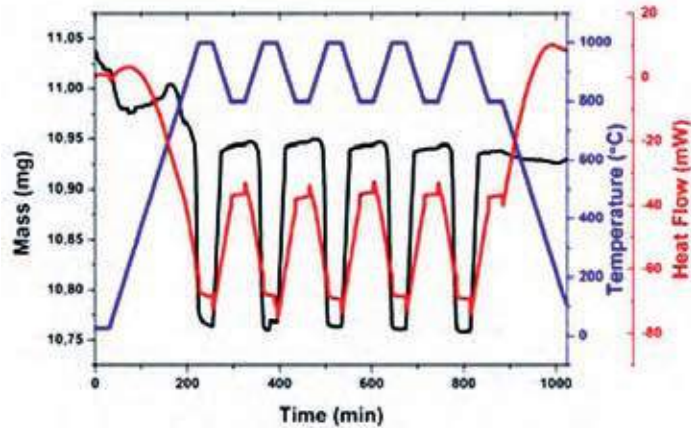
- Optimization of the design and scaling up of the catalysts for each catalytic steps in the new developed cascade process: catalytic pyrolysis and final hydrodeoxygenation (HDO) that has been proved to produce a bio oil with a max oxygen content of 6% able to be used as a drop in biofuel.
- Demonstrated the synergetic effect of co-feeding lignocellulose and plastic in catalytic pyrolysis: much higher deoxygenation degree and aromatics production.
- The effect of zeolite properties (porosity and acidity) correlated with the conversion and products distribution in the liquid oil from catalytic co-pyrolysis.
- Study of the cross-reactivity of bio-oil components (carboxylic acids and oxygenated aromatics) during hydrodeoxygenation over Ni-supported catalysts.
- Study of vapour-phase acylation between carboxylic acids and phenolic-based compounds as intermediate deoxygenation step previous to HDO of bio-oils: screening of catalysts (zeolite-based, mesoporous materials) and reaction conditions.
- Implementation of advanced analytical techniques for bio-oil characterization: carbonyl groups by potentiometric titration and hydroxyl groups by ^{31}P -NMR.





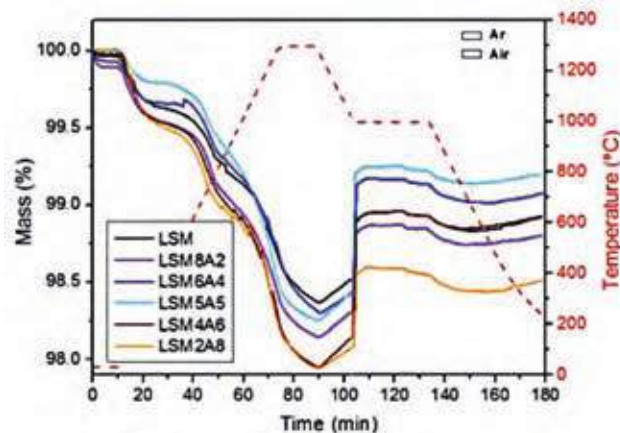
Thermochemical heat storage

- Development on new materials for heat storage based on Mn spinels, MMn_2O_4 ($\text{M}=\text{Cu}$, Li). This work was developed in collaboration University of Western Cape (Cape Town, South Africa).



Solar fuels production

- Synthesis and evaluation of redox perovskites of complex composition, (e.g. $\text{La}_{0.6}\text{Sr}_{0.4}\text{Mn}_{1-x}\text{Al}_x\text{O}_3$) with activity for CO_2 splitting.
- Development of perovskites LSF for combining chemical looping reforming of methane with CO_2 splitting.





High Temperature Processes Unit

annual report
2017



Dr. Manuel Romero
Research Professor
Head of the Unit



Dr. José González-Aguilar
Senior Researcher
Co-head of the Unit



Salvador Luque
Senior Assistant
Researcher

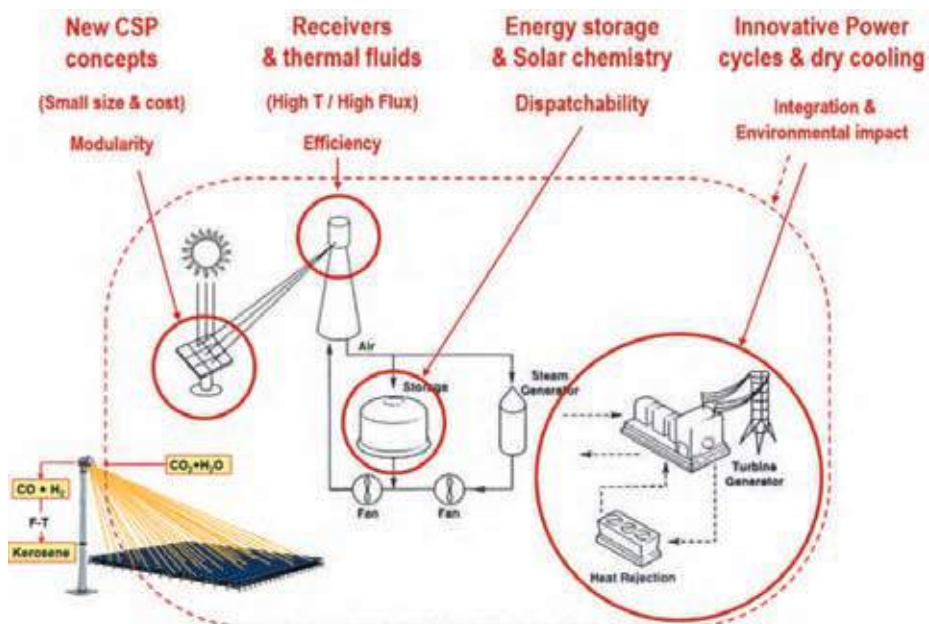


R&D Objectives

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

Research lines

- New modular schemes for high-efficient and dispatchable concentrating solar thermal technologies and urban integration.
- Solar receivers and reactors: cavity, volumetric, rotary kiln, and particle receivers. Computational fluid dynamic simulation and experimental characterization.
- Thermal energy storage (latent heat, thermochemical) for STE/CSP plants. Modelling and CFD simulation and test rigs for materials and system characterization.
- Solar fuels and chemicals production using metal oxides.
- PCU Integration & Environmental impact (advanced cycles, water, glint, glare).



Relevant projects and networking

The High Temperature Processes Unit (HTPU) is an active agent in the research on solar thermal technologies covering collaborations at local, national and international level. The HTPU leads this topic in the Comunidad de Madrid by the regional project ALCCONES (2014-2018) and it is actively contributing to the most recent developments on new heat transfer fluids and solar receivers (EU H2020 NEXT-CSP and ES Retos ARROPAR-CEX projects), solar thermal industrial process heat (EU H2020 INSHIP), production of solar fuels (EU H2020 Sun-to-Liquid project) and it takes part of the Integrated Research Program STAGE-STE (Scientific and Technological Alliance for Guaranteeing the European Excellence in Concentrating Solar Thermal Energy) that gathers 42 members, all EU research institutions

partners of EERA JP-CSP plus a significant number of additional organizations, including those from non-EU countries.

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 (SolarConcentra) and the Working Group on Energy Storage (GIA), an initiative of the Spanish Ministry of Economy and Competitiveness, within Thermal Storage activities and participates in the IEA SolarPACES Task III within the Workgroup on Thermal Storage 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).
- 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.

Singular facilities for components and prototypes testing

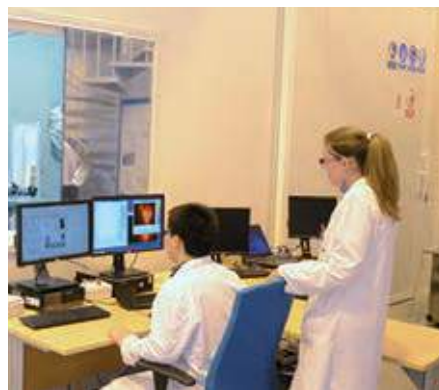
- 42 kWe high-flux solar simulator equipped with a three-axis positioning system with a static load capacity of 250 kg.
- 250 kW solar tower facility composed of 169 heliostats.

Specific test rigs

- Aerothermal characterization of volumetric absorbers.
- Thermal storage in packed and fluidized beds.

Computational design lab for high temperature processes

- Workstations.
- Specific software for computational fluid dynamic, lightning, data treatment and process control and monitoring, process engineering.



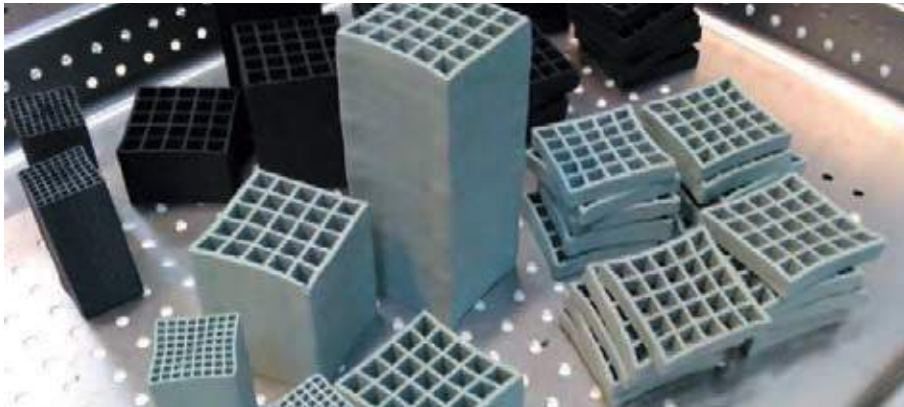
Scientific activities and results

Innovative modular concepts with minimum environmental impact

- Commissioning of a modular solar tower with 169 small heliostats able to achieve irradiance higher than 2000 kW/m².
- Optical characterisation of small facets having short focal distances.
- Customised modules for Monte Carlo Ray Tracing software for solar field design.

Solar receivers & new heat transfer fluid

- Design and Aero-thermal characterization of volumetric absorbers made by additive manufacturing (Selected Laser melting) at kW-scale in the 7 kWe high flux solar simulator.
- Aerothermal characterization of solar receivers modules at 10 kW scale in high flux solar simulator.
- Patent filed on solar receiver (WO2017060882A1).
- Design, construction and commissioning of 1 kW and 5 kW fluidised bed particle receivers.



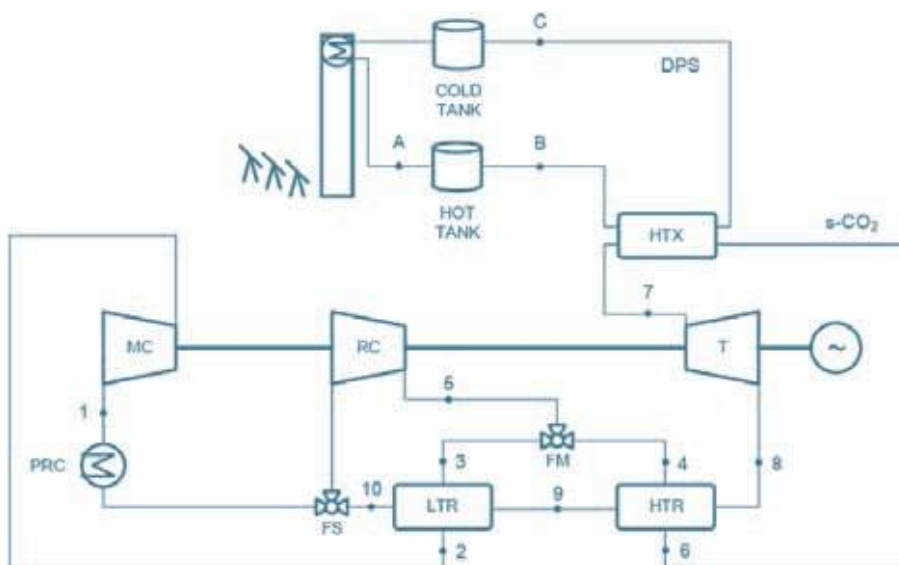


Energy storage & solar thermo-chemistry

- Development of macro-encapsulated phase change materials for thermal storage systems.
- Characterization of $\text{Mn}_3\text{O}_4/\text{CeO}_2$ mixtures: elemental analysis, thermal and structural characterizations. Performance in high-flux solar simulator.
- Synthesis and materials characterization of ceria foams from porous material of vegetable origin. Testing in high-flux solar simulator.
- Fully equipped test bench for experimental characterization of kinetics in solar thermochemistry.

High temperature processes integration & environmental impact

- Analysis on integration of new heat transfer fluids based on dense particle suspensions and supercritical fluids in central receiver solar thermal power plants.
- Analysis on innovative solar thermal power plants concepts based on thermo-electro-chemical conversion (carbon fuel cells).
- Patent filed P201730170 on system of electricity generation by means of hybrid turbomachinery.





Electrochemical Processes Unit

annual report
2017



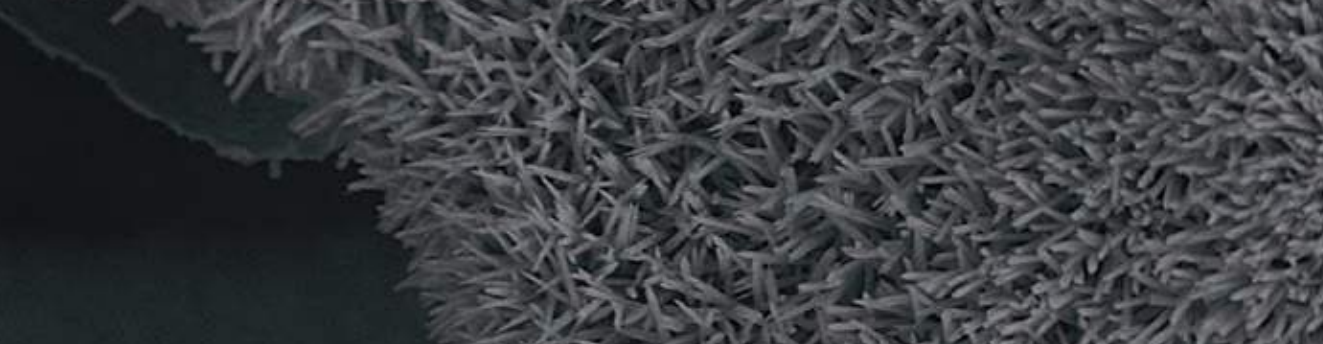
Prof. Dr. Marc A. Anderson
Research Professor
Head of the Unit



Dr. Jesús Palma
Senior Researcher
Co-head of the Unit



Dr. Rebeca Marcilla
Senior 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
 - Increase energy density by designing new electrodes and formulating advanced electrolytes.
 - Multifunctional devices combining structural and storage capacities.
- Capacitive deionization
 - Energy efficiency in water deionization.
 - Enhanced water recovery, reduction of effluents, brine concentration.
- Flow batteries
 - New electrolytes to increase energy density or reduce cost per kWh.
 - New membrane-less concepts.
- Metal-air/metal-ion batteries
 - Primary: electrodes and electrolytes for lower cost and increased performance.
 - Secondary: promote the reversibility of $\text{MeO}/\text{Me}^{n+}$ and O_2/O^{2-} reactions.
 - Structural batteries based on reinforced electrodes and solid electrolytes.
- Battery testing
 - Performance evaluation, aging and cycle life.
 - Non conventional testing.



Relevant projects and networking

In 2017 the Electrochemical Processes Unit (ECPU) has participated in 15 research projects ranging from fundamental to industrial research. One of them, is funded by the R&D collaboration program of regional government of Comunidad de Madrid; three projects belong to the applied research programme of MINECO, identified as Retos Colaboracion; one to the fundamental research programme, identified as Retos Investigacion; two are projects supported with European funds through the European Research Council, and the Joint Undertaking on Fuel Cells and Hydrogen. Finally, the Unit has been involved in 8 research contracts funded directly by private companies.

The researchers of the ECPU have made an effort to expand its network in 2017, resulting in a greater involvement in Spanish and European organizations. For example, the Unit participates in the Joint Programme on Energy Storage of the European Energy Research Alliance (EERA); it has coordinated the Electrochemical Storage subgroup of the Working Group on Energy Storage (GIA), created by several Spanish Technological Platforms; and is member of the Spanish network of excellence in Redox Flow Batteries (BAT-FLU).

In 2017, the ECPU has established new cooperation agreements for training and mobility actions with foreign universities and research organizations in China, USA, Australia, Portugal and Italy.

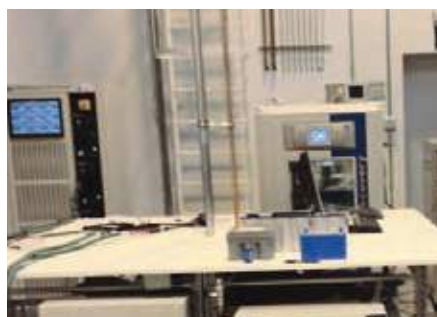


Facilities

Still cells laboratory

- Synthesis of materials: sol-gel, hydro-thermal and ultrasonic.
- Particle size and Z-potential analysis.
- Electrode preparation: ink mixer, dip-coater, doctor blade, roll press.
- Cell manufacturing equipment: electrode puncher, coin cell crimper, vacuum sealing machine.
- Potentiostats (30 channels x $\pm 10V - 0,5A$ max.); boosters 4A and 10A; impedance spectroscopy.
- Rotating disk and rotating ring-disk electrodes.
- Climatic chamber 50 L (-40 to +180°C).
- Inert glove box.

- Flow battery test beds from 5 kW to 35 kW.
- LabView programmable control system.



Flow cells laboratory

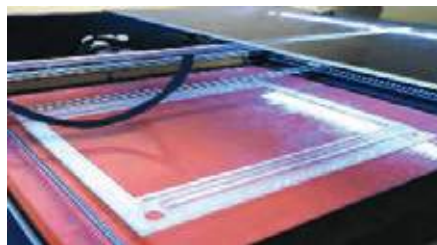
- Schlenk line for synthesis of polymers.
- Inert glove box.
- Flow cell manufacturing equipment.
- Flow cell control and test equipment.
- Potentiostat (16 channels x $\pm 10V - 0,5A$ max); booster 4A; impedance spectroscopy.

Modeling, design and manufacturing facilities

- 2 Workstations for high throughput computing.
- Computational chemistry: gaussian.
- Computer fluid dynamics: COMSOL Multiphysics.
- 3D Design: Solidworks.
- 3D Printers: 600 L and 4 L working volume; fused deposition.

Electrochemical devices testing laboratory

- Cell cycler (64 channels x 50 mW, 5V – 10mA max.).
- Cell cycler (16 channels x 30 W, 5V – 6A max.).
- Battery cycler (4 channels x 300 W, 80V – 50A max.).
- Battery cycler (3 channels x 8 kW, 120V – 200A max.).
- Climatic chamber 200 L (-40 to +180°C and 10 a 98%H).
- Flow reactor test bench with controlled Q, T, P, pH, ORP...



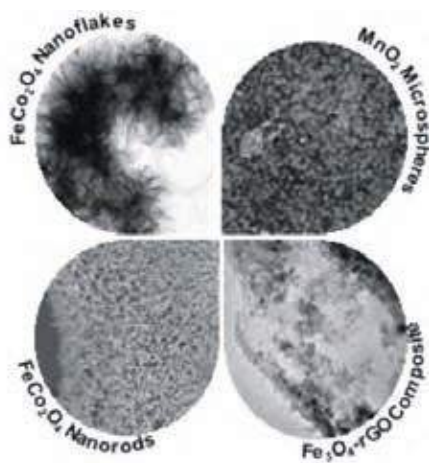
Scientific activities and results

Electrochemical capacitors

- Supercapacitors with aqueous electrolytes and pseudocapacitive electrodes made of nanostructured metal oxides deposited on graphene and other carbon materials to increase the capacitance.
- Performance of supercapacitors with in-situ characterization techniques such as X-ray diffraction, SAXS and WAXS.
- Development of a demonstrator to supply power to electronic devices. A stack of 5 cells connected in series has been manufactured and tested.
- A Spanish patent application entitled “material compuesto multifuncional” was filed with application No. P201730017.

Capacitive deionization (CDI)

- Assessment of an application of capacitive deionization to the treatment of high salinity brackish water.
- Manufacturing of larger area electrodes with larger active mass loading to improve the performance of deionization reactors. Electrodes with 1200 cm² geometric area and 40 mg/cm² have been produced.
- Investigation of composite materials made of nanocarbons and metal oxides for CDI electrodes.
- A Spanish patent application entitled “carbon nanotube fibers for capacitive deionization” was filed with application No. P201730828.



Redox Flow Batteries (RFB)

- Exploration new chemistries to avoid the use of ion selective membranes.
- Study of the thermodynamics and fluid dynamics of immiscible phases to understand a key factor in membrane-free flow batteries.
- Designing and manufacturing of membrane-free flow battery prototypes.
- Formulation of new electrolytes with highly concentrated organic redox couples in aqueous and non-aqueous solvents.
- Designing and testing demonstrators based on vanadium to assess the scaling up of the technology.
- Technology consulting for the development and operation of full size prototypes.

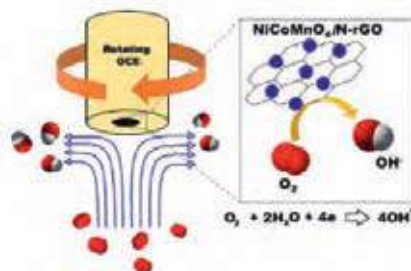


Metal-air batteries/metal-ion batteries (Me-air/Me-ion)

- Investigation of the Al electrodeposition process and its reversibility in different electrolytes and substrates such as carbons and aluminum alloys.
- Investigation of air electrodes (positive) compatible with the electrolytes selected for reversible aluminum electrodes (negative).
- Research on materials such as metal oxides, graphene and conductive polymers to catalyze the oxygen reduction/

evolution reactions or to host intercalated aluminum ions.

- Designing of a laboratory prototype cell to test cathodes under realistic operating conditions.
- Increasing the operating voltage and reversibility of Zinc-air batteries applying nanostructured active materials and advanced electrolytes respectively.
- A new research line has been launched on solid electrolyte Li-ion batteries with enhanced properties such as flexibility, mechanical strength and retarded flammability.



Battery testing

- Development of software tools and testing protocols based on pulses and variable frequencies to determine performance and accelerated aging.
- Application software tools and protocols to generate unconventional charging/discharging profiles to improve batteries and capacitors performance and cycle life.





Biotechnological Processes Unit



Dr. Mercedes Ballesteros
Principal Researcher
Head of the Unit



Dr. Cristina González
Senior Assistant
Researcher



Dr. María José Negro
Senior Associated
Researcher



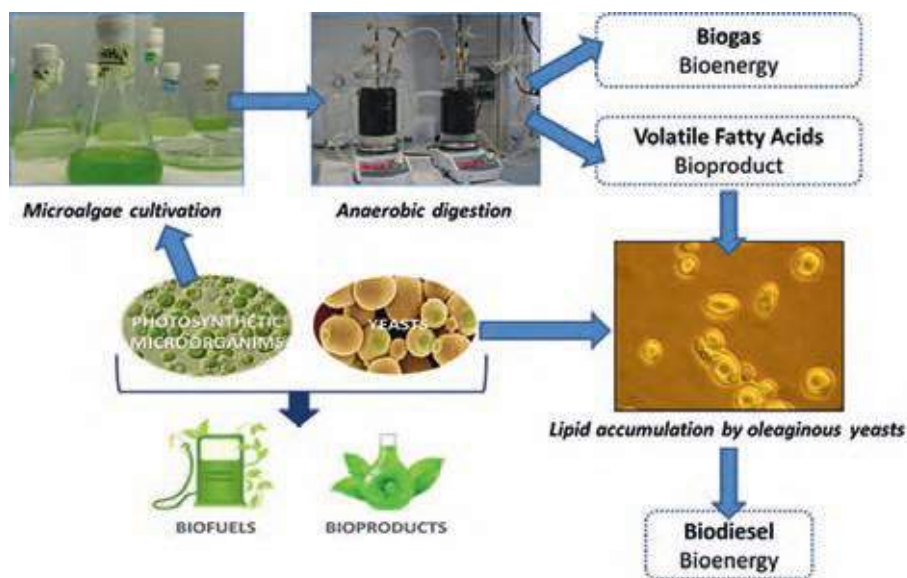
Dr. Ignacio Ballesteros
Senior Associated
Researcher

R&D Objectives

- To develop technologies to produce biofuels and bioproducts via biological processes using lignocellulosic and microalgal biomass.

Research lines

- Microalgae in upstream processes: microalgae and aerobic bacteria consortia for wastewater treatment.
- Microalgae downstream processes: photosynthetic biomass anaerobic digestion.
- Microbial oil production from the carboxylic platform (volatile fatty acids).
- Lignocellulose based biofuels and bioproducts.
- Use of non-conventional yeast as efficient biocatalyst for biofuels and bioproducts from lignocellulose.



Relevant projects and networking

The Biotechnological Processes Unit (BTPU) participates in several national and international projects related with the use of photosynthetic microorganisms for wastewater treatment and microalgae biomass valorization by anaerobic digestion. In this sense, BTPU leads the European project EUALGAE (2015-2019), supported COST Action of H2020, which involves more than 180 investigators from 25 countries. BTPU also leads the national project WWAL-GAS (2014-2018) and is involved in MICROAL-BAC (2015-2018) which is performed in collaboration with industry. Under WWAL-GAS, the evaluation of different bioreactor configurations and the production of alternative bioproducts (volatile fatty acids) are assessed. Furthermore, the Biotechnology Unit is currently working in the development of tools to improve phototrophic biomass production through the participation in INSPIRA1 project (2014-2018) to determine the feasibility of using *Spirulina* biomass for anaerobic digestion. The Unit is also actively involved in two ERANET projects, namely WASTE-2BIO (2017-2020) (ERANET+ BESTF3) and BIOGASMENA (2017-2020) (ERANET

MED), addressing key technological challenges to foster the development of biogas technology in both the EU and the Mediterranean region.

BTPU is also very active in the valorization of lignocellulosic biomass. In this sense, BTPU is working in yeast and bacteria culture for bioenergy and bioproducts production from lignocellulosic residues. The Unit works in LIGNOYEAST (2015-2018) and BIO_LIG-WASTE (2016-2019) projects related with the production of bioethanol at high substrate loading and lactic acid from lignocellulosic streams. In 2017 BTPU has starting leading the national project ACMIBIO_AD (2017-2021) with the objective to produce microbial oils VFAs obtained by anaerobic digestion agri-food residues.

As a result of participation in the 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

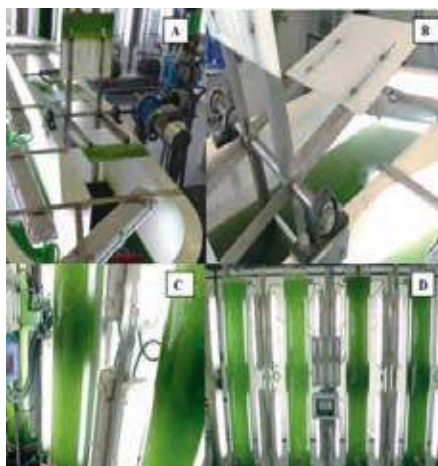
- Gas and liquid chromatographs with different detectors (FID, TCD, DAD, RI).
- Ionic chromatography.
- Equipment for routine analysis; TS/VS, pH, TNK, COD...
- Spectrophotometers: microplate and cuvette type.

Molecular biology lab

- Polymerase chain reaction: traditional and real-time.
- Electroporator.
- Denaturing gradient gel electrophoresis and agarose electrophoresis.

Pilot plants

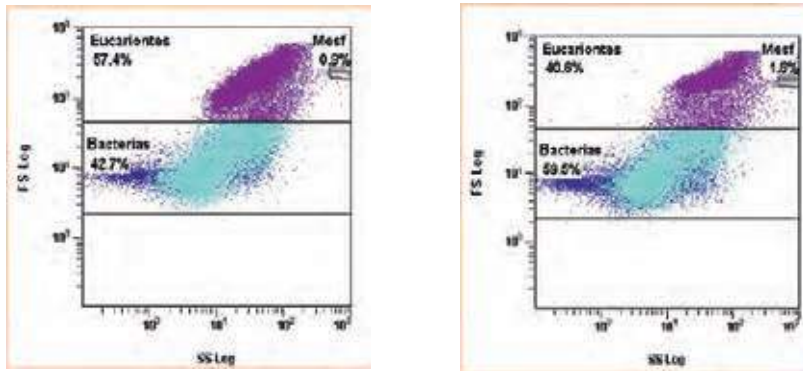
- Steam explosion and screw extruder pretreatment plants for lignocellulosic material.
- Bioreactors.
- 3 modules of 4 bubbled columns each (1 m³ in total).
- 2 open raceways (1 m³ in total).



Scientific activities and results

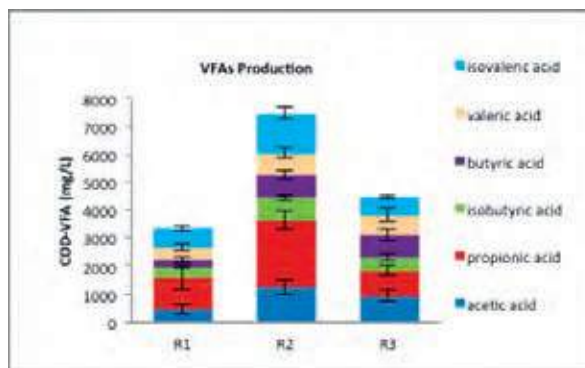
Microalgae in upstream processes: microalgae and aerobic bacteria consortia for wastewater treatment

- Assessment of symbiotic interactions between microalgae and bacteria by pyrosequencing at lab- and pilot- scale reactors.
- Evaluation of nutrients removal mechanisms and kinetics under different operational conditions.
- Study of strategies to be implemented under a limited efficiency of microalgae-bacteria consortia for wastewater bioremediation technology.



Microalgae downstream processes: photosynthetic biomass anaerobic digestion

- Alternative bioproducts generation (VFAs) as a chemical platform.
- Evaluation of different anaerobic digester configuration (CSTR vs UASB) for biogas and VFAs production purposes.
- Potential strategies to decrease archaeas activities to enhance VFAs accumulation.
- Microbial community's identification in anaerobic microbiome of biodigesters operated to produce VFAs.
- Effect of microalgae biomass storage methods on their biogas production yields.
- Effect of anaerobic inocula on biogas yields: ammonium tolerant inoculum and thermo-adapted sludge inocula.



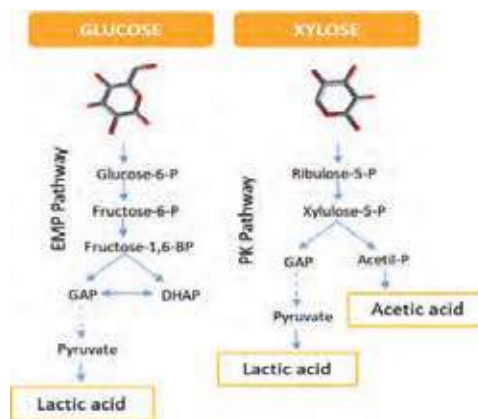
Microbial oil production from the carboxylic platform (volatile fatty acids)

- Evaluation of oleaginous yeast growth on VFAs.
- Analysis of lipid composition produced by yeast.
- Strategies to improve lipid accumulation.



Lignocellulose based biofuels and bioproducts

- Study of the effect of the insoluble solids on yeast: ethanol production capacity and tolerance to inhibitors.
- Optimization of the yeast propagation phase.
- Lactic acid production from lignocellulosic hydrolysates.
- Enzymatic hydrolysis tests to release monomeric sugars from lignocellulosic hydrolysates.
- Evolutionary engineering approach to obtain microorganisms with improved fermentative traits.



Use of non-conventional yeast as efficient biocatalyst for biofuels and bioproducts from lignocellulose

- Evaluation of *K. marxianus* potential as a tool for tailored biotechnological production.
- Evolutionary engineering approaches to develop new *K. marxianus* strains.





Electrical Systems Unit



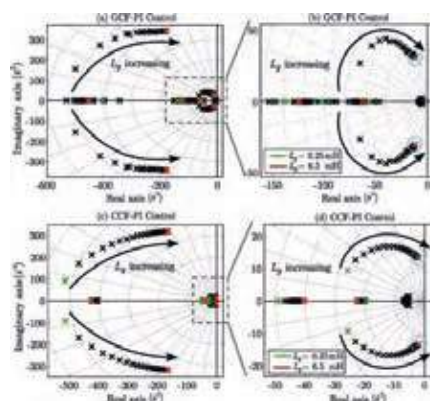
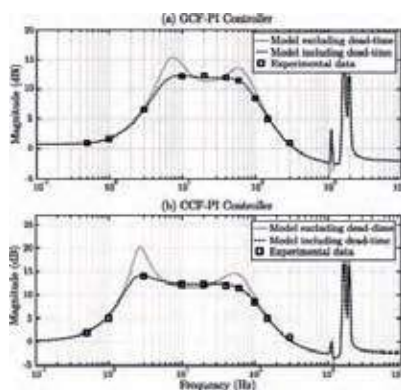
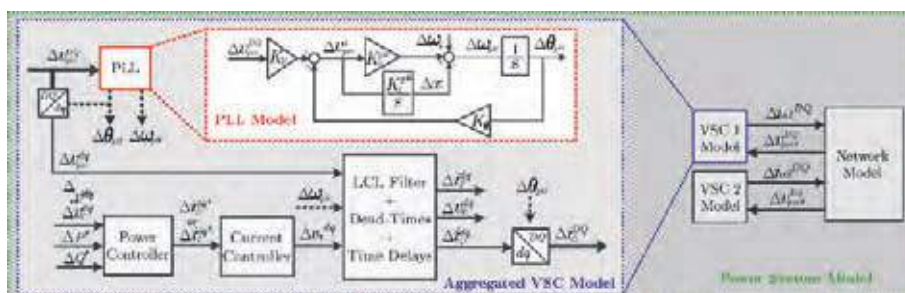
Dr. Milan Prodanovic
Senior Researcher
Head of the Unit

R&D Objectives

- To improve management, reliability and stability aspects of future electricity networks with high share of renewable and storage technologies, to propose optimisation based algorithms for demand management and renewable integration and to increase energy efficiency in industrial applications.

Research lines

- Renewable and energy storage integration.
- Stability of power networks with high penetration of renewables.
- Reliability of power systems with high penetration of renewables.
- Power electronics applications in distribution networks and microgrids.
- Building and residential demand modelling, demand flexibility.
- Forecasting of demand and generation.
- Energy management systems.
- Energy efficiency in systems for vibration testing.



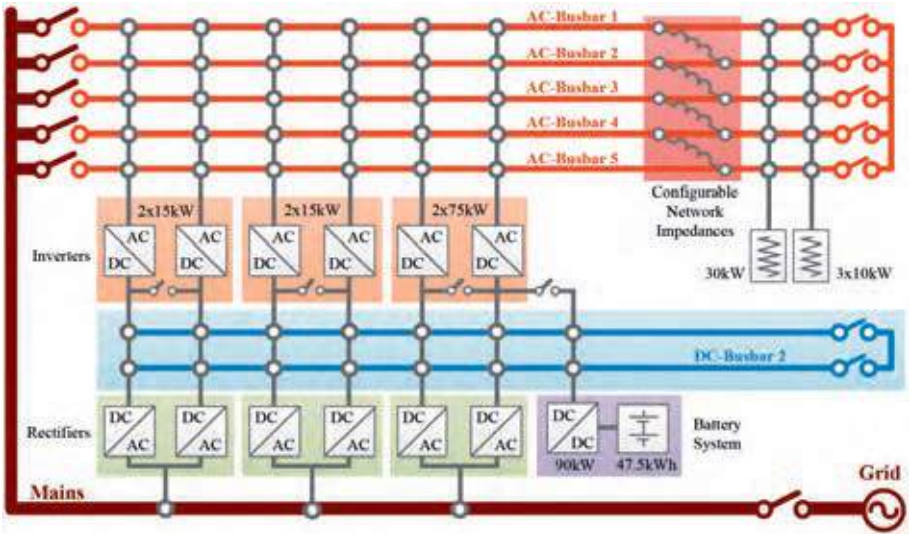
Relevant projects and networking

In 2017, the Electrical Systems Unit (ESU) participated in several research and development projects. Principal research activities were performed within the framework of the PRICAM project (2014-2018) and the EnRed project funded by Foundation Iberdrola (2017-2018). These projects addressed management, stability and reliability aspects of renewable and storage integration to power networks and also the topic of control of power electronics interfaces for grid applications. Regarding the industrial collaboration the main projects were LPT (2015-2018) addressing energy storage integration to power networks, GENPER (2017) creating tools for residential demand profile generation and demand recognition, COBING (2017) providing cost estimation for battery systems integrated to power networks and EEISVT (2011-) dealing with the development of energy efficient vibration test equipment.

ESU actively contributed to the Spanish Platform for Power Networks (FUTURED) within two workgroups: Power Electronics



and Energy Storage. Also, in 2017 ESU continued its participation 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

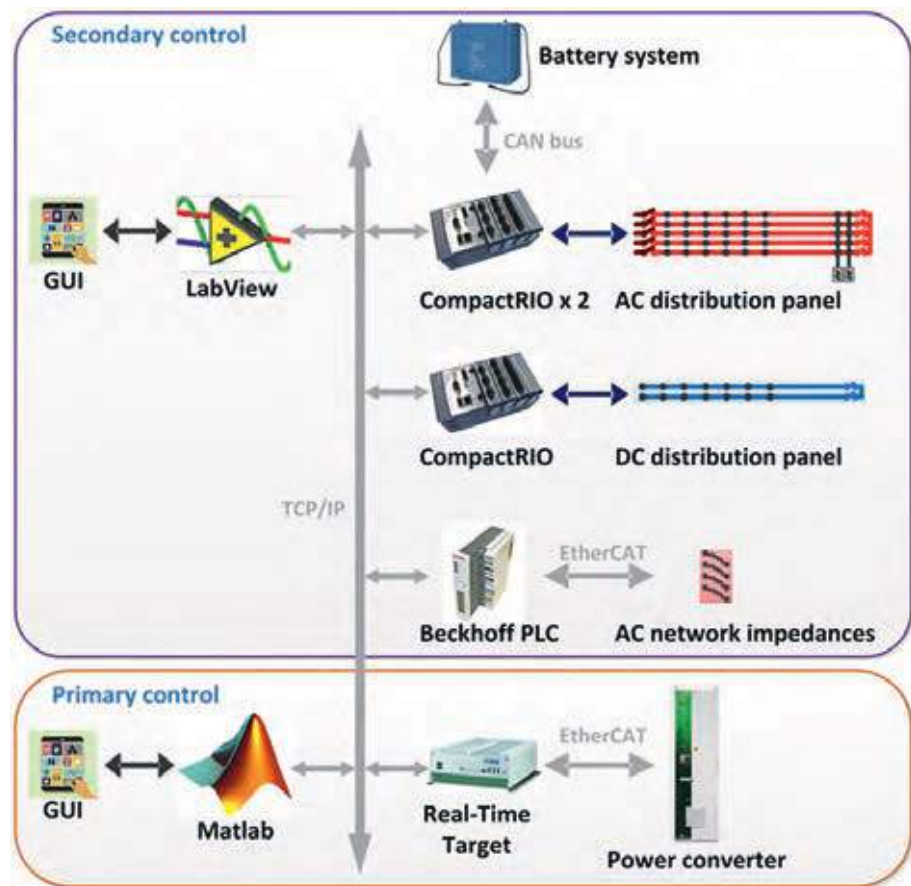
- KNX (Siemens) based technology.
- Sensors and actuators.

Modelling and simulation tools

- Matlab, PowerWorld, IPSA, PLECS.

Acquisition and control platforms

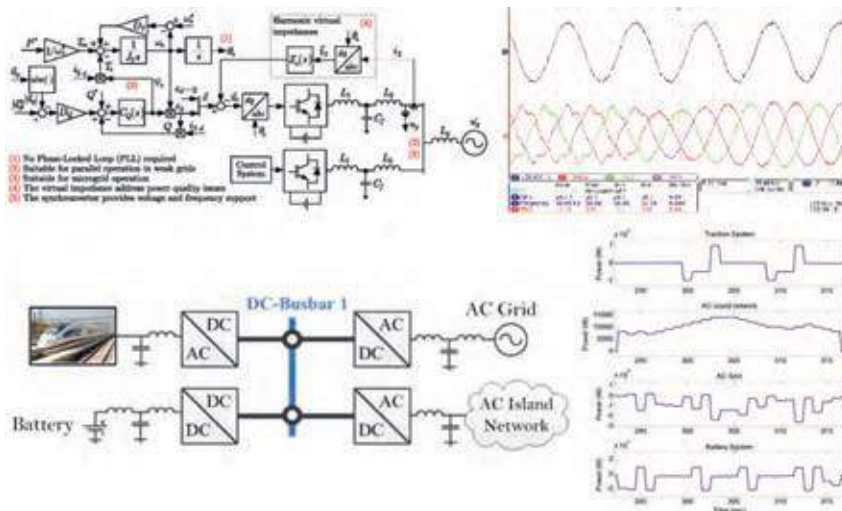
- LabView (NI), Beckhoff, Texas Instruments etc.
- Oscilloscopes, bench power supplies and function generators.



Scientific activities and results

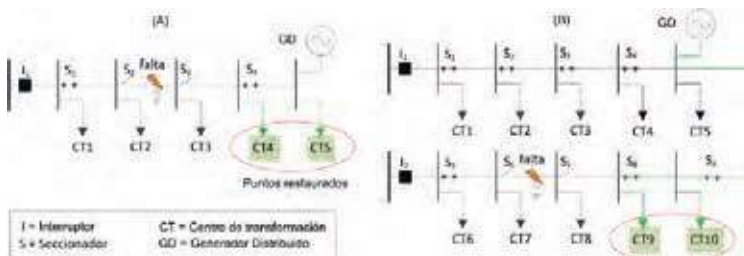
Stability and control of power converters in grid applications

- Small-signal modelling of power networks and microgrids.
- Transient stability analysis for power networks based on Singular Value Decomposition.
- Control of multi-terminal DC networks in power transmission and distribution applications.
- Energy management algorithms for railway systems.
- Novel control systems approach to battery interface in power networks.
- Power quality issues in weak power networks.



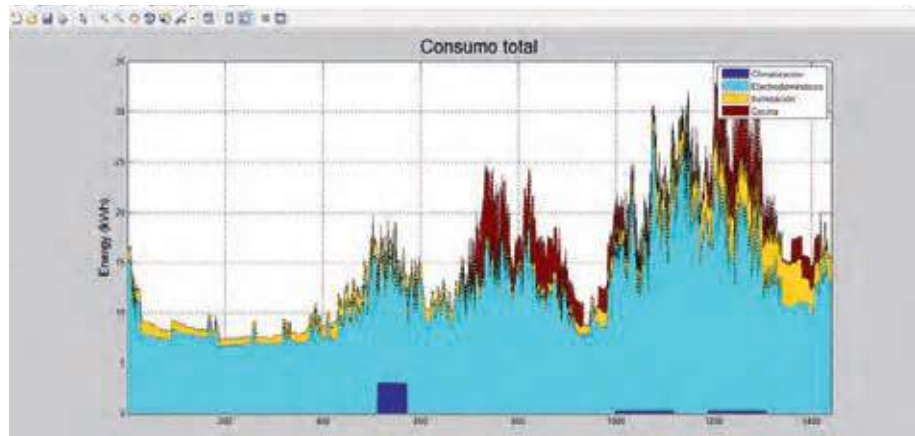
Power network reliability studies

- Novel analytic methods for reliability assessment of distribution networks with high penetration of renewable and energy storage technologies.
- Reliability assessment of SmartGrids technologies deployed in distribution networks.
- Optimisation based sizing tools for renewable and energy storage installations for improving continuity of supply in power networks.



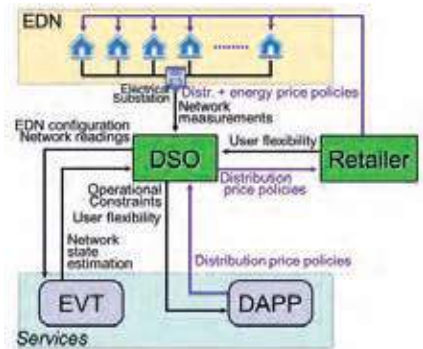
Demand modelling and demand flexibility

- Residential demand modelling for advanced demand response schemes.
- Automatic demand profile generation for residential customers taking into account their regional and statistic properties.
- Automatic recognition of the home appliance use from Smart Meter data.
- Demand flexibility in commercial buildings.



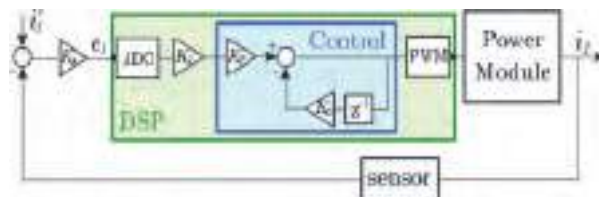
Network applications and services

- Demand and PV generation forecasting for physical islands.
- Demand prediction methods using top-to-bottom and bottom-to-top approaches.
- Techno-economic analysis of demand response schemes based on individual pricing for residential users.



Energy efficiency in systems for vibration testing

- Development of control boards for switching power amplifiers in vibration system applications.
- Control system analysis of switching amplifiers.
- Development of a 20kW bidirectional isolated industrial power supply.
- Improvement of control algorithms for Intelligent Shaker Manager.





System Analysis Unit

annual report
2017



Dr. Javier Dufour
Senior Researcher
Head of the Unit



Dr. Diego Iribarren
Senior Assistant
Researcher



Dr. José Luis Gálvez
Senior Assistant
Researcher

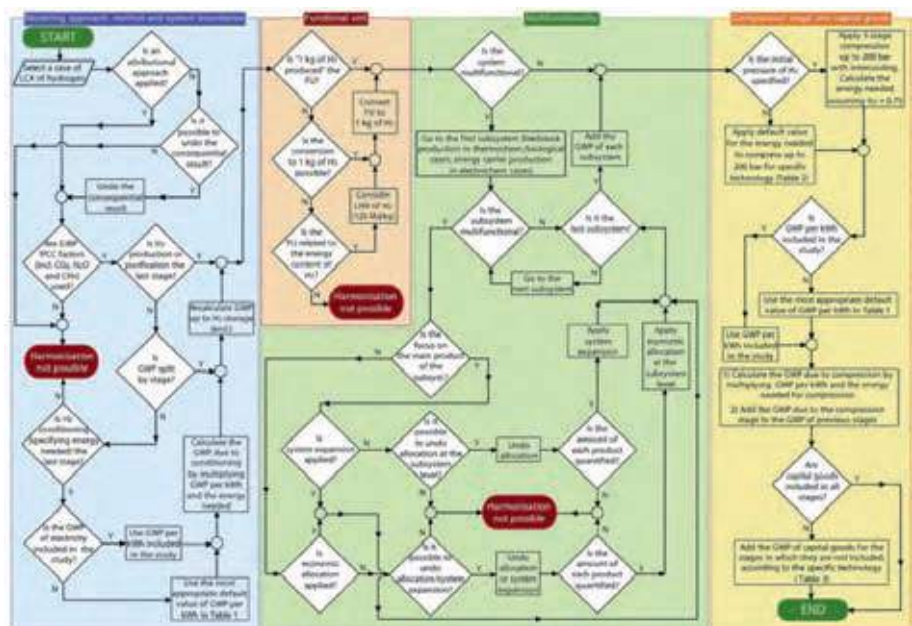


R&D Objectives

- 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, 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 economic/environmental evaluation.
- Prospective analysis of energy scenarios: development of energy system models; integration of sustainability indicators and geographic information systems.





Relevant projects and networking

During the last year, the System Analysis Unit (SAU) has participated in four European projects related to solar fuels (EU H2020 Sun-to-Liquid project), 2nd generation biofuels based on catalytic pyrolysis of lignocellulosic biomass (EU FP7 CAS-CATBEL project), end-of-life strategies for fuel cells and hydrogen technologies (EU FCHJU HyTechCycling project) and the deployment of compressed and liquid natural gas infrastructure (EU CEF Eco-Gate project). At domestic level, SAU has developed the BIOSUSCAT project, focused on the sustainability and techno-economic assessment of “building block” compounds obtained from lignocellulosic biomass, and the PICASO project where the Spanish alternative mobility model

is being developed. At the regional level, SAU is responsible, in the ResToEne-2 programme, of the roadmapping of novel pathways for the production of clean transportation fuels from agro-forestry and oily waste. Moreover, SAU has developed six research contracts with other institutions dealing with feasibility studies (3), process simulation (2) and energy modelling (1).

Regarding networking, SAU has leaded, as Operating Agent, the Task 36 of the IEA Hydrogen Implementing Agreement. The Unit has been actively involved in the Hydrogen Europe Association and the Spanish Network for Life Cycle Assessment (esLCA).

Capabilities

Sustainability assessment of energy systems

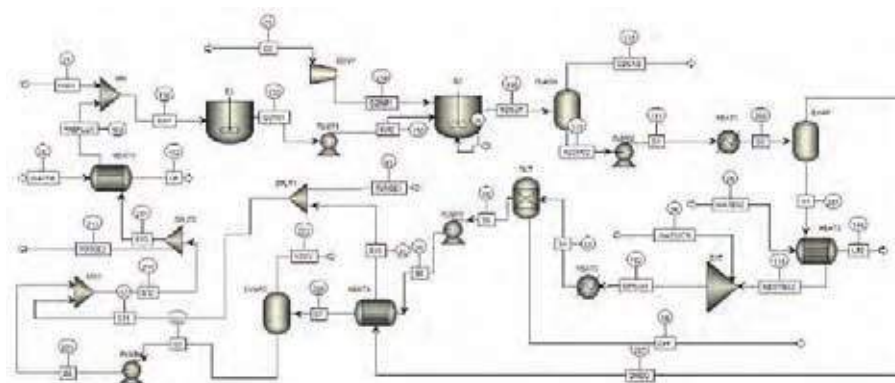
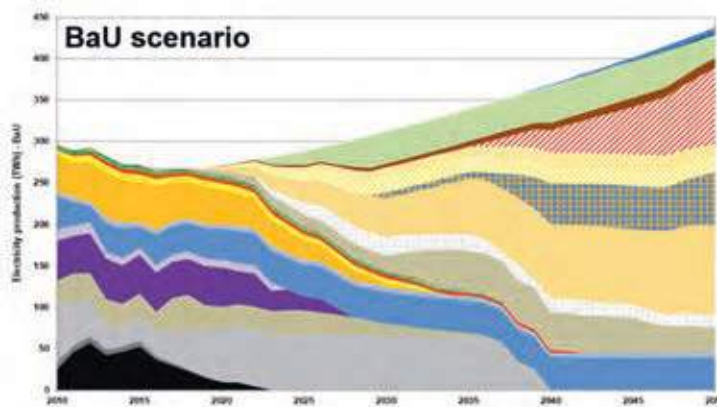
- Environmental LCA, carbon footprinting and ecodesign.
- Combined application of LCA and Data Envelopment Analysis for multi-criteria decision analysis.
- Harmonised LCA and life cycle sustainability assessment.

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

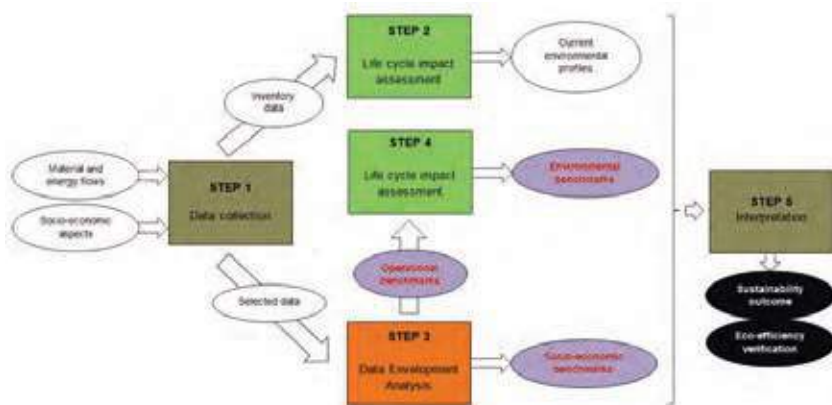
- Process design, simulation and optimization.
- Circular economy energy modelling.
- Energy, exergy and emergy analyses.
- Conventional economic analysis and externalities.



Scientific activities and results

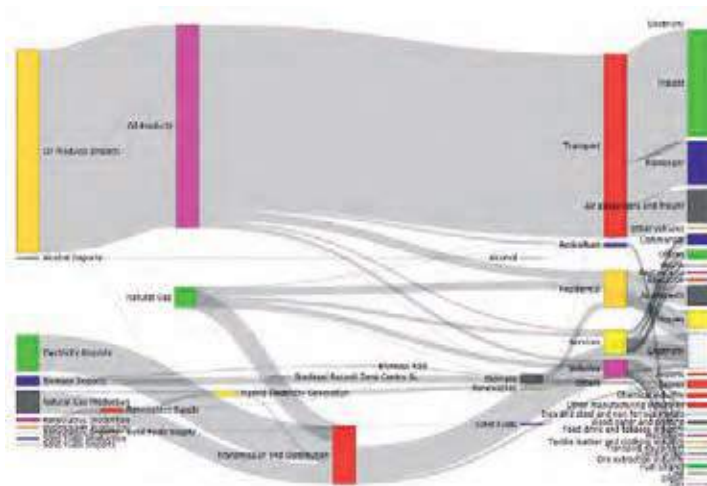
Sustainability assessment methodology

- LC + DEA methods as multi-criteria decision analysis tools in the field of energy systems analysis.
- Harmonised LCA of hydrogen energy systems.
- Definition of novel end-of-life technologies for FCH products.
- Prospective assessment of life-cycle indicators in energy scenarios: power generation and transport sectors.



Energy systems modelling

- Roadmapping for new lignocellulosic biofuels.
- Techno-economic and environmental assessment of high-value bio-based products.
- Validation and enhancement of the energy systems model of Peru.
- Advances in prospective energy security indicators.





Photoactivated Processes Unit



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

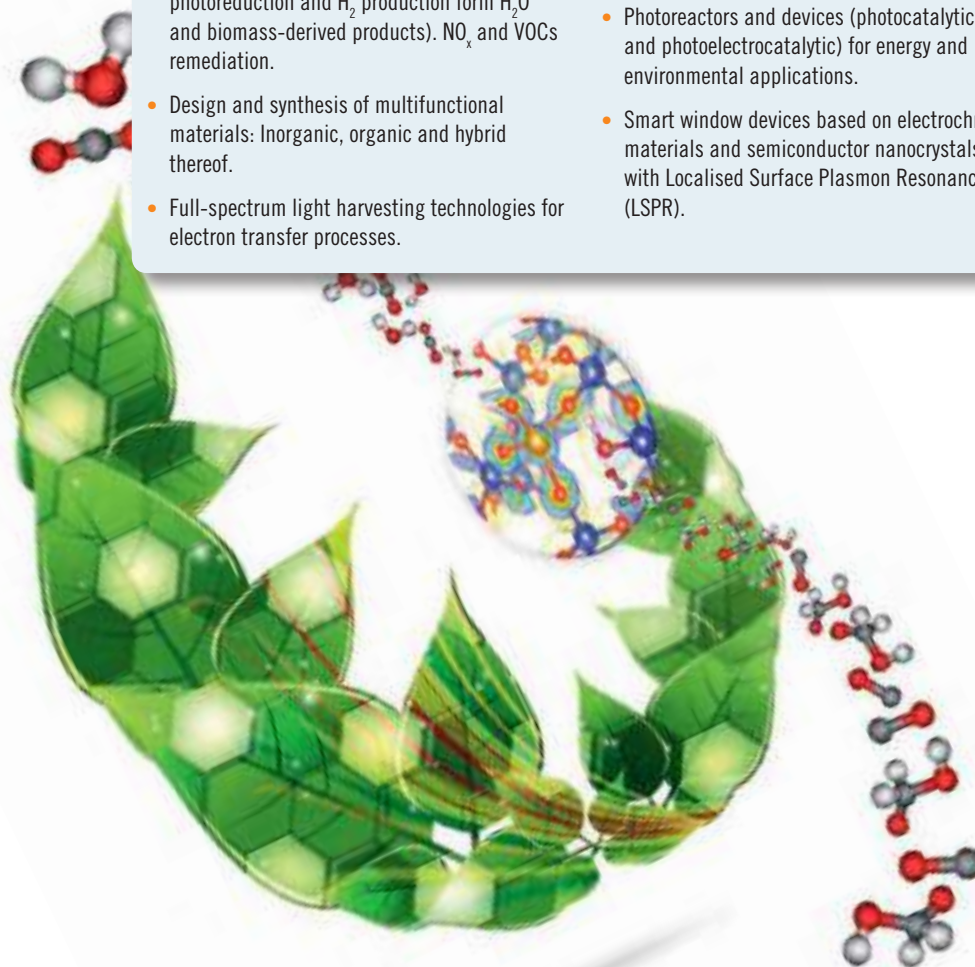


Dr. Marta Liras
Senior Assistant
Researcher



Dr. Raúl Pérez
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

The Photoactivated Processes Unit (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) under the European Union's Horizon 2020 research and innovation programme. 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 Ramon y Cajal Programme project (2015 call) and a Juan de la Cierva Formation grant (2017 call), all of them related with the design and synthesis of new materials (inorganic semiconductors, conductive polymers and organic-inorganic hybrids) as heterogeneous photocatalysts and photoelectrodes for artificial photosynthesis. In the regional framework, the unit is participating into the MAD2D program (Fundamental Properties and Applications of Graphene and other two-dimensional Materials).

Besides, PAPU is coordinating the national Excellence 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) where the head of the Unit coordinates the CO₂ uses working group.



Facilities

Synthesis of materials

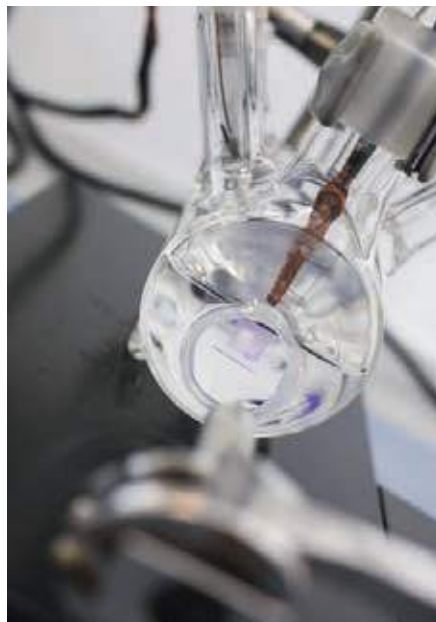
- Equipment for organic and polymer synthesis.
- Thermal and microwave ovens and autoclaves for hydrothermal synthesis.
- Tools for chemical synthesis under controlled atmosphere.
- Ball Milling.
- Spin Coating.

Materials characterization facilities

- Single-crystal and powder 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 resolve fluorescence spectrometer.
- Electro- and photoelectrochemical characterization in three and two electrode cell configuration. Cyclic voltammetry, photovoltage, photocurrent and electrochemical impedance spectroscopy (EIS) by potentiostatic and galvanostatic measurements.
- *In situ* and *operando* cells for spectroscopic measurements such as FTIR, Raman, XPS, NEXAFS, at laboratory and synchrotron set ups:
- Near-ambient pressure (NAP) XPS which allows the *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.



- Reactors for photocatalytic H₂ production coupled to in-line gas chromatography for product analysis.
- Photoelectrochemical cells for solar fuels production by water splitting and CO₂ reduction, coupled to 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

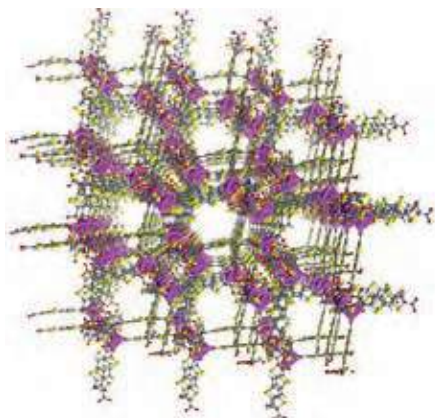
- Band-Gap engineering synthesis of UV- and visible-light-absorbing metallates based on group-5 metals and cations with outer shell s-electrons.
- Preparation of novel oxide-oxide hetero-junctions with improved photocatalytic activity and extended absorption spectrum.
- Controlled deposition of metal nanoparticles as co-catalysts in mono- and bi-metallic catalytic systems.

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 polymers (linear, hyper-branched and porous networks) based on DTT and BOPHY.
- Post-functionalization of conjugated polymers.
- Preparation and characterization of hybrid materials based on conjugated porous polymers and inorganic semiconductors.

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

- Determination of structural, textural and morphological properties of multifunctional materials.
- Optoelectronic characterization by time-resolved optical techniques to correlate these intrinsic properties with the efficiency of the devices for light-driven technologies.
- *In-situ* characterization under working conditions using vibrational and optical spectroscopies using 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.
- Tunable selectivity of CO₂ photoreduction with metal nanoparticle co-catalysts.
- H₂ production from biomass derivatives in real matrices.
- Scalability studies for CO₂ photoreduction catalysts.
- Preparation of thin films of all the new synthesised materials and evaluation as photoelectrodes in photoelectrochemical cells.





Advanced Porous Materials Unit

annual report
2017



Dr. Patricia Horcajada
Senior Researcher
Head of the Unit

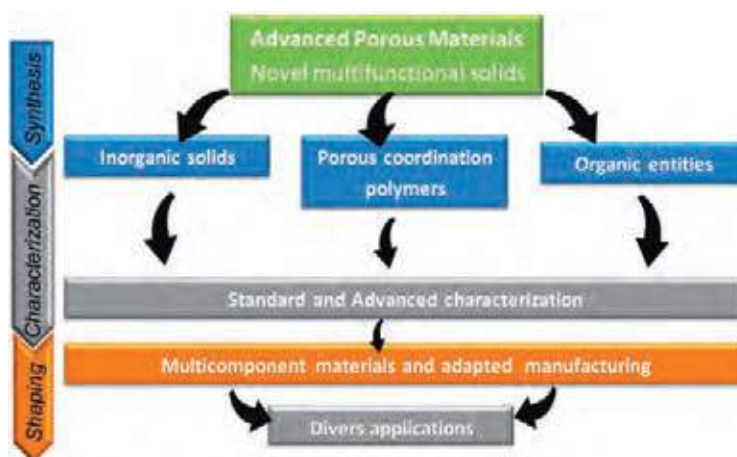


R&D Objectives

- 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

- Advanced hybrid materials: porous coordination polymers (also known as Metal-Organic Frameworks).
- Inorganic solids with regular and/or hierarchical porosity.
- Organic entities as building units of hybrid solids and/or 3D materials.
- Tuning of the physicochemical properties of materials (e.g. conductivity, reactivity, adsorption) through the control of their chemical nature and textural properties.
- Complete characterization (standard and cutting-edge techniques): Improvement of the material performances via the full understanding of their physicochemical properties.
- Multicomponent materials and manufacturing (scale-up and shaping): control of particle size, morphology, thin films, membranes, columns, pellets and monoliths, among others.





Relevant projects and networking

Despite its recent creation in February 2016, during 2017 the Advanced Porous Materials Unit (APMU) has been involved in 3 national projects. The project Raphael (2016-2019), funded by MINECO, focused on the development of new multifunctional materials for CO₂ photoconversion. A project funded by BBVA Leonardo call (2017-2019, PolyMOF) was dedicated to the preparation of new conducting polymer@MOF composites for energy storage. Finally, another project funded by Iberdrola Foundation, was aiming to develop electroactive metal@MOF composites for different applications (energy storage, sensing, biomedicine). In addition APMU has been awarded with 6 personal fellowships: 2 European “Marie Curie Europe Program”, 1 national “Ramon y Cajal” and 3 regional grants (Junior Talento Postdoctoral, Predoctoral and Technician fellows).

APMU possesses a large frame of collaborations at the national, European and international level that has enhanced mobility actions and collaborative projects. APMU is also involved in the MATERPLAT Spanish platform, promoting innovation in advanced materials.



Facilities

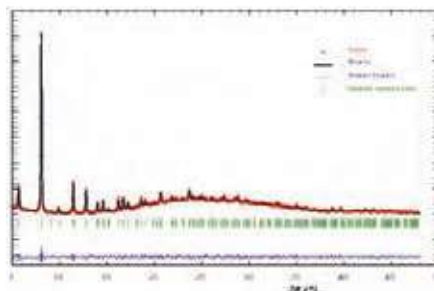
Synthesis

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



Characterization

- High-through put filtration system coupled with multi-sample XRPD.
- *In situ* structural characterization (XRD, IR) as a function of temperature, adsorbate and pressure.
- Experimental crystalline structure determination and refinement.
- Chemical, structural, mechanical and colloidal stability tests (HPLC, XRD, DLS).
- Computation of properties of periodic structures using state-of-art density functional theory methods (ORCA, Dmol3, CASTEP, VASP codes) and atomistic modelling.



Manufacturing

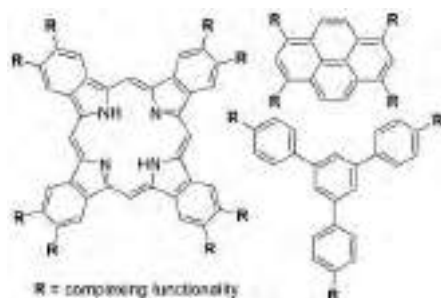
- Supercritical CO₂ extraction system (material purification, adsorption, shaping).
- Press-molding and monoliths.
- Spin-coating (thin films, membranes).



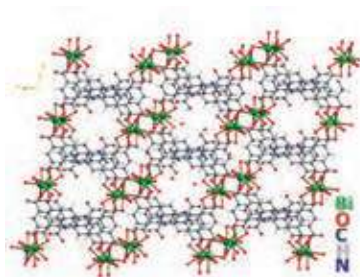
Scientific activities and results

Organic entities

- Development of multigram-scale synthetic procedures for the preparation of multipodal organic linkers (complexing functionalities) with potential photo-, electro- and proton conductivity.

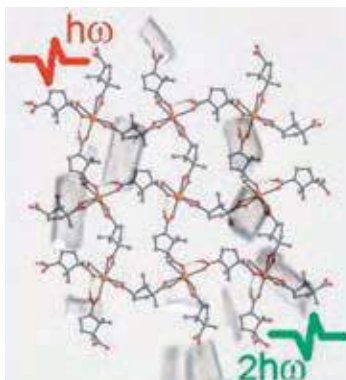
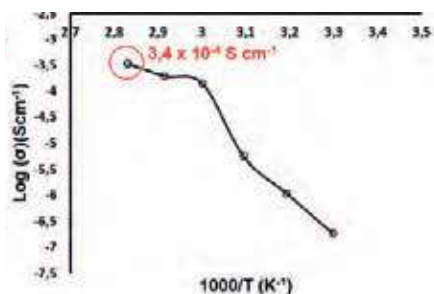


- Controlled pyrolysis of porous MOFs to form porous metal oxides/nitrides with improved electrochemical properties under acidic and basic conditions.
- Highly porous carbon materials (electrochemically active) obtained from demetalization of porous MOFs.



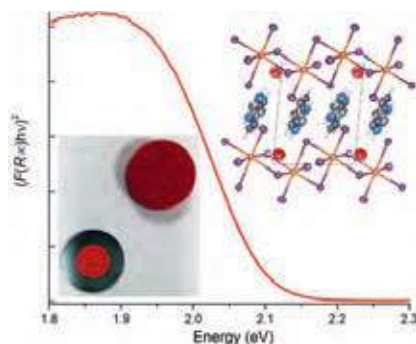
Novel porous Metal-Organic Frameworks (MOFs)

- Design and synthesis of porous composite micro- and nanostructured inorganic main group metal halides for optical applications.
- Synthesis and characterization of new sustainable light halide and oxide absorbers with 3D and reduced structural dimensionality.
- Association of metal nanoparticles (Au, Ag) into porous substrates (e.g. photoactive MOFs) by (1) *in situ* synthesis within their porosity, (2) *in situ* synthesis within their structure and (3) seed for MOF growth (core-shell). Enhancement of their optical properties with the objective of obtaining suitable photocatalysts for energy storage (e.g. Li/air batteries, artificial photosynthesis).



Inorganic solids

- Design and synthesis of organic cation (benzimidazolium, triazolium) based bis-muth halides as photovoltaic materials: control of $[Bi_m I_n]$ anion dimensionality, crystallographic exploring anion-cation interactions, computationally supported assessment of microscopic parameters, experimental evaluation of bulk and nanoscale properties.
- Preparation of iron/cobalt-doped carbon nitrides by controlled pyrolysis of MOFs, exhibiting good performances as electrocatalysts in oxygen reduction reactions for fuel cells.
- Highly porous carbon materials (electrochemically active) obtained from the chlorination of porous MOFs.

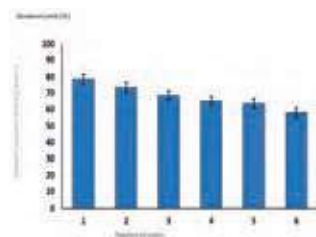


Multicomponent materials

- *In situ* synthesis Metal nanoparticles (Au, Ag) into porous photoactive MOFs as proved antifouling photo-bactericidal solids for several applications (heat exchange, biocorrosion, medical devices, food industry, transport) and as promising photocatalysts and sensors.
- In deep structural characterization of composite materials based on the in situ

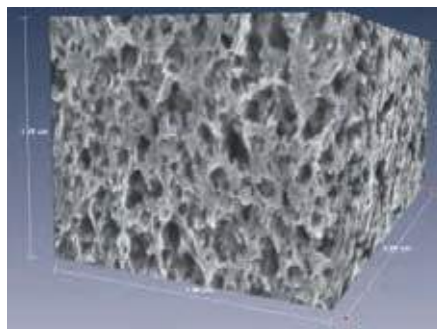
polymerization of highly conducting polymers within the porosity of stable MOFs.

- Nanometric bio-active drug@MOF system as a potential nerve agent antidote in biomedicine.
- Biodiesel production from soybean oil using enzyme-immobilized MOFs.



Manufacturing

- Assessment of the mechanical stability and textural features by a combination of different textural and morphological techniques of monolithic MOF aerogels produced by supercritical CO_2 drying.
- Manufacturing highly porous 3D pieces of CeO_2 via an easy template method based on abundant and low cost natural products with longer and higher solar H_2 production.
- Microspheres based on nanoscaled MOFs and biocompatible polymers prepared by a continuous spray-drying technique for the pulmonary administration of drugs.



annex

R&D projects,
contracts and grants

71

scientific results

91

training and
dissemination activities

117

annex



1. R&D projects, contracts and grants

1.1. Regional R&D projects

1. Title/Acronym: Storage and conversion of concentrated solar power/ALCCONES

Partners: IMDEA Energy Institute (Coordinator); URJC; CIEMAT; CSIC; Abengoa Research; SENER Ingeniería y Sistemas; Empresarios Agrupados

Period: 2014-2018

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

IMDEA Energy Institute external funding: 232.921 €

2. Title/Acronym: Use of agro-forest and oily residues to produce clean transportation fuels/RESTOENE2

Partners: ICP-CSIC (Coordinator); CIEMAT; GIQA-URJC; IMDEA Energy Institute; UAM; Laboratorio-URJC; Abengoa Bioenergía; Repsol; Exide Technologies; Soluciones Catalíticas Ibercat

Period: 2014-2018

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

IMDEA Energy Institute external funding: 143.399 €

3. Title/Acronym: Fundamental properties and application of graphene and other 2D materials/MAD2D

Partners: ICMM-CSIC (Coordinator); IMDEA Energy Institute; IMDEA Nanoscience Institute; IMDEA Materials Institute; Autonomía University of Madrid; Laboratory-IMDEA Materials; Laboratory-IMDEA Nanoscience; Laboratory-IMDEA Energy; Airbus Operations; Repsol; Bruker; Albufera Energy Storage; Nanoinnova Technologies

Period: 2014-2018

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

IMDEA Energy Institute external funding: 140.373 €

4. Title/Acronym: Smart grids for the Community of Madrid/PRICAM

Partners: Alcalá University (Coordinator); Rey Juan Carlos University; Carlos III University; Pontificia Comillas University of Madrid; Laboratory-IMDEA Energy; Iberdrola; Indra; Real Academia de Ingeniería; Hospital Universitario de Fuenlabrada

Period: 2014-2018

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

IMDEA Energy Institute external funding: 148.500 €

5. Title/Acronym: Industrial applications of spirulina/INSPIRA1

Partners: CIB-CSIC (Coordinator); ICP-CSIC; ICV-CSIC; UAM; UCM; URJC; UPM; Laboratory-IMDEA Energy; Bodesma; Micro algae Solutions; Laboratorios Actafarma; Isolux Corsán; Canal de Isabel II

Period: 2014-2018

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

IMDEA Energy Institute external funding: 80.000 €

1.2. National R&D projects

1. Title/Acronym: Algal biogas from wastewater bioremediation: seeking for insights on population dynamics and cell wall characteristics/WWAL-GAS

Partners: IMDEA Energy Institute (Coordinator); Explotación Agropecuaria Jose Mario Anton Andrés; Bodega Valdehermoso; Aqualia

Period: 2014-2018

Funding Institution/Program: Ministry of Economy and Competitiveness/State Program of Research, Development and Innovation Oriented Challenges of the Society. Research Challenges 2013

IMDEA Energy Institute external funding: 127.050 €

2. Title/Acronym: European projects office Madrimasd-IMDEA/OPE MADRIMASD-IMDEA

Partners: Fundación madrimasd para el conocimiento (Coordinator); IMDEA Energy Institute; IMDEA Water Institute; IMDEA Food Institute; IMDEA Materials Institute; IMDEA Nanoscience Institute; IMDEA Networks Institute; IMDEA Software Institute

Period: 2014-2017

Funding Institution/Program: Ministry of Economy and Competitiveness/State Program of Research, Development and Innovation Oriented Challenges of the Society. *Acciones de dinamización "Europa Redes y Gestores"*





3. Title/Acronym: Efficient production of solar fuels through the development of new perovskites with redox capacity for thermochemical splitting of CO₂ and H₂O/SOLARKITE
Partners: IMDEA Energy Institute

Period: 2015-2018

Funding Institution/Program: Ramón Areces Foundation/XVII Concurso Nacional para la adjudicación de ayudas a la Investigación en Ciencias de la Vida y de la Materia 2014
IMDEA Energy Institute external funding: 126.849 €

4. Title/Acronym: Lignocellulosic bioethanol production at high substrate loading: developing yeast tolerant to mechanical stress/LignoYeast

Partners: IMDEA Energy Institute (Coordinator); Abengoa Bioenergía; Neol Biosolution; Biopolis

Period: 2015-2018

Funding Institution/Program: Ministry of Economy and Competitiveness/State Program of Research, Development and Innovation Oriented Challenges of the Society. *Research Challenges 2014*

IMDEA Energy Institute external funding: 174.240 €

5. Title/Acronym: Catalytic co-processing of waste plastics and lignocellulosic residues for the preparation of advanced fuels/CATPLASBIO

Partners: Rey Juan Carlos University (Coordinator); IMDEA Energy Institute; Abengoa Research; Urbaser, CLH

Period: 2015-2017

Funding Institution/Program: Ministry of Economy and Competitiveness/State Program of Research, Development and Innovation Oriented Challenges of the Society. *Research Challenges 2014*

6. Title/Acronym: Advanced catalytic systems for the sustainable valorization of cellulosic biomass towards high-value biobased products/BIOSUSCAT

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

Period: 2015-2017

Funding Institution/Program: Ministry of Economy and Competitiveness/State Program of Research, Development and Innovation Oriented Challenges of the Society. *Research Challenges 2014*

7. Title/Acronym: Solar fuels by artificial photosynthesis with multifunctional hybrid catalysts/SolarFuel

Partners: IMDEA Energy Institute

Period: 2015-2017

Funding Institution/Program: Ministry of Economy and Competitiveness/State Program of Research, Development and Innovation Oriented Challenges of the Society. *Modality young researchers 2014*

IMDEA Energy Institute external funding: 170.610 €

8. Title/Acronym: Innovative Storage for Stationary Applications Based on Aluminum/ALIENA

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

Period: 2015-2019

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

IMDEA Energy Institute external funding: 128.088 €

9. Title/Acronym: Capacitive Deionization of Brines Coming from Brackish Water Reverse Osmosis Plants/DC-SÓIAS

Partners: GS-INIMA (Coordinator); PROINGESA; IMDEA Energy Institute

Period: 2015-2018

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

IMDEA Energy Institute external funding: 162.480 €

10. 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

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/State Program of Research, Development and Innovation Oriented Challenges of the Society. *Collaboration Challenges 2015*

IMDEA Energy Institute external funding: 416.900 €

11. Title/Acronym: New strategies for the integration of microalgae-bacteria consortium in small size urban wastewater treatment plants/MICROALBAC

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

Period: 2015-2018

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

IMDEA Energy Institute external funding: 160.926 €

12. Title/Acronym: Flow batteries for electrical energy storage/BAT-FLU

Partners: IREC (Coordinator); Fundació Institut Català de Nanociència i Nanotecnologia; Castilla La-Mancha University; Cidetec Foundation; Tecnalia Research & Innovation Foundation; CSIC; Tekniker Foundation; IMDEA Energy Institute

Period: 2015-2017

Funding Institution/Program: Ministry of Economy and Competitiveness/State Program for Promotion of Scientific and Technical Research Excellence. *Acciones de dinamización "Redes de excelencia" 2015*

13. Title/Acronym: Production of clean transportation biofuels from lignocellulosic biomass/SUGTOBIO

Partners: URJC (Coordinator); ICP-CSIC; IMDEA Energy Institute; Autónoma University of Madrid; CIEMAT

Period: 2015-2017

Funding Institution/Program: Ministry of Economy and Competitiveness/State Program for Promotion of Scientific and Technical Research Excellence. *Acciones de dinamización "Redes de excelencia" 2015*

14. Title/Acronym: Multidisciplinary analysis of indirectly-heated particles receivers/reactors for solar applications in extreme conditions/ARROPAR-CEX

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

Period: 2016-2018

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

IMDEA Energy Institute external funding: 189.970 €

15. Title/Acronym: Innovative materials for application in advanced supercapacitor/MATCAP
Partners: IMDEA Energy Institute (Coordinator); CIC Energune; Repsol; Solvionic; AVAN-ZARE Innovacion Tecnologica

Period: 2016-2018

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

IMDEA Energy Institute external funding: 145.200 €

16. Title/Acronym: State of the art revision in Flow Batteries for energy storage in stationary applications

Funding Institution/Program: IBERDROLA Foundation/Call for research funding in energy and environment 2016-2017

Period: 2016-2017

IMDEA Energy Institute external funding: 20.000 €

17. Title/Acronym: Decoupled turbomachinery for small solar applications

Funding Institution/Program: IBERDROLA Foundation/Call for research funding in energy and environment 2016-2017

Period: 2016-2017

IMDEA Energy Institute external funding: 20.000 €

18. Title/Acronym: Advanced storage systems for renewable and manageable energy/TERMOSTOK

Partners: Abengoa Research (Coordinator); IMDEA Energy Institute

Period: 2016-2017

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

IMDEA Energy Institute external funding: 23.891 €€

19. Title/Acronym: New concept of multifunctional biorefinery based on the production of lignocellulosic bioethanol and other bioproducts from garbage waste and garden cleaning/BIO_LIGWASTE

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

Period: 2016-2019

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

IMDEA Energy Institute external funding: 102.132 €

20. Title/Acronym: CO₂ photoconversion to solar fuels using multifunctional materials/Ra-Phuel

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/State Program of Research, Development and Innovation Oriented Challenges of the Society. *Research Challenges 2016*

IMDEA Energy Institute external funding: 223.850 €

21. Title/Acronym: Planning the implementation of alternative fuels in the Spanish energy sector towards a sustainable transport system/PICASO

Partners: IMDEA Energy Institute

Period: 2017-2019

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

IMDEA Energy Institute external funding: 203.280 €

22. Title/Acronym: New challenges in the production of solar fuels/FOTOFUEL-2

Partners: IMDEA Energy Institute (Coordinator); ICP-CSIC; Universidad Politécnica de Valencia; IMDEA Materials Institute; Consorci per a la Construcció, Equipament i Explo-tació del Laboratori de Il·lum de Síncrotró; Universidad de Barcelona; Universitat Jaume I de Castello; Fundacio 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: 19.000 €



23. Title/Acronym: Impact of the high penetration of the storage, renewable and other technologies to the stability of distribution networks/EnRed

Partners: IMDEA Energy Institute

Period: 2017-2018

Funding Institution/Program: Fundación Iberdrola España/Call for research funding in energy and environment 2017-2018

IMDEA Energy Institute external funding: 20.000 €

24. Title/Acronym: Nano-metallic electroactive objects associated to porous Organic Metal Networks for the chemical storage of energy

Partners: IMDEA Energy Institute

Period: 2017-2018

Funding Institution/Program: Fundación Iberdrola España/Call for research funding in energy and environment 2017-2018

IMDEA Energy Institute external funding: 20.000 €

25. Title/Acronym: New materials based on porous metal-organic networks and conductive polymers for energy storage/PolyMOF

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 €





1.3. International R&D projects

1. Title/Acronym: CAScade deoxygenation process using tailored nanoCATalysts for the production of BiofuELs from lignocellulosic biomass/CASCATBEL

Partners: IMDEA Energy Institute (Coordinator); ENCE; Universita' degli studi di Milano Bicocca; Charles University in Prague; Institute of Physical Chemistry; Universiteit Utrecht; Aston University; Abengoa Research; ETH Zürich; Max Planck Institut fuer Kohlenforschung; MAST Carbon International; Silkem; Nanologica; Center for Research and Technology Hellas/Chemical Process and Energy Research Institute; ENI; Hamburg University of Technology; OUTOTEC

Period: 2013-2017

Funding Institution/Program: European Union/FP7. Call identifier: FP7-NMP-2013-LARGE-7

IMDEA Energy Institute external funding: 1.151.995 € €

2. Title/Acronym: Scientific and Technological Alliance for Guaranteeing the European Excellence in Concentrating Solar Thermal Energy/STAGE-STE

Partners: CIEMAT (Coordinator); more than 40 partners, companies, universities, research centres, associations, from all over the world

Period: 2014-2018

Funding Institution/Program: European Union/FP7. Call identifier: FP7-ENERGY-2013-IRP

IMDEA Energy Institute external funding: 472.102 €

3. Title/Acronym: European network for algal-bioproducts/EUALGAE

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: 62.134 € (estimated)

4. Title/Acronym: Hybrid Materials for Artificial Photosynthesis/HyMap

Partners: IMDEA Energy Institute

Period: 2015-2020

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

IMDEA Energy Institute external funding: 2.506.738 €

5. Title/Acronym: SUNlight-to-LIQUID: Integrated solar-thermochemical synthesis of liquid hydrocarbon fuels/SUN-to-LIQUID

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: 936.525 € €

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

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: 89.292 € €

7. Title/Acronym: High Temperature concentrated solar thermal power plan with particle receiver and direct thermal storage/NEXT-CSP

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 € €

8. Title/Acronym: Valorization of urban WASTES to new generation of BIOethanol/WASTE-2BIO

Partners: Imecal (Coordinator); Ciemat; 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 € €

9. Title/Acronym: Integrating National Research Agendas on Solar Heat for Industrial Processes/INSHIP

Partners: Fraunhofer (Coordinator); Ciemat; 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-Ciemat; 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 € €

10. Title/Acronym: Membrane-Free Redox Flow Batteries/MFreeB

Partners: IMDEA Energy Institute

Period: 2017-2022

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

IMDEA Energy Institute external funding: 1.998.407 € €

11. Title/Acronym: European COrridors for natural GAs Transport Efficiency/ECO-GATE

Partners: Gas Natural Madrid; CETIL Dispensing technology; Fundacion Cidaut; Instituto IMDEA Energía; GASNAM; Inversora Melofe; Autoridad Portuaria de Huelva; SOLTEL IT Solutions; Universidad de Santiago de Compostela; Port Authority of 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 € €

12. Title/Acronym: Demonstration of dry fermentation and optimization of biogas technology for rural communities in the MENA region/BIOGASMENA

Partners: University of Hohenheim (Coordinator); 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'Environnement (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/ERA-NETMED 2nd joint call /APCIN 2017

IMDEA Energy Institute external funding: 99.865 € €

1.4. Contracts with companies and other organizations

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

Company: IMV Corporation (Japan)

Period: 2010-2018

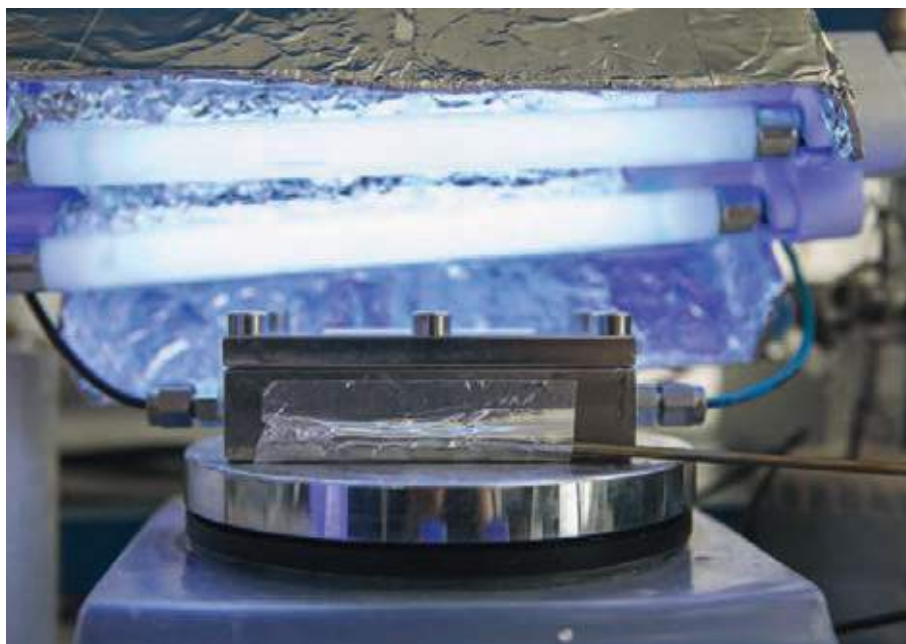
IMDEA Energy Institute external funding: 202.498 € €

2. Title/Acronym: Development of new structural materials for energy harvesting and storage/DESMAN

Institution: IMDEA Materials Institute (Spain)

Period: 2014-2017

IMDEA Energy Institute external funding: 151.600 € €



3. Title/Acronym: Energy storage with flow batteries in photovoltaic plants

Company: Ingenia Solar Energy (Spain)

Period: 2015-2017

IMDEA Energy Institute external funding: 108.161 € €

4. Title/Acronym: Preparation of vanadium electrolyte from V_2O_5 /ELECTROVAN

Company: PV HARDWARE SOLUTIONS (Spain)

Period: 2016-2017

IMDEA Energy Institute external funding: 19.008 € €

5. Title/Acronym: Installation and operation of a 100kW vanadium flow battery demonstrator /DEMOVAN

Company: PV HARDWARE SOLUTIONS (Spain)

Period: 2016-2017

IMDEA Energy Institute external funding: 40.522 € €

6. Title/Acronym: Characterization and study of materials derived from graphene for energy applications

Company: GNANOMAT (Spain)

Period: 2016-2017

IMDEA Energy Institute external funding: 13.750 € €

7. Title/Acronym: Research in electrochemical energy storage technologies/ITAE

Company: Inversiones Financieras Perseo (Spain)

Period: 2016-2017

IMDEA Energy Institute external funding: 15.000 € €

8. Title/Acronym: Validation and comparison report of several software models of solar receivers with those obtained in scientific articles

Company: STA-Solar Technology Advisors (Spain)

Period: 2017

IMDEA Energy Institute external funding: 8.928 € €

9. Title/Acronym: Generation of electricity demand profiles in residential customers/GenPer

Company: Gas Natural SGD (Spain)

Period: 2017

IMDEA Energy Institute external funding: 22.120 € €

10. Title/Acronym: Development of an organic flow drum based on redox pairs for electric vehicles and stationary storage/BAFO-2

Company: PV HARDWARE SOLUTIONS/REPSOL (Spain)

Period: 2017-2018

IMDEA Energy Institute external funding: 346.682 € €

11. Title/Acronym: Study on the behavior of materials to the exposure of different irradiance ranges

Company: PROMAT Ibérica (Spain)

Period: 2017

IMDEA Energy Institute external funding: 3.420 € €

12. Title/Acronym: Cost evaluation of lithium-ion batteries integrated in electrical networks

Company: Inversiones Financieras Perseo (Spain)

Period: 2017

IMDEA Energy Institute external funding: 26.126 € €

13. Title/Acronym: Selected H₂ Production Routes/RevH2

Company: The Catalyst Group Resources (USA)

Period: 2017

IMDEA Energy Institute external funding: 3.690 € €

14. Title/Acronym: Design of the measurement and verification system of the national energy efficiency plan (PLANEE) of Ecuador/SMLEAP

Company: Fundación Tecnalia Research & Innovation (Spain)

Period: 2017

IMDEA Energy Institute external funding: 7.680 € €

15. Title/Acronym: H₂ production via electrolysis routes/RevH2-2

Company: The Catalyst Group Resources (USA)

Period: 2017

IMDEA Energy Institute external funding: 1.257 € €

16. Title/Acronym: Testing and evaluation of reflective mirror under concentrating solar light exposure

Company: XXENTRIA Technology Materials (Taiwan)

Period: 2017-2018

IMDEA Energy Institute external funding: 17.500 € €

17. Title/Acronym: LCA critical review

Company: Solinnen (France)

Period: 2017-2018

IMDEA Energy Institute external funding: 2.300 € €

18. Title/Acronym: Characterization of materials and determination of their electrochemical properties

Company: GNANOMAT (Spain)

Period: 2017-2018

IMDEA Energy Institute external funding: 37.022 € €

19. Title/Acronym: Validation and numerical analysis of components of a desalination device by humidification and dehumidification of its invention

Company: SEENSO RENOVAL (Spain)

Period: 2017-2018

IMDEA Energy Institute external funding: 5.760 € €

20. Title/Acronym: Modeling and simulation of the filter of Fucus vesiculosus and beet pulp for the treatment of the residual water of galvanized and galvanized processes

Company: Hidrolab (Spain)

Period: 2017-2018

IMDEA Energy Institute external funding: 2.000 € €

21. Title/Acronym: Modeling and simulation of different technologies for the treatment of waste water from the São Domingos mine

Company: LCW Consult (Portugal)

Period: 2017-2018

IMDEA Energy Institute external funding: 3.500 € €

1.5. Researcher grants

1. Program: Predoctoral Research Grant (FPI2012)

Project/Acronym: Development of novel catalytic systems for the production of 2nd-Generation Biofuels by deoxygenation of lignocellulosic biomass processes/LIGCATUP

Period: 2013-2017

Funding Institution: Ministry of Economy and Competitiveness

IMDEA Energy Institute external funding: 97.000 € €

Mr. Antonio M. Berenguer

2. Program: Contract FPI2013

Project/Acronym: Development of high performance supercapacitors by using novel ionic liquid-based electrolytes/SUPERLION

Period: 2014-2017

Funding Institution: Ministry of Economy and Competitiveness

IMDEA Energy Institute external funding: 82.400 € €

Ms. Paula Navalpotro

3. Program: “Marie Curie” AMAROUT Europe II. FP7-People Program. Call identifier FP7-PEOPLE-2011-COFUND Period: 2014-2017

Funding Institution: European Union

IMDEA Energy Institute external funding: 50.634 € €

Dr. Elia Tomás

4. Program: “Marie Curie” AMAROUT Europe II. FP7-People Program. Call identifier FP7-PEOPLE-2011-COFUND

Period: 2015-2017

Funding Institution: European Union

IMDEA Energy Institute external funding: 47.402 € €

Dr. Fernando Fresno



5. Program: “Marie Curie” AMAROUT Europe II. FP7-People Program. Call identifier FP7-PEOPLE-2011-COFUND

Period: 2015-2017

Funding Institution: European Union

IMDEA Energy Institute external funding: 43.201 € €

Dr. Salvador Luque

6. Program: Contract FPU2014

Project/Acronym: Particle reactors for applications in the solar thermochemical

Period: 2015-2019

Funding Institution: Ministry of Education, Culture and Sports

IMDEA Energy Institute external funding: 76.727 € €

Ms. Lucía Arribas

7. Program: Ramón y Cajal 2014

Project: Linking wastewater bioremediation by means of microalgae cultivation and energy production out of this biomass

Period: 2016-2020

Funding Institution: Ministry of Economy and Competitiveness

IMDEA Energy Institute external funding: 168.600 € €

Dr. Cristina González

8. Program: Ramón y Cajal 2014

Project: Bioapplications of porous materials

Period: 2016-2021

Funding Institution: Ministry of Economy and Competitiveness

IMDEA Energy Institute external funding: 168.600 € €

Dr. Patricia Horcajada

9. Program: “Marie Curie” AMAROUT Europe II. FP7-People Program. Call identifier FP7-PEOPLE-2011-COFUND

Period: 2016-2017

Funding Institution: European Union

IMDEA Energy Institute external funding: 59.807 € €

Dr. Patricia Horcajada

10. Program: IED 2016

Period: 2016-2018

Funding Institution: Ministry of Economy, Industry and Competitiveness

IMDEA Energy Institute external funding: 98.684 € €

Dr. Rebeca Marcilla

11. Program: IED 2016

Period: 2016-2018

Funding Institution: Ministry of Economy, Industry and Competitiveness

IMDEA Energy Institute external funding: 98.684 € €

Dr. Víctor A. de la Peña

12. Program: Ramón y Cajal 2015

Project: Design and Synthesis of Hybrid Materials for Advances Applications: Solar Fuels Generation

Period: 2017-2021

Funding Institution: Ministry of Economy, Industry and Competitiveness/FSE

IMDEA Energy Institute external funding: 168.600 € €

Dr. Marta Liras

13. Program: “Marie Curie” AMAROUT Europe II. FP7-People Program. Call identifier FP7-PEOPLE-2011-COFUND

Period: 2017

Funding Institution: European Union

IMDEA Energy Institute external funding: 17.992 € €

Dr. José L. Gálvez

14. Program: “Marie Curie” AMAROUT Europe II. FP7-People Program. Call identifier FP7-PEOPLE-2011-COFUND

Period: 2017

Funding Institution: European Union

IMDEA Energy Institute external funding: 15.996 € €

Dr. Ignacio Villar

15. Program: “Marie Curie” AMAROUT Europe II. FP7-People Program. Call identifier FP7-PEOPLE-2011-COFUND

Period: 2017

Funding Institution: European Union

IMDEA Energy Institute external funding: 15.351 € €

Dr. Artem Babaryk

16. Program: “Marie Curie” AMAROUT Europe II. FP7-People Program. Call identifier FP7-PEOPLE-2011-COFUND

Period: 2017

Funding Institution: European Union

IMDEA Energy Institute external funding: 8.333 € €

Dr. Daniele Zonetti

17. Program: Recruitment of young doctors 2016 (Modality 2)

Period: 2017-2021

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 80.000 € €

Dr. Julio Lado

18. Program: Recruitment of experienced doctors 2016 (Modality 1)

Project/Acronym: Application of photon up-conversion in photoredox catalysis/APUPCAT

Period: 2017-2021

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 110.000 € €

Dr. Raúl Pérez

19. Program: Recruitment of research assistants and laboratory technicians 2016

Period: 2017-2019

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 45.000 € €

Mr. Carlos Lirio

20. Program: Recruitment of research assistants and laboratory technicians 2016

Period: 2017-2019

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 38.000 € €

Ms. Eva Álvarez

21. Program: Recruitment of research assistants and laboratory technicians 2016

Period: 2017-2019

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 38.000 € €

Mr. Alejandro Aguilar

22. Program: Recruitment of research assistants and laboratory technicians 2016

Period: 2017-2019

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 38.000 € €

Mr. Álvaro Pérez

23. Program: Call for Predoctoral and Postdoctoral Researchers 2016

Period: 2017-2019

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 25.000 € €

Ms. Ana Arenas

24. Program: Call for Predoctoral and Postdoctoral Researchers 2016

Period: 2017-2019

Funding Institution: Comunidad de Madrid

IMDEA Energy Institute external funding: 25.000 € €

Mr. Antonio Molina

25. Program: Contract FPU2016

Project/Acronym: Integración de sistemas de conversión termo-electro-química en centrales termosolares

Period: 2017-2021

Funding Institution: Ministry of Education, Culture and Sports

IMDEA Energy Institute external funding: 82.180 € €

Ms. Elena Díaz

26. Program: H2020 WP 2016-2017/Excellent science/MSCA

Project/Acronym: Solar Energy Storage PERovskites/SESPer

Period: 2017-2019

Funding Institution: European Union

IMDEA Energy Institute external funding: 186.991 € €

Dr. Emanuela Mastronardo

27. Program: Contract FPI2016

Project/Acronym: Multidisciplinary analysis of indirectly-heated particles receivers/reactors for solar applications in extreme conditions/ARROPAR-CEX

Period: 2017-2021

Funding Institution: Ministry of Economy, Industry and Competitiveness

IMDEA Energy Institute external funding: 82.000 € €

Mr. Mario Sánchez





2. Scientific Results

2.1. Publications in journals with an impact index

1. Aijan, F.N.; Tiruye, G.A.; Cordella, D.; Fernandes, A.M.; Grygiel, K.; Isik, M.; Patil, N.; Antonietti, M.; Detrembleur, C.; Ingañäs, O.; Jérôme, C.; Marcilla, R.; Mecerreyes, D.; Taton, D.; Solin, N. "Innovative Polyelectrolytes/Poly(ionic liquid)s for Energy and Environment". *Polymer International*, **2017**, *66* (8), 1119-1128.
2. Álvarez, S.; Mollocana Lara, J.G.; García Cena, C.E.; Romero, M.; García de María, J.M.; González-Aguilar, J. "Identification model and PI and PID controller design for a novel electric air heater". *Automatika*, **2017**, *58* (1), 55-68. IF=0.260
3. Andronescu, C.; Barwe, S.; Ventosa, E.; Masa, J.; Vasile, E.; Konkena, B.; Möller, S.; Schuhmann, W. "Powder Catalyst Fixation for Post-Electrolysis Structural Characterization of NiFe Layered Double Hydroxide Based Oxygen Evolution Reaction Electrocatalysts". *Angewandte Chemie International Edition*, **2017**, *56* (37), 11258-11262.
4. Arbib, Z.; de Godos, I.; Ruiz, J.; Perales, J.A. "Optimization of pilot high rate algal ponds for simultaneous nutrient removal and lipids production". *Science of the Total Environment*, **2017**, *589*, 66-72.
5. Arbib, Z.; de Godos, I.; Lara, E.; Rogalla, F. "Understanding the biological activity of high rate algae ponds through the calculation of oxygen balances". *Applied Microbiology and Biotechnology*, **2017**, *101* (12), 5189-5198.
6. Arribas, L.; Arconada, N.; González-Fernández, C.; Löhl, C.; González-Aguilar, J.; Kaltschmitt, M.; Romero, M. "Solar-driven pyrolysis and gasification of low-grade carbonaceous materials". *International Journal of Hydrogen Energy*, **2017**, *42*, 13598-13606.
7. Ayón, X.; Gruber, J.K.; Hayes, B.P.; Usaola, J.; Prodanović, M. "An optimal day-ahead load scheduling approach based on the flexibility of aggregate demands". *Applied Energy*, **2017**, *198*, 1-11.
8. Barwe, S.; Andronescu, C.; Masa, J.; Ventosa, E.; Klink, S.; Genç, A.; Arbiol, J.; Schuhmann, W. "Polybenzoxazine-Derived N-Doped Carbon as Matrix for Powder-Based Electrocatalysts". *ChemSusChem*, **2017**, *10*, 2653-2659.
9. Barwe, S.; Masa, J.; Andronescu, C.; Mei, B.; Schuhmann, W.; Ventosa, E. "Overcoming the Instability of Nanoparticle-Based Catalyst Films in Alkaline Electrolyzers by using Self-Assembling and Self-Healing Films". *Angewandte Chemie International Edition*, **2017**, *56* (29), 8573-8577.
10. Bellan, S.; Cordiviola, A.; S Barberis, S.; Traverso, A.; González-Aguilar, J.; Romero, M. "Numerical analysis of latent heat storage system with encapsulated phase change material in spherical capsules". *Renewable Energy Environmental Sustainability*, **2017**, *2*, 3.
11. Botas, J.A.; Moreno, J.; Espada, J.J.; Serrano, D.P.; Dufour, J. "Recycling of used lubricating oil: evaluation of environmental and energy performance by LCA". *Resources, Conservation & Recycling*, **2017**, *125*, 315-323.
12. Brooks, N.J.; Castiglione, F.; Doherty, C.M.; Dolan, A.; Hill, A.J.; Hunt, P.A.; Matthews, R.P.; Mauri, M.; Mele, A.; Simonutti, R.; Villar-García, I.J. "Linking the structures, free volumes, and

properties of ionic liquid mixtures". *Chemical Science*, **2017**, *8*, 6359-6374.

13. Caldeira, V.P.S.; Peral, A.; Linares, M.; Araujo, A.S.; García-Muñoz, R.A.; Serrano, D.P. "Properties of hierarchical Beta zeolites prepared from protozeolitic nanounits for the catalytic cracking of high density polyethylene". *Applied Catalysis A: General*, **2017**, *531*, 187-196.

14. Castillo, C.; de la Peña-O'Shea, V.A.; Puente-Orech, I.; Romero de Paz, J.; Sáez-Puche, R.; Gutiérrez Puebla, E.; Gándara, F.; Monge, A. "Addressed realization of multicatalytic complex arrangements in metal-organic frameworks". *Science Advances*, **2017**, *3* (7), e1700773.

15. Collado, L.; Jansson, I.; Platero-Prats, A.E.; Perez-Dieste, V.; Escudero, C.; Molins, E.; Casas, I.; Doucastela, L.; Sánchez, B.; Coronado, J.M.; Serrano, D.P.; Suarez, S.; De la Peña-O'Shea, V.A. "Elucidating the Photoredox Nature of Isolated Iron Active Sites on MCM-41". *ACS Catalysis*, **2017**, *7* (3), 1646-1654.

16. Cruz, P.L.; Iribarren, D.; Dufour, J. "Exergy analysis of alternative configurations of a system coproducing synthetic fuels and electricity via biomass gasification, Fischer-Tropsch synthesis and a combined-cycle scheme". *Fuel*, **2017**, *194*, 375-394.

17. Cruz, P.L.; Montero, E.; Dufour, J. "Modelling of co-processing of HDO-oil with VGO in a FCC unit". *Fuel*, **2017**, *196*, 362-370.

18. Epifani, M.; Kaciulis, S.; Mezzi, A.; Altamura, D.; Giannini, C.; Díaz, R.; Force, C.; Genç, A.; Arbiol, J.; Siciliano, P.; Comini, E.; Concina, I. "Inorganic Photocatalytic Enhancement: Activated RhB Photodegradation by Surface Modification of SnO₂ Nanocrystals with V₂O₅-like species". *Scientific Reports*, **2017**, *7*, 44763.

19. Feroso, J.; Hernando, H.; Jiménez-Sánchez, S.; Lappas, A.A.; Heracleous, E.; Pizarro, P.; Coronado, J.M.; Serrano, D.P. "Bio-oil production by lignocellulose fast-pyrolysis: Isolating

and comparing the effects of indigenous versus external catalysts". *Fuel Processing Technology*, **2017**, *167*, 563-574.

20. Feroso, J.; Pizarro, P.; Coronado, J.M.; Serrano, D.P. "Advanced biofuels production by upgrading of pyrolysis bio-oil". *Wiley Interdisciplinary Reviews: Energy and Environment*, **2017**, *6* (4), e245.

21. Fillat, U.; Ibarra, D.; Eugenio, M.E.; Moreno, A.D.; Tomás-Pejó, E.; Martín-Sampedro, R. "Laccases as potential tool for improving the conversion efficiency of lignocellulose into ethanol: A review". *Fermentation* **2017**, *3* (17), doi: 10.3390.

22. Fresno, F.; Jana, P.; Reñones, P.; Coronado, J.M.; Serrano, D.P.; de la Peña O'Shea, V.A. "CO₂ reduction over NaNbO₃ and NaTaO₃ perovskite photocatalysts". *Photochemical & Photobiological Sciences*, **2017**, *16*, 17-23.

23. García-Gusano, D.; Iribarren, D.; Garraín, D. "Prospective analysis of energy security: A practical life-cycle approach focused on renewable power generation and oriented towards policy-makers". *Applied Energy*, **2017**, *190*, 891-901.

24. García-Gusano, D.; Garraín, D.; Dufour, J. "Prospective life cycle assessment of the



Spanish electricity production". *Renewable & Sustainable Energy Reviews*, **2017**, *75*, 21-34.

25. Gruber, J.K.; Prodanovic, M.; Alonso, R. "Estimation and sensitivity analysis of building energy demand". *Proceedings of the Institution of Civil Engineers-Engineering Sustainability*, **2017**, *170* (2), 81-92.

26. Hayes, B.P.; Melatti, I.; Mancini, T.; Prodanovic, M.; Tronci, E. "Residential demand management using individualised demand-aware price policies". *IEEE Transactions on Smart Grid*, **2017**, *8* (3), 1284-1294.

27. Heracleous, E.; Lappas, A.; Serrano, D.P. "Special thematic issue in "Biomass Conversion and Biorefinery" "Advances in catalytic biomass fast pyrolysis and bio-oil upgrading". *Biomass Conversion and Biorefinery*, **2017**, *7* (3), 275-276.

28. Hernández, G.; Iek, M.; Mantione, D.; Pendashteh, A.; Navalpotro, P.; Devaraj, S.; Marcilla, R.; Mecerreyes, D. "Redox-active poly(ionic liquid)s as active materials in energy storage applications". *Journal of Materials Chemistry A*, **2017**, *5*, 16231-16240.

29. Hernando, H.; Feroso, J.; Moreno, I.; Coronado, J.M.; Serrano, D.P.; Pizarro, P. "Thermo-

chemical valorization of Camelina straw waste via fast pyrolysis". *Biomass Conversion and Biorefinery*, **2017**, *7* (3), 277-287.

30. Hernando, H.; Moreno, I.; Feroso, J.; Ochoa-Hernández, C.; Pizarro, P.; Coronado, J.M.; Eijka, J.; Serrano, D.P. "Biomass catalytic fast pyrolysis over hierarchical ZSM-5 and Beta zeolites modified with Mg and Zn oxides". *Biomass Conversion and Biorefinery*, **2017**, *7* (3), 289-304.

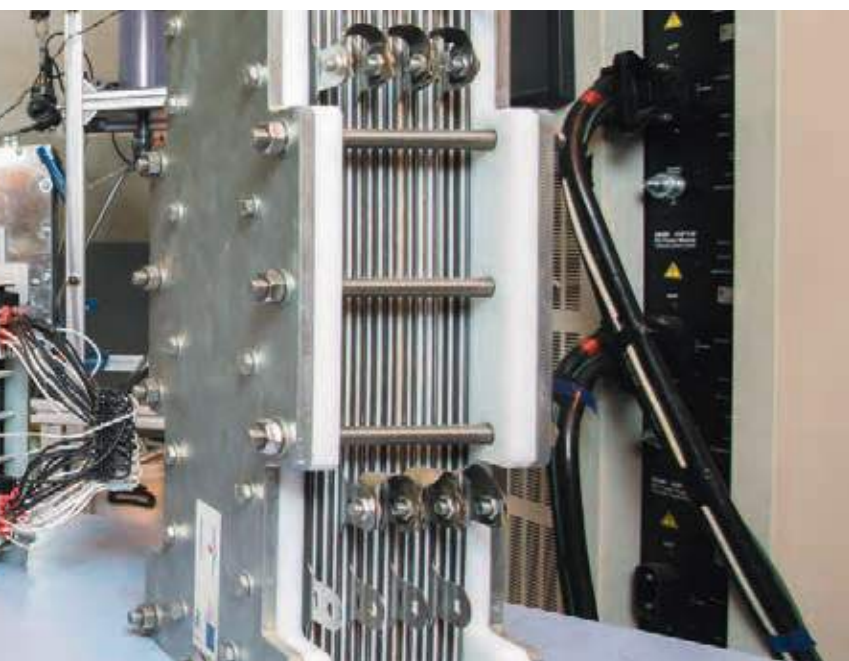
31. Hidalgo, T.; Giménez-Márquez, M.; Lozano, M.V.; Guillevic, M.; Simón-Vázquez, R.; Santander-Ortega, J.M.; González-Fernández, A.; Alonso, M.J.; Horcajada, P. "Chitosan-coated mesoporous MIL-100(Fe) nanoparticles as promising oral nanocarriers". *Scientific Reports*, **2017**, *7*, 43099.

32. Hidalgo, T.; Cooper, L.; Gorman, M.; Lozano-Fernández, T.; Simón-Vázquez, R.; Mouchaham, G.; Marrot, J.; Guillou, N.; Serre, C.; Fertey, P.; González-Fernández, A.; Devic, T.; Horcajada, P. "Crystal structure dependent in vitro antioxidant activity of biocompatible calcium gallate MOFs". *Journal of Materials Chemistry B*, **2017**, *5*, 2813-2822.

33. Huerta, F.; Tello, R.; Prodanovic, M. "Real-time PHIL discrete modeling and implementation of variable-speed wind turbines". *IEEE Transactions on Industrial Electronics*, **2017**, *64* (3), 1893-1904. IF=7.168

34. Island, J.O.; Molina-Mendoza, A.J.; Barawi, M.; Biele, R.; Flores, E.; Clamagirand, J.M.; Ares, J.R.; Sánchez, C.; van der Zant, H.S.J.; D'Agosta, R.; Ferrer, I.J.; Castellanos-Gomez, A. "Electronics and optoelectronics of quasi-1D layered transition metal trichalcogenides". *2D Materials*, **2017**, *4*, 022003.

35. Lado, J.J.; Pérez-Roa, R.E.; Wouters, J.J.; Tejedor-Tejedor, M.I.; Federspill, C.; Ortiz, J.M.; Anderson, M.A. "Removal of nitrate by asym-



metric capacitive deionization". Separation and Purification Technology, **2017**, 183, 145-152.

36. Lado, J.J.; Zornitta, R.L.; Calvi, F.A.; Martins, M.; Anderson, M.A.; Nogueira, F.G.; Ruotolo, L.A. "Enhanced capacitive deionization desalination provided by chemical activation of sugar cane bagasse fly ash electrodes". Journal of Analytical and Applied Pyrolysis, **2017**, 126, 143-153.

37. Leung, P.K.; Martín, T.; Liras, M.; Berenguer, A.M.; Marcilla, R.; Shah, A.; Anderson, M.A.; Palma, J. "Cyclohexanedione as the negative electrode reaction for aqueous organic redox flow batteries". Applied Energy, **2017**, 197, 318-326.

38. Leung, P.K.; Martin, T.; Shah, A.A.; Mohamed, M.R.; Anderson, M.A.; Palma, J. "Membrane-less hybrid flow battery based on low-cost elements". Journal of Power Sources, **2017**, 341, 36-45.

39. Linares, M.; Vargas, C.; García, A.; Ochoa-Hernández, C.; Cejka, J.; García, R.; Serrano, D.P. "Effect of hierarchical porosity in Beta zeolites on the Beckmann rearrangement of oximes". Catalysis Science & Technology, **2017**, 7 (1), 181-190.

40. Liras, M.; Verde-Sesto, E.; Iglesias, M.; Sánchez, F. "Synthesis of polyesters by an efficient heterogeneous phosphazene (P1)-Porous Polymeric Aromatic Framework catalyzed-Ring Opening Polymerization of lactones". European Polymer Journal, **2017**, 95, 775-784.

41. Luis-Barrera, J.; Laina-Martín, V.; Rigotti, T.; Peccati, F.; Solans-Monfort, X.; Sodupe, M.; Mas-Ballester, R.; Liras, M.; Alemán, J. "Visible-Light Photocatalytic Intramolecular Cyclopropane Ring Expansion". Angewandte Chemie International Edition, **2017**, 56, 7826-7830.

42. Luque, S.; Jones, T.V.; Povey, T. "Effects of Coolant Density, Specific Heat Capacity, and

Biot Number on Turbine Vane Cooling Effectiveness". Journal of Turbomachinery, **2017**, 139 (11), 111005.

43. Luque, S.; Jones, T.V.; Povey, T. "Scaling of turbine metal temperatures in cooled compressible flows-experimental demonstration of a new theory". Journal of Turbomachinery, **2017**, 139 (8), 081001.

44. Mahdy, A.; Fotidis, I.A.; Mancini, E.; Ballesteros, M.; González-Fernández, C.; Angelidaki, I. "Ammonia tolerant inocula provide a good base for anaerobic digestion of microalgae in third generation biogas process". Bioresource Technology, **2017**, 225, 272-278.

45. Marcos-Almaraz, M.T.; Agostoni, V.; Kreuz, C.; Clayette, P.; Couvreur, P.; Serre, C.; Gref, R.; Horcajada, P. "Towards an improved anti-HIV activity: coencapsulation of NRTI drugs in biocompatible iron(III) trimesate MIL-100 nanocarriers". Journal of Materials Chemistry B, **2017**, 5, 8563-8569.

46. Martín-Gamboa, M.; Iribarren, D.; García-Gusano, D.; Dufour, J. "A review of life-cycle approaches coupled with data envelopment analysis within multi-criteria decision analysis for sustainability assessment of energy systems". Journal of Cleaner Production, **2017**, 150, 164-174.

47. Narayanan, S.; Judith Vijaya, J.; Sivasanker, S.; Sankaranarayanan, T.M.; Ragupathi, C.; John Kennedy, L.; Jothiramalingam, R.; Al-Ohedan, H.A.; Tawfeek, A.M. "Catalytic conversion of polyols (sorbitol and xylitol) to hydrocarbons over hierarchical ZSM-5 zeolite catalysts in a fixed bed reactor". Reaction Kinetics, Mechanisms and Catalysis, **2017**, 122 (1), 247-257.

48. Navalpotro, P.; Palma, J.; Anderson, M.A.; Marcilla, R. "A Membrane-Free Redox Flow Battery with Two Immiscible Redox Electrolytes". Angewandte Chemie International Edition, **2017**, 56 (41), 12460-12465.

49. Pendashteh, A.; Palma, J.; Anderson, M.A.; Marcilla, R. "NiCoMnO₄ nanoparticles on N-doped graphene: highly efficient bifunctional electrocatalyst for oxygen reduction/evolution reactions". *Applied Catalysis B: Environmental*, **2017**, *201*, 241-252.
50. Pendashteh, A.; Senokos, E.; Palma, J.; Anderson, M.A.; Vilatela, J.J.; Marcilla, R. "Manganese dioxide decoration of macroscopic carbon nanotube fibers: From high-performance liquid-based to all-solid-state supercapacitors". *Journal of Power Sources*, **2017**, *372*, 64-73.
51. Pérez-Ruiz, R.; Lence, E.; Andreu, I.; Limones-Herrero, D.; González-Bello, C.; Miranda, M.A.; Jiménez, M.C. "A New Pathway of Protein Haptenation by β -Lactams". *Chemistry-A European Journal*, **2017**, *23*, 13986-13994.
52. Peters, J.F.; Banks, S.W.; Bridgwater, A.V.; Dufour, J. "A kinetic reaction model for biomass pyrolysis processes in Aspen Plus". *Applied Energy*, **2017**, *188*, 595-603.
53. Reñones, P.; Álvarez-Galván, M.C.; Ruiz-Matas, L.; Retuerto, M.; Navarro, R.M.; Fierro, J.L.G. "Nickel ferrite supported on calcium-stabilized zirconia for solar hydrogen production by two-step thermochemical water splitting". *Materials Today Energy*, **2017**, *6*, 248-254.
54. Reñones, P.; Fresno, F.; Fierro, J.L.G.; de la Peña-O'Shea, V.A. "Effect of La as Promoter in the Photoreduction of CO₂ Over TiO₂ Catalysts". *Topics in Catalysis*, **2017**, *60* (14-15), 119-1128.
55. Rojas, S.; Devic, T.; Horcajada, P. "Metal organic frameworks based on bioactive components". *Journal of Materials Chemistry B*, **2017**, *5*, 2560-2573.
56. Roldán-Pérez, J.; Zamora-Macho, J.L.; Ochoa-Giménez, M.; García-Cerrada, A. "A Steady-State Harmonic Controller for a Series Compensator with Uncertain Load Dynamics". *Electric Power Systems Research*, **2017**, *150*, 152-161.
57. Sánchez, J.S.; Pendashteh, A.; Palma, J.; Anderson, M.A.; Marcilla, R. "Anchored Fe₃O₄ Nanoparticles on rGO Nanosheets as High-Power Negative Electrodes for Aqueous Batteries". *ChemElectroChem*, **2017**, *4* (6), 1295-1305.
58. Sanz, J.L.; Rojas, P.; Morato, A.; Méndez, L.; Ballesteros, M.; González-Fernández, C. "Microbial communities of biometanization digesters fed with raw and heat pre-treated microalgae biomasses". *Chemosphere*, **2017**, *168*, 1013-1021.
59. Sastre, D.; Carrillo, A.J.; Serrano, D.P.; Pizarro, P.; Coronado, J.M. "Exploring the redox behaviour of La_{0.6}Sr_{0.4}Mn_{1-x}Al_xO₃ Perovskites for CO₂-splitting in thermochemical cycles". *Topics in Catalysis*, **2017**, *60* (15-16), 1108-1118.
60. Senokos, E.; Reguero, V.; Cabana, L.; Palma, J.; Marcilla, R.; Vilatela, J.J. "Large-area, all-solid and flexible electric double layer capacitors based on CNT fiber electrodes and polymer electrolytes". *Advanced Materials Technologies*, **2017**, *2* (7), 1600290.
61. Serrano, D.P.; Escola, J.M.; Briones, L.; Arroyo, M. "Hydroprocessing of the LDPE thermal cracking oil into transportation fuels over Pd supported on hierarchical ZSM-5 catalyst". *Fuel*, **2017**, *206*, 190-198.
62. Simon-Yarza, T.; Giménez-Marqués, M.; Mrimi, R.; Mielcarek, A.; Gref, R.; Horcajada, P.; Serre, C.; Couvreur, P. "A Smart metal-Organic Framework nanomaterial for lung targeting". *Angewandte Chemie International Edition*, **2017**, *56* (49), 15565-15569.
63. Steinfeld, A.; Epstein, M.; González-Aguilar, J. "Progress in Solar Energy special issue: Advances in solar thermochemistry". *Solar Energy*, **2017**, *156*, 1-168.

64. Tiruye, G.A.; Muñoz-Torrero, D.; Berthold, T.; Palma, J.; Antonietti, M.; Fechner, N.; Marcilla, R. "Functional porous carbon nanospheres from sustainable precursors for high performance supercapacitors". *Journal of Materials Chemistry A*, **2017**, 5, 16263-16272.
65. Tomás-Pejó, E.; Feroso, J.; Herrador, E.; Hernando, H.; Jiménez-Sánchez, S.; Ballesteros, M.; González-Fernández, C.; Serrano, D.P. "Valorization of steam-exploded wheat straw through a biorefinery approach: Bioethanol and bio-oil co-production". *Fuel*, **2017**, 199, 403-412.
66. Valente, A.; Iribarren, D.; Dufour, J. "Harmonised life-cycle global warming impact of renewable hydrogen". *Journal of Cleaner Production*, **2017**, 149, 762-772.
67. Valente, A.; Iribarren, D.; Dufour, J. "Life cycle assessment of hydrogen energy systems: A review of methodological choices". *The International Journal of Life Cycle Assessment*, **2017**, 22 (3), 346-363.
68. Vázquez-Galván, J.; Flox, C.; Fàbrega, C.; Ventosa, E.; Parra, A.; Andreu, T.; Morante, J.R. "Hydrogen-treated Rutile TiO₂ Shell in Graphite Core Structure as a Negative Electrode for High Performance Vanadium Redox Flow Batteries". *ChemSusChem*, **2017**, 10, 2089-2098. IF=7.226.
69. Vilela, S.M.F.; Salcedo, P.; Colinet, I.; Salles, F.; Koning, M.C.; Joosen, M.J.A.; Serre, C.; Horcajada, P. "Nanometric MIL125-NH₂ as potential nerve agent antidote carrier". *Nanomaterials*, **2017**, 7 (10), 321-335.
70. Xu, Q.; Zhang, F.; Xu, Li; Leung, P.; Yang, C.; Li, H. "The applications and prospect of fuel cells in medical field: A review". *Renewable & Sustainable Energy Reviews*, **2017**, 67, 574-580.
71. Yue, H.; Reguero, V.; Senokos, E.; Monreal-Bernal, A.; Mas, B.; Fernández-Blázquez, J.P.; Marcilla, R.; Vilatela, J.J. "Fractal carbon nanotube fibers with mesoporous crystalline structure". *Carbon*, **2017**, 122C, 47-53.
72. Zhu, Y.; Zhai, R.; Qi, J.; Yang, Y.; Reyes-Belmonte, M.A.; Romero, M.; Yan, Q. "Annual performance of solar tower aided coal-fired power generation system". *Energy*, **2017**, 119, 662-674.
73. Zhu, Y.; Zhai, R.; Yang, Y.; Reyes-Belmonte, M.A. "Techno-Economic Analysis of Solar Tower Aided Coal-Fired Power Generation System". *Energies*, **2017**, 10, 1392-1452.
74. Zornitta, R.L.; Garcia-Mateos, F.J.; Lado, J.J.; Rodríguez-Mirasol, J.; Cordero, T.; Hammer, P.; Ruotolo, L.A.M. "High-performance activated carbon from polyaniline for capacitive deionization". *Carbon*, **2017**, 123, 318-333.



2.2. Patents

2.2.1. Granted patents

1. Patent: W02017060882 A1, title “Improved volumetric receiver”. Date of application: 10/10/2016. Date of grant: 13/04/2017. Holders: Fondazione Bruno Kessler (FBK) (Italy). Inventors: Alberti, F.; Rocabrana, M.; Crema, L.; Santiago, S.; González-Aguilar, J.; Romero, M.

2.2.2. Submitted patents

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

2. Application number: P201730451, title: “Uso de una composición que comprende una combinación de nanopartículas fluorescentes”. Date of application: 28/03/2017 (OEPM). Holders: Universidad Rey Juan Carlos; Fundación IMDEA Energía; Universidad Autónoma de Madrid. Inventors: Moyano Rodríguez, E.; Caa-maño 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. Application number: P201730445, title: “Polímeros conjugados porosos, materiales que los comprenden, método de preparación y uso de los mismos”. Date of application: 28/03/2017 (OEPM). Holders: Fundación IMDEA Energía. Inventors: García, A.; García, C.; Reñones, P.; Fresno, F.; Liras, M.; de la Peña-O’Shea, V.A.

4. Application number: P201730170, title: “Sistema de generación de energía eléctrica mediante turbomaquinaria híbrida”. Date of application: 13/02/2017 (OEPM). Holders:

Fundación IMDEA Energía. Inventors: Reyes-Belmonte, M.A.; González-Aguilar, J.; Romero, M.

5. Application number: P201730017, title: “Material compuesto multifuncional”. Date of application: 10/01/2017 (OEPM). Holders: Fundación IMDEA Energía. Inventors: Vilatela, J.J.; Senokos, E.; Marcilla, R.; Palma, J.J]

2.3. Books/Chapters of books

1. Cavinato, C.; Ugurlu, A.; de Godos, I.; Kendir, E.; González, C. **2017**. Chapter 8: Biogas production from microalgae. Book: Microalgae-Based Biofuels and Bioproducts: From Feedstock Cultivation to End Products. Ed.: Woodhead Publishing. Editors: Muñoz, R.; González-Fernández, C. ISBN: 9780081010235 (Print), ISBN: 9780081010273 (Online).

2. Feroso, J.; Coronado, J.M.; Serrano, D.P.; Pizarro, P. **2017**. Chapter 11: Pyrolysis of microalgae for fuel production. Book: Microalgae-Based Biofuels and Bioproducts: From Feedstock Cultivation to End Products. Ed.: Woodhead Publishing. Editors: Muñoz, R.; González-Fernández, C., pp. 259-281. ISBN: 9780081010235 (Print), ISBN: 9780081010273 (Online).

3. Feroso, J.; Pizarro, P.; Coronado, J.M.; Serrano, D.P. **2017**. Chapter: Transportation Biofuels via the Pyrolysis Pathway: Status and Prospects. Book: Encyclopedia of Sustainability Science and Technology. Ed.: Springer Science+Business Media LLC **2017**. Editors: Meyers, R.A. DOI: 10.1007/978-1-4939-2493-6_963-1. ISBN: 978-1-4939-2493-6 (Print), ISBN: 978-1-4939-2493-6 (Online).

4. Gruber, J.; Prodanovic, M. **2017**. Chapter: Smart Energy Control Systems for Sustainable Buildings. Book: Two-Stage Optimization for Building Energy Management. Ed.: Springer. Editors: Littlewood, J.; Spataru, C.; Howlett, R.J.; Jain, L.C., vol. 67, pp. 225-243. ISBN:

978-3-319-52074-2 (Print), ISBN: 978-3-319-52076-6 (Online).

5. Moreno, A.D.; Alvira, P.; Ibarra, D.; Tomás-Pejó, E. **2017**. Chapter 14: Production of ethanol from lignocellulosic biomass. Book: Production of Platform Chemicals from sustainable Resources. Ed.: Springer. Editors: Fang, Z.; Smith, Jr.; Richard, L.; Qi, X., pp 375-410. ISBN: 978-981-10-4171-6 (Print), ISBN: 978-981-10-4172-3 (Online).

6. Rivero, C.; García, M.; González, M. I.; Martín, F.; Anguera, A.; Pinar, H.; Baena, A.; Dufour, J.; García-Gusano, D.; Iribarren, D.; Martín-Gamboa, M.; Valente, A.; Martín, J. **2017**. Chapter 1: Las ciudades: Una gran oportunidad para lograr un sistema energético más sostenible. Book: Energía y ciudades. Ed.: Club Español de la Energía. ISBN: 978-84-697-3779-8.

7. Sanz de Juan, A.; Susmozas, A.; Peters, J.; Dufour, J. **2017**. Chapter 6: Biorefinery Modeling and Optimization. Book: Biorefineries. Targeting Energy, High Value Products and Waste Valorisation. Ed.: Springer. Editors: Rabaçal, M.; Ferreira, A.F.; Silva, C.A.M.; Costa, M. vol. 57, pp. 123-160. ISBN: 978-3-319-48286-6.

8. Serrano, D.P.; Melero, J.A.; Coronado, J.M.; Pizarro, P.; Morales, G. **2017**. Chapter 12: Biomass Conversion over Zeolite Catalysts. Book: Zeolites in Catalysis: Properties and Applications. Ed.: RSC. Editors: Čejka, J.; Morris, R.E.; Nachtigall, P. ISBN: 978-1-78262-784-5 (Print), 978-1-78801-061-0 (Online).

9. Simon-Yarza, T.; Rojas, S.; Horcajada, P.; Serre, C. **2017**. Chapter: The Situation of Metal-Organic Frameworks in Biomedicine. Book: Comprehensive Biomaterials II. Ed.: Elsevier. Editors: Ducheyne, P.; Healy, K.; Huttmacher, D.; Grainger, D.; Kirkpatrick, J., pp. 719-749. ISBN: 978-0-08-100692-4.

10. Thormann, L.; Pizarro, P. **2017**. Chapter 22: Fuels from Pyrolysis. Book: Biokerosene. Status and Prospects. Ed.: Springer. Editors: Kaltschmitt, M.; Neuling, U., pp. 575-605. ISBN: 9783662530658.

11. Tomás-Pejó, E.; González-Fernández, C.; Méndez, L.; Ballesteros, M. **2017**. Chapter: Hydrothermal Processing of Microalgae. Book: Hydrothermal Processing in Biorefineries. Ed.: Springer. Editors: Ruiz, H.A.; Thomsen, M.H.; Trajano, H.L., pp. 483-500. ISBN: 978-3-319-56456-2 (Print), 978-3-319-56457-9 (Online).

12. Tomás-Pejó, E.; Moreno, A.D. **2017**. Chapter: Alcohol Fuels: The biochemical route. Book: Biofuels Production and Processing Technology. Ed.: CRC Press/Taylor & Francis Group. ISBN: 978-1-498-77893-0.

2.4. Non indexed publications

1. Bergna-Díaz, G.; Zonetti, D.; Sánchez, S.; Tedeschi, E.; Ortega, R. "PI passivity-based control of modular multilevel converters for multi-terminal HVDC systems". 2017 IEEE



18th Workshop on Control and Modeling for Power Electronics (COMPEL 2017), 2017. Article number 8013329. DOI: 10.1109/COMPEL.2017.8013329.

2. Frankforter, K.J.; Tejedor-Tejedor, M.I.; Anderson, M.A.; Jahns, T.M. "Investigation of hybrid electrode optimization for energy storage applications with varying energy and power requirements using HPPC cycling. 2017 IEEE Energy Conversion Congress and Exposition (ECCE 2017), pp. 5151-5158 (2017). Article number 8096867. DOI: 10.1109/ECCE.2017.8096867.

3. Gálvez-Martos, J.L.; Sánchez, I.; Dufour, J. "Modelo para el cálculo de indicadores del impacto ambiental de la recogida selectiva de residuos orgánicos en Madrid". Revista Técnica de Medio Ambiente. November/December 2017.

4. Guía del sector energético. CASCATBEL and SUNlight-to-LIQUID projects.

5. Hayes, B.; Escalera, A.; Prodanovic, M. "Event-triggered topology identification for state estimation in active distribution networks". IEEE PES Innovative Smart Grid Technologies Conference Europe, pp. 1-6 (2017). Article number 7856295. DOI: 10.1109/ISGTEurope.2016.7856295.

6. Luque, S.; Bai, F.; González-Aguilar, J.; Wang, Z.; Romero, M. "A parametric experimental study of aerothermal performance and efficiency in monolithic volumetric absorbers". AIP Conference Proceedings, SolarPACES 2016, vol. 1850, pp. 030034-1/8 (2017). Article number 030034. DOI: 10.1063/1.4984377.

7. Marín, F. "Análisis DAFO y Prioridades Científico Tecnológicas y de Innovación del Sector Ferroviario Español. Plataforma Tecnológica Ferroviaria Española (PTFE). Editor: Fundación de los Ferrocarriles Españoles, FSP. June 2017.

8. Muñoz-Sánchez, B.; Nieto-Maestre, J.; González-Aguilar, J.; Julia, J.E.; Navarrete, N.; Faik, A.; Bauer, T.; Bonk, A.; Navarro, M.E.; Ding, Y.; Uranga, N.; Veca, E.; Sau, S.; Giménez, P.; García, P.; Burgaleta, J.I. "Round robin test on the measurement of the specific heat of solar salt". AIP Conference Proceedings, SolarPACES 2016, vol. 1850, pp. 080017-1/8 (2017). Article number 080017. DOI: 10.1063/1.4984438.

9. Prodanovic, M.; Rodríguez-Cabero, A.; Jiménez-Carrizosa, M.; Roldán-Pérez, J. "A Rapid Prototyping Environment for DC and AC Microgrids: Smart Energy Integration Lab (SEIL)". 2017 IEEE 2nd International Conference on Direct Current Microgrids (ICDCM 2017), pp. 421-427. Article number 8001079. DOI: 10.1109/ICDCM.2017.8001079.

10. Reyes-Belmonte, M.A.; Gómez-García, F.; González-Aguilar, J.; Romero, M.; Benoit, H.; Flamant, G. "Heat exchanger modelling in central receiver solar power plant using dense particle suspension". AIP Conference Proceedings, SolarPACES 2016, vol. 1850, pp. 030042-1/8 (2017). Article number 030042. DOI: 10.1063/1.4984385.

11. Reyes-Belmonte, M.A.; Sebastián, A.; González-Aguilar, J.; Romero, M. "Performance comparison of different thermodynamic cycles for an innovative central receiver solar power plant". SolarPACES 2016. AIP Conference Proceedings, vol. 1850, pp. 160024-1/8 (2017). Article number 160024. DOI: 10.1063/1.4984558.

12. Roldán-Pérez, J.; García-Cerrada, A.; Ochoa-Giménez, M.; Zamora-Macho, J.L. "A high-performance voltage sag detection algorithm for a Dynamic Voltage Restorer", 2017 11th IEEE International Conference on Compatibility, Power Electronics and Power Engineering (CPE-POWERENG), pp. 127-132 (2017). Article number 7915157. DOI: 10.1109/CPE.2017.7915157.

13. Romero, M.; González-Aguilar, J.; Luque, S. "Ultra-modular 500m² heliostat field for high flux/high temperature solar-driven processes". AIP Conference Proceedings, SolarPACES 2016, vol. 1850, pp. 030044-1/9 (2017). Article number 030044. DOI: 10.1063/1.4984387

2.5. PhD Thesis

1. Title: *Optimización de la digestión anaerobia de microorganismos fotosintéticos: pretratamiento térmico y uso de cianobacterias*

Author: Lara Méndez Rodríguez

Director: Dr. Cristina González and Dr. Mercedes Ballesteros

Venue: Complutense University of Madrid, Spain

Date: 3 July 2017

2. Title: *Hidroxidoxigenación catalítica de bio-oils de pirólisis sobre fosfuros metálicos soporados*

Author: Antonio Berenguer Ruiz

Director: Dr. David Serrano and Dr. Patricia Pizarro

Venue: Rey Juan Carlos University, Madrid, Spain

Date: 11 July 2017

3. Title: *Estudio de la desionización capacitiva para el tratamiento de aguas salobres: Evaluación de prestaciones y eficiencia energética*

Author: Cleis Santos Santos

Director: Dr. Jesús Palma and Dr. Enrique García-Quismondo

Venue: Autonoma University of Madrid, Spain

Date: 6 September 2017

4. Title: *Analysis of redox reactions in a fluidized/fixed bed reactor for thermochemical energy storage in solar thermal power plants*

Author: Sandra Álvarez de Miguel

Director: Dr. José González (IMDEA Energía), Dr. Juan Mario García (UPM)

Venue: Polytechnic University of Madrid, Spain

Date: 15 September 2017

5. Title: *Development and application of advanced methods for sustainability assessment of energy systems*

Author: Mario Martín Gamboa

Director: Dr. Javier Dufour and Dr. Diego Iribarren

Venue: Rey Juan Carlos University, Madrid, España

Date: 9 November 2017

2.6. Congress communications

2.6.1. Invited lectures

1. Title: *Nuevos avances en la producción de combustibles solares por fotorreducción de CO₂*

Author: de la Peña-O'Shea, V.A.

Congress: Aportando valor al CO₂

Venue: Tarragona, Spain

Date: 9-10 May 2017

Organizer: PTECO₂ and SusChem-España

2. Title: *High Flux/High Temperature Concentrated Solar Thermal Power Technologies and Applications*

Author: Romero, M.

Congress: 9th International Exergy, Energy and Environmental Symposium (IEEES-9)

Venue: Split, Croacia

Date: 14-17 May 2017

Organizer: University of Split and University of Zagreb

3. Title: *Identifying knowledge gaps for an efficient anaerobic digestion of microalgae biomass*

Author: González-Fernández, C.

Congress: BioTech 2017 and 7th Czech-Swiss Symposium

Venue: Prague, Czech Republic

Date: 13-17 June 2017

Organizer: Czech Biotechnology Society; University of Chemistry and Technology Prague; zhaw

4. Title: *Production of advanced biofuels by biomass pyrolysis and bio-oil upgrading*

Author: Serrano, D.P. (plenary)

Congress: 7th Czech-Italian-Spanish Symposium on Catalysis (CIS-7)

Venue: Třeš', Czech Republic

Date: 13-17 June 2017

Organizer: Jiří Čejka and Michal Horáček

5. Title: *Understanding Redox Reactions of Mn Oxides for Thermochemical Energy Storage*

Author: Coronado, J.M.

Congress: 21st International Conference on Solid State Ionics

Venue: Padua, Italy

Date: 18-23 June 2017

Organizer: Università DeGgli Studi Di Padova

6. Title: *Metal organic frameworks as drug nanocarriers*

Author: Horcajada, P.

Congress: XXXVI Reunión Bienal de la Real Sociedad Española de Química

Venue: Sitges, Spain

Date: 25-29 June 2017

Organizer: RSEQ

7. Title: *Flexible all-solid electric double-layer capacitors based on polymer electrolytes*

Author: Marcilla, R.

Congress: 5th International Symposium on Enhanced Electrochemical Capacitors (ISEE CAP'17)

Venue: Jena, Germany

Date: 10-14 July 2017

Organizer: Friedrich-Schiller University Jena

8. Title: *Chitosan engineered metal-organic frameworks as oral drug nanocarriers*

Author: Horcajada, P.

Congress: 24th Congress and General Assembly of the International Union of Crystallography 2017

Venue: Hyderabad, India

Date: 21-28 August 2017

Organizer: IUCr

9. Title: *Engineered metal-organic frameworks as drug nanocarriers*

Author: Horcajada, P. (plenary)

Congress: Primer Simposio de Nanomateriales y Toxicología

Venue: Ciudad de Mexico, Mexico

Date: 30 Agosto-01 September 2017

Organizer: Autonomous Metropolitan University

10. Title: *Boosting photocatalysis for energy applications - A materials point of view*

Author: Fresno, F.

Congress: International Functional Nanomaterials and Nanodevice Conference 2017

Venue: Budapest, Hungary

Date: 24-27 September 2017

Organizer: European Nanoscience and Nanotechnology Association (ENNA)

2.6.2. Oral communications

1. Title: *Functional NiCoMnO₄/N-rGO nanocomposites as Highly Efficient electrocatalyst for energy applications*

Author: Pendashteh, A.; Palma, J.; Anderson, M.A.; Marcilla, R.

Congress: 5th International Conference on Multifunctional, Hybrid and Nanomaterials

Venue: Lisbon, Portugal

Date: 6-10 March 2017

Organizer: Elsevier

2. Title: *A High-Performance Voltage Sag Detection Algorithm for a Dynamic Voltage Restorer*

Author: Roldán-Pérez, J.; García-Cerrada, A.; Ochoa, M.; Zamora, J.

Congress: 11th IEEE International Conference on Compatibility, Power Electronics and Power Engineering (CPE-POWERENG 2017)

Venue: Cádiz, Spain

Date: 4-6 April 2017

Organizer: IEEE, ICE, University of Seville

3. Title: *New concentrated solar power plants based on fuel cells*

Author: Díaz, E.; Martín, L.; Epstein, M.; Romero, M.; González-Aguilar, J.

Congress: 9th International Exergy, Energy and Environmental Symposium (IEEEES-9)

Venue: Split, Croatia

Date: 14-17 May 2017

Organizer: University of Split and University of Zagreb

4. Title: *Benchmarking operacional y ambiental de viñas mediante análisis del ciclo de vida y análisis envolvente de datos*

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

Congress: II Workshop of the Spanish Excellence Network esLCA

Venue: Barcelona, Spain

Date: 15 May 2017

Organizer: LCA

5. Title: *Integration of fuel cells in solar thermal plants*

Author: Díaz, E.; Romero, M.; González-Aguilar, J.

Congress: 13th SOLLAB Doctoral Colloquium on Solar Concentrating Technologies

Venue: Berlín, Germany

Date: 15-17 May 2017

Organizer: DLR

6. Title: *Directly irradiated fluidized bed reactor for solar thermochemical applications*

Author: Arribas, L.; González-Aguilar, J.; Romero, M.

Congress: 13th SOLLAB Doctoral Colloquium on Solar Concentrating Technologies

Venue: Berlín, Germany

Date: 15-17 May 2017

Organizer: DLR

7. Title: *The symbiotic relationship of Microalgae and Bacteria studied through the analysis of O₂ exchange*

Author: de Godos, I.

Congress: Frontiers International Conference on Wastewater Treatment (FICWTM2017)

Venue: Palermo, Italy

Date: 21-24 May 2017

Organizer: International Water Association (IWA)

8. Title: *2D Porous NiCoMnO₄-Graphene Nanocomposites for High-Performance Hybrid Energy Storage Devices*

Author: Sánchez, J.; Pendashteh, A.; Palma, J.; Anderson, M.; Marcilla, R.

Congress: E-MRS 2017 Spring Meeting

Venue: Strasbourg, France

Date: 21-24 May 2017

Organizer: E-MRS

9. Title: *Energy Systems Modelling and Life Cycle Assessment: a symbiotic story*

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

Congress: Workshop on Sustainability Performance of the Energy Systems

Venue: Madrid, Spain

Date: 29-30 May 2017

Organizer: CIEMAT

10. Title: *New insights on the electrodeposition of aluminum and their impact on rechargeable Al-batteries*

Author: Muñoz-Torrero, D.; García-Quismondo, E.; Anderson, M.; Palma, J.; Marcilla, R.

Congress: III Metal-air Batteries international Congress (MABIC2017)

Venue: Huesca, Spain

Date: 4-7 June 2017

Organizer: Albufera Energy Storage

11. Title: *Modelling transport scenarios in the region of Madrid*

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

Congress: 2nd Biomass Resources for Renewable Energy Production Workshop (RESTOENE-2-CM)

Venue: Madrid, Spain

Date: 5-6 June 2017

Organizer: ICP; CIEMAT; URJC; IMDEA Energía; UAM; LABTE

12. Title: *Regionalising the Madrid energy model: combined use of Energy Systems Modelling and Geographic Information Systems*



Author: Martín-Gamboa, M.; García-Gusano, D.; Iribarren, D. Dufour, J.

Congress: 2nd Biomass Resources for Renewable Energy Production Workshop (RESTOENE-2-CM)

Venue: Madrid, Spain

Date: 5-6 June 2017

Organizer: ICP; CIEMAT; URJC; IMDEA Energía; UAM; LABTE

13. Title: *Bioethanol production: Developing yeast strains tolerant to inhibitors and mechanical stress through an evolutionary engineering approach*

Author: Salor, J.M.

Congress: 2nd Biomass Resources for Renewable Energy Production Workshop (RESTOENE-2-CM)

Venue: Madrid, Spain

Date: 5-6 June 2017

Organizer: ICP; CIEMAT; URJC; IMDEA Energía; UAM; LABTE

14. Title: *Nickel Phosphide supported on hierarchical ZSM-5 as catalyst for hydrodeoxygenation of m-Cresol*

Author: Berenguer, A.M.

Congress: 2nd Biomass Resources for Renewable Energy Production Workshop (RESTOENE-2-CM)

Venue: Madrid, Spain

Date: 5-6 June 2017

Organizer: ICP; CIEMAT; URJC; IMDEA Energía; UAM; LABTE

15. Title: *Novel function 3D porous bismuth-organic framework based on a tetrapodal carboxylate linker*

Author: Vilela, S.M.F.; Devic, T.; Horcajada, P.

Congress: 2nd Biomass Resources for Renewable Energy Production Workshop (RESTOENE-2-CM)

Venue: Madrid, Spain

Date: 5-6 June 2017

Organizer: ICP; CIEMAT; URJC; IMDEA Energía; UAM; LABTE

16. Title: *Hydrogen production by photocatalytic reforming of bioethanol over Pt/TiO₂ catalysts*

Author: Lirio, C.; Fresno, F.; de la Peña-O'Shea, V.A.; Serrano, D.P.; Coronado, J.M.

Congress: 2nd Biomass Resources for Renewable Energy Production Workshop (RESTOENE-2-CM)

Venue: Madrid, Spain

Date: 5-6 June 2017

Organizer: ICP; CIEMAT; URJC; IMDEA Energía; UAM; LABTE

17. Title: *Bioethanol production from steam-exploded wheat straw and valorization of the lignin residue through a biorefinery approach*

Author: Tomás-Pejó, E.

Congress: 13th International conference on Renewable Resources and Biorefineries (RRB 13)

Venue: Wroclaw, Poland

Date: 7-9 June 2017

Organizer: Wroclaw University of Environmental & Life Sciences; Ghent University; Development Agency of West Flanders (POM)

18. Title: *Understanding the role of microalgae proteins on anaerobic digestion*

Author: González-Fernández, C.

Congress: 13th International conference on Renewable Resources and Biorefineries (RRB 13)

Venue: Wroclaw, Poland

Date: 7-9 June 2017

Organizer: Wroclaw University of Environmental & Life Sciences; Ghent University; Development Agency of West Flanders (POM)

19. Title: *Hierarchical beta zeolite with uniform mesopores and enhanced catalytic properties for acylation reactions*

Author: Linares, M.; Moreno, I.; Peral, A.; Sanz, R.; García, E.A.; Escola, J.M.; Serrano, D.P.

Congress: 7th Czech-Italy-Spanish Symposium on Catalysis (CIS-7)

Venue: Třeš', Czech Republic

Date: 13-17 June 2017

Organizer: Jiří Čejka and Michal Horáček

20. Title: *Influence of nickel phosphide loading over hierarchical ZSM-5 in M-cresol catalytic hydrodeoxygenation*

Author: Berenguer, A.; Bennett, J.A.; Moreno, I.; Coronado, J.M.; Wilson, K.; Serrano, D.P.; Pizarro, P.

Congress: 7th Czech-Italy-Spanish Symposium on Catalysis (CIS-7)

Venue: Třeš', Czech Republic

Date: 13-17 June 2017

Organizer: Jiří Čejka and Michal Horáček

21. Title: *Performance of MCM-22 zeolite for upgraded bio-oil production by lignocellulose catalytic pyrolysis*

Author: Feroso, J.; Ochoa-Hernández, C.; Herando, H.; Jiménez-Sánchez, S.; Opanasenko, M.; Pizarro, P.; Coronado, J.M.; Serrano, D.P.

Congress: 7th Czech-Italy-Spanish Symposium on Catalysis (CIS-7)

Venue: Třeš', Czech Republic

Date: 13-17 June 2017

Organizer: Jiří Čejka and Michal Horáček

22. Title: *A new power flow method for mixed AC-DC power systems*

Author: Jiménez-Carrizosa, M.; Jiménez, E.; Arzandé, A.

Congress: PowerTech 2017

Venue: Manchester, UK

Date: 18-22 June 2017

Organizer: IEEE

23. Title: *Metal/oxide and oxide/oxide heterojunctions as photocatalysts for CO₂ reduction*

Author: Fresno, F.; Reñones, P.; Galdón, S.; Liras, M.; Barawi, M.; de la Peña-O'Shea, V.A.

Congress: 21st International Conference on Solid State Ionics

Venue: Padua, Italy

Date: 18-23 June 2017

Organizer: Università Degli Studi Di Padova

24. Title: *Characterization of microalgae-bacteria consortia developed during wastewater treatment*

Author: Barreiro, S.

Congress: BIOTEC 2017. National Congress of biotechnology

Venue: Murcia, Spain

Date: 19 June 2017

Organizer: SEBIOT & Murcia University

25. Title: *Bioethanol production: Developing yeast strains tolerant to inhibitors and mechanical stress through an evolutionary engineering approach*

Author: Salor, J.M.

Congress: BIOTEC 2017. National Congress of biotechnology

Venue: Murcia, Spain

Date: 19 June 2017

Organizer: SEBIOT & Murcia University

26. Title: *Proteins: A key macromolecule for an efficient anaerobic digestion of microalgae biomass*

Author: Magdalena, J.A.; González-Fernández, C.; Mahdy, A.; de Godos, I.; Ballesteros, M.

Congress: 5th International Conference on Sustainable Solid Waste Management

Venue: Athens, Greece

Date: 21-24 June 2017

Organizer: National Technical University of Athens

27. Title: *Hacia la producción eficiente de combustibles solares por fotorreducción de CO₂*

Author: de la Peña-O'Shea, V.A.

Congress: XXXVI Reunión Bienal de la Real Sociedad Española de Química

Venue: Sitges, Spain

Date: 25-29 June 2017

Organizer: RSEQ

28. Title: *Fotofuel: red de excelencia para abordar los nuevos desafíos en la producción de combustibles solares*

Author: de la Peña-O'Shea, V.A.

Congress: XXXVI Reunión Bienal de la Real Sociedad Española de Química

Venue: Sitges, Spain

Date: 25-29 June 2017

Organizer: RSEQ

29. Title: *In situ Studies of Redox Cycles on Manganese Oxides for High Temperature Heat Storage*
Author: Carrillo, A.J.; Sastre, D.; Gutiérrez-Rubio, S.; Iglesias-Juez, A.; Serrano, D.P.; Pizarro, P.; Coronado, J.M.

Congress: XXXVI Reunión Bienal de la Real Sociedad Española de Química

Venue: Sitges, Spain

Date: 25-29 June 2017

Organizer: RSEQ

30. Title: *Novel function 3D porous bismuth-organic framework based on a tetrapodal carboxylate linker*

Author: Vilela, S.M.F.; Devic, T.; Horcajada, P.

Congress: XXXVI Reunión Bienal de la Real Sociedad Española de Química

Venue: Sitges, Spain

Date: 25-29 June 2017

Organizer: RSEQ

31. Title: *Organic-inorganic hybrid materials and their use as photocatalyst in artificial photosynthesis*

Author: Liras, M.

Congress: XXXVI Reunión Bienal de la Real Sociedad Española de Química

Venue: Sitges, Spain

Date: 25-29 June 2017

Organizer: RSEQ

32. Title: *Actividad de perovskitas de niobio y tántalo en la reducción fotocatalítica de CO₂*

Author: Fresno, F.; Jana, P.; Reñones, P.; Coronado, J.M.; Serrano, D.P.; de la Peña-O'Shea, V.A.

Congress: Reunión de la Sociedad Española de Catálisis (SECAT'17)

Venue: Oviedo, Spain

Date: 26-28 June 2017

Organizer: SECAT

33. Title: *Reducción de Meerwein-Ponndorf-Verley de ciclohexanona sobre zeolitas MFI de porosidad jerarquizada con zirconio*

Author: Moreno, I.; Linares, M.; Serrano, D.P.

Congress: Reunión de la Sociedad Española de Catálisis (SECAT'17)

Venue: Oviedo, Spain

Date: 26-28 June 2017

Organizer: SECAT

34. Title: *Efecto de óxidos La e In como promotores de TiO₂ para la fotorreducción de CO₂*

Author: Reñones, P.; Fresno, F.; Fierro, J.L.G.; de la Peña-O'Shea, V.A.

Congress: Reunión de la Sociedad Española de Catálisis (SECAT'17)

Venue: Oviedo, Spain

Date: 26-28 June 2017

Organizer: SECAT

35. Title: *Hidredesoxigenación catalítica (HDO) de guayacol sobre Ni₂P soportado en zeolitas*

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

Congress: Reunión de la Sociedad Española de Catálisis (SECAT'17)

Venue: Oviedo, Spain

Date: 26-28 June 2017

Organizer: SECAT

36. Title: *Producción de hidrógeno por descomposición catalítica de metano sobre materiales silíceos obtenidos de la cascarilla de arroz*

Author: Gómez-Pozuelo, G.; Pizarro, P.; Botas, J.A.; Serrano, D.P.

Congress: Reunión de la Sociedad Española de Catálisis (SECAT'17)

Venue: Oviedo, Spain

Date: 26-28 June 2017

Organizer: SECAT

37. Title: *Exergy analysis of hydrogen production via biogas dry reforming*

Author: Cruz, P.L.; Navas-Anguita, Z.; Iribarren, D.; Dufour, J.

Congress: HYdrogen-POwer THEoretical and Engineering Solutions International Symposium (HYPOTHESIS XII)

Venue: Syracuse, Italy

Date: 28-30 June 2017

Organizer: CNR-ITAE

38. Title: *Revisiting end-of-life technologies for fuel cells and hydrogen products*

Author: Valente, A.; Martín-Gamboa, M.; Iribarren, D.; Dufour, J.

Congress: HYdrogen-POwer THEoretical and Engineering Solutions International Symposium (HYPOTHESIS XII)

Venue: Syracuse, Italy

Date: 28-30 June 2017

Organizer: CNR-ITAE

39. Title: *2D Porous NiCoMn Ternary Metal Oxide/Graphene Nanocomposites for Energy Storage Application*

Author: Sánchez, J.; Pendashteh, A.; Palma, J.; Anderson, M.; Marcilla, R.

Congress: Power our Future 2017

Venue: Vitoria, Spain

Date: 2-5 July 2017

Organizer: CIC Energigune

40. Title: *Proof-of-Concept of Membrane Free Flow Battery*

Author: Navalpotro, P.; Palma, J.; Anderson, M.; Marcilla, R.

Congress: Power our Future 2017

Venue: Vitoria, Spain

Date: 2-5 July 2017

Organizer: CIC Energigune

41. Title: *The challenge of the separator in non-aqueous flow batteries. Are semi-solid electrodes a possible way to go?*

Author: Ventosa, E.

Congress: Power our Future 2017

Venue: Vitoria, Spain

Date: 2-5 July 2017

Organizer: CIC Energigune

42. Title: *Nitrate Removal by Asymmetric Capacitive Deionization Using Oxide Coated Carbon Electrodes*

Author: Lado, J.J.; Pérez-Roa, R.E.; Wouters, J.J.; Tejedor-Tejedor, I.; Federspill, C.; Ortiz Díaz-Guerra, J.M.; Anderson, M.A.

Congress: 3rd International Conference on Capacitive Deionization, Electrosorption & Electrodialysis (CDI&E 2017)

Venue: Seoul, Republic of South Korea

Date: 3-6 July 2017

Organizer: CDI&I Working Group; Seoul National University; Korean Society of Industrial & Engineering Industry

43. Title: *Hydrodeoxygenation over supported nickel phosphide catalysts for pyrolysis bio-oils upgrading*

Author: Berenguer, A.; Gutiérrez-Rubio, S.; Moreno, I.; Sankaranarayanan, T.M.; Pizarro, P.; Coronado, J.M.; Serrano, D.P.

Congress: 7th FEZA Conference "The ZEOLITES: Materials with Engineered Properties"

Venue: Sofia, Bulgaria

Date: 3-7 July 2017

Organizer: Bulgarian Zeolite Association

44. Title: *Deoxygenation of Stearic Acid over Hierarchical Pd/ZSM-5 Catalysts*

Author: Briones, L.; Arroyo, M.; Escola, J.M.; Serrano, D.P.

Congress: 7th FEZA Conference "The ZEOLITES: Materials with Engineered Properties"

Venue: Sofia, Bulgaria

Date: 3-7 July 2017

Organizer: Bulgarian Zeolite Association

45. Title: *Macroscopic CNT fibers as multi-functional material for large-area flexible all-solid-state EDLC*

Author: Senokos, E.; Reguero, V.; Cabana, L.; Palma, J.; Marcilla, R.; Vilatela, J.J.

Congress: 1st Transpyrenean Encounter on Advanced Materials

Venue: Sète, France

Date: 4-6 July 2017

Organizer: University of Toulon and Nîmes

46. Title: *Single-Loop Current Controller for Voltage-Sourced Converters with LCL Filters*

Author: Roldán-Pérez, J.; Bueno, E.; Peña-Alzola, R.; Rodríguez-Cabero, A.

Congress: Seminario Anual de Automática, Electrónica Industrial e Instrumentación 2017 (SAAEI'2017)

Venue: Valencia, Spain

Date: 5-7 July 2017

Organizer: University of Valencia

47. Title: *A Unified Modelling Approach for the Simultaneous Control of Back to-Back Converters in Grid-Connected Applications*

Author: Rodríguez-Cabero, A.; Prodanovic, M.

Congress: Seminario Anual de Automática, Electrónica Industrial e Instrumentación 2017 (SAAEI'2017)

Venue: Valencia, Spain

Date: 5-7 July 2017

Organizer: University of Valencia

48. Title: *Mechanistic studies on the activation of aryl bromides by two-photon absorption methodology*

Author: Pérez-Ruiz, R.

Congress: 28th International Conference on Photochemistry (ICP2017)

Venue: Strasbourg, France

Date: 16-21 July 2017

Organizer: University of Strasbourg; CNRS

49. Title: *New insight in solar fuels production from CO₂ photoreduction*

Author: Reñones, P.; Collado, L.; García, A.; Alfonso, E.; García, C.; Fresno, F.; Liras, M.; Barawi, M.; Pérez, R.; de la Peña-O'Shea, V.A.

Congress: 15th International Conference on Carbon Dioxide Utilization (ICCDU XV)

Venue: Shanghai, China

Date: 17-21 July 2017

Organizer: SARI-CAS; ShanghaiTech

50. Title: *Unravelling the photoredox pathways in CO₂ photoreduction by artificial photosynthesis*

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

Congress: 24th Congress and General Assembly of the International Union of Crystallography 2017

Venue: Hyderabad, India

Date: 21-28 August 2017

Organizer: IUCr

51. Title: *Hydrodeoxygenation of guaiacol and acetic acid blends over Ni₂P/ZSM-5 catalyst: elucidating molecular interactions during bio-oil upgrading*

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

Congress: 13th European Congress on Catalysis (Europacat 2017)

Venue: Florence, Italy

Date: 27-31 August 2017

Organizer: ERIC aisbl; SCI

52. Title: *Catalytic fast pyrolysis of wheat straw over Mg-Al mixed oxides derived from hydrotalcite precursors*

Author: Jiménez-Sánchez, S.; Guil-López, R.; Navarro, R.; García-Fierro, J.L.; Pizarro, P.; Serrano, D.P.; Coronado, J.M.

Congress: Workshop on Layered Materials

Venue: Třeš', Czech Republic

Date: 1-5 September 2017

Organizer: Jiří Čejka, Petr Nachtigall, Vitězslav Zima

53. Title: *Decontamination of emerging pollutant using porous metal organic frameworks (MOFs)*

Author: Rojas, S.; Navarro, J.A.; Horcajada, P.

Congress: International Symposium on composites of metal and covalent organic frameworks: fundamental design and applications

Venue: Granada, Spain

Date: 12-14 September 2017

Organizer: University of Granada

54. Title: *Bismuth Metal-Organic Frameworks based on conjugated organic ligands as active photocatalyst for solar fuels production*

Author: de la Peña-O'Shea, V.A.

Congress: International Symposium on composites of metal and covalent organic frameworks: fundamental design and applications

Venue: Granada, Spain

Date: 12-14 September 2017

Organizer: University of Granada

55. Title: *Valorisation of intermediates and by-products*

Author: González-Fernández, C.

Congress: 2nd Training School: Microalgae processes: from fundamentals to industrial scale

Venue: Almería, Spain

Date: 13-15 September 2017

Organizer: University of Almería, Fundación Cajamar

56. Title: *Novel functional 3D porous bismuth-based metal-organic framework*

Author: Vilela, S.M.F.; Devic, T.; Horcajada, P.

Congress: EuroMat 2017

Venue: Thessaloniki, Greece

Date: 17-22 September 2017

Organizer: Hellenic Metallurgical Society, HSSTCM

57. Title: *Chitosan-engineered metal-organic frameworks as oral drug nanocarriers*

Author: Hidalgo, T.; Gimenez-Marques, M.; Bellido, E.; Avila, J.; Asension, M.C.; Salles, F.; Lozano, M.V.; Guillevic, M.; Simon-Vazquez, R.; Serre, C.; Alonso, M.J.; Horcajada, P.

Congress: EuroMat 2017

Venue: Thessaloniki, Greece

Date: 17-22 September 2017

Organizer: Hellenic Metallurgical Society, HSSTCM

58. Title: *Particles-based Thermal Energy Storage Systems for Concentrated Solar Power Applications*

Author: Reyes-Belmonte, M.A.; Díaz, E.; González-Aguilar, J.; Romero, M.

Congress: SolarPACES 2017

Venue: Santiago de Chile, Chile

Date: 26-29 September 2017

Organizer: SolarPACES

59. Title: *Performance of hierarchical ZSM-5 in catalytic fast-pyrolysis of de-ashed wheat straw*

Author: Hernando-Marcos, H.; Fermoso, J.; Jiménez-Sánchez, S.; Ochoa-Hernández, C.; Peral, Á.; Moreno, I.; Pizarro, P.; Coronado, J.M.; Serrano, D.P.

Congress: GEZ Summer School on Zeolites. New trends & future challenges

Venue: Móstoles, Madrid, Spain

Date: 27-29 September 2017

Organizer: Grupo Español de Zeolitas (GEZ)

60. Title: *Hydrodeoxygenation over Ni2P/ZSM-5 catalyst: guaiacol and acetic acid blends*

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

Congress: GEZ Summer School on Zeolites. New trends & future challenges

Venue: Móstoles, Madrid, Spain

Date: 27-29 September 2017

Organizer: Grupo Español de Zeolitas (GEZ)

61. Title: *Life cycle assessment of hydrogen production via biogas dry reforming*

Author/es: Dufour, J.; Navas-Anguita, Z.; Cruz, P.; Iribarren, D.

Congress: 10th World Congress of Chemical Engineering (WCCE2017)

Venue: Barcelona, Spain

Date: 1-5 October 2017

Organizer: ANQUE, AIQS, Enginyers Industrial de Catalunya, SEQUI

62. Title: *The role of lifecycle indicators in energy planning: road transport and power generation in Spain*

Author/es: Iribarren, D.; García-Gusano, D.; Dufour, J.

Congress: 10th World Congress of Chemical Engineering (WCCE2017)

Venue: Barcelona, Spain

Date: 1-5 October 2017

Organizer: ANQUE, AIQS, Enginyers Industrial de Catalunya, SEQUI

63. Title: *Ex-situ biomass catalytic pyrolysis to high quality bio-oil in pilot scale over novel ZSM-5 based nano-catalysts*

Author/es: Heracleous, E.; Kalogiannis, K.; Hernando-Marcos, H.; Serrano, D.P.; Fakin, T.; Horvat, A.; Lappas, A.

Congress: 10th World Congress of Chemical Engineering (WCCE2017)

Venue: Barcelona, Spain

Date: 1-5 October 2017

Organizer: ANQUE, AIQS, Enginyers Industrial de Catalunya, SEQUI

64. Title: *Effect of indigenous and external catalysts on the Bio-Oil production by lignocellulose fast- pyrolysis*

Author/es: Hernando-Marcos, H.; Feroso, J.; Jimenez, S.; Lappas, A.; Heracleous, E.; Pizarro, P.; Coronado, J.M.; Serrano, D.P.

Congress: 10th World Congress of Chemical Engineering (WCCE2017)

Venue: Barcelona, Spain

Date: 1-5 October 2017

Organizer: ANQUE, AIQS, Enginyers Industrial de Catalunya, SEQUI

65. Title: *Chemical looping reforming of methane and CO₂ splitting using La_{1-x}Sr_xFeO₃ (x= 0, 0., 0., 0., 0., 1) PEROVSKITES*

Author/es: Sastre-Quemada, D.; Serrano, D.P.; Pizarro, P.; Coronado, J.M.

Congress: 10th World Congress of Chemical Engineering (WCCE2017)

Venue: Barcelona, Spain

Date: 1-5 October 2017

Organizer: ANQUE, AIQS, Enginyers Industrial de Catalunya, SEQUI

66. Title: *Synergetic effects in the catalytic co-pyrolysis of lignocellulose/plastic mixtures for upgrading the bio-oil properties*

Author/es: Jiménez-Sánchez, S.; Peral, A.; Moreno, J.M.; Coronado, J.M.; Pizarro, P.; Serrano, D.P.

Congress: 10th World Congress of Chemical Engineering (WCCE2017)

Venue: Barcelona, Spain

Date: 1-5 October 2017

Organizer: ANQUE, AIQS, Enginyers Industrial de Catalunya, SEQUI

67. Title: *Producción de ácido láctico a partir de hidrolizado de paja de trigo: estudio de las condiciones de proceso*

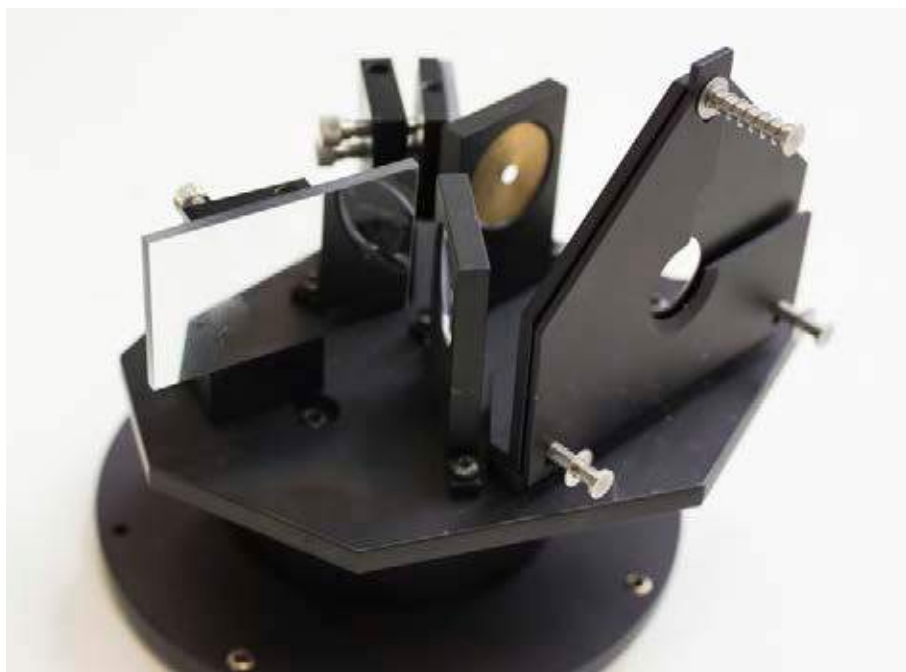
Author/es: Cubas, E.; Tomás-Pejó, E.

Congress: XIX Reunión de la red temática Lignocel

Venue: INIA, Madrid, Spain

Date: 9-10 October 2017

Organizer: INIA



68. Title: *Insights in the CO₂ photo-activation over hybrid photocatalysts for artificial photosynthesis*

Author/es: de la Peña-O'Shea, V.A.

Congress: VIII AUSE Congress and III ALBA User's Meeting - 2017

Venue: Madrid, Spain

Date: 9-11 October 2017

Organizer: AUSE

69. Title: *Capacitive Deionization for the treatment of Brine from Brackish Water Reverse Osmosis Plants*

Author/es: García-Quismondo, E.; Lado, J.J.; Palma, J.; Ordóñez, A.; Gutiérrez, B.; Huertas, F.; Parrado, R.; de Miguel, A.

Congress: IDA World Congress 2017-Water Reuse & Desalination "Ensure Your Water Future"

Venue: São Paulo, Brazil

Date: 15-20 October 2017

Organizer: IDA-International Desalination Association

70. Title: *Insights into the effect of mechanical stress on bioethanol producing yeasts*

Author/es: Tomás-Pejó, E.

Congress: VII International Conference on Environmental, Industrial and Applied Microbiology (BioMicroWorld2017)

Venue: Madrid, Spain

Date: 18-20 October 2017

Organizer: Formatex Research Center

71. Title: *Influence of socio-environmental externalities on the future role of waste-to-energy plants in Spain*

Author/es: Iribarren, D.; García-Gusano, D.; Dufour, J.

Congress: IV Workshop esLCA "Life cycle assessment and circular economy: waste management decision tools"

Venue: Santander, Spain

Date: 27 October 2017

Organizer: LCA

72. Title: *Understanding the drug incorporation and delivery from Metal Organic Frameworks as cutaneous drug delivery systems*

Author: Rojas, S.; Colinet, D.; Cunha, D.; Hidalgo, T.; Guillou, N.; Serre, C.; Horcajada, P.

Congress: 2017 Young EuroMOF conference

Venue: Delft, Netherlands

Date: 28 October 2017

Organizer: TU Delft, KU Leuven, University of Adelaide

73. Title: *Stability Analysis for Weak Meshed Networks with Power Electronics-Based Distributed Generation*

Author: Rodríguez-Cabero, A.; Prodanovic, M.

Congress: 43rd Annual Conference of the IEEE Industrial Electronics Society (IECON2017)

Venue: Beijing, China

Date: 29 October-01 November 2017

Organizer: IEEE Industrial Electronics Society (IES)

74. Title: *Detailed Discrete-Time Implementation of a Battery-Supported Synchronverter for Weak Grids*



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

Congress: 43rd Annual Conference of the IEEE Industrial Electronics Society (IECON2017)

Venue: Beijing, China

Date: 29 October-01 November 2017

Organizer: IEEE Industrial Electronics Society (IES)

75. Title: *Molten Carbonates Electrolyzer Model for Hydrogen Production coupled to Medium/Low Temperature Solar Power Plant*

Author: Reyes-Belmonte, M.A.; Delgado, A.; Díaz, E.; González-Aguilar, J.; Romero, M.

Congress: ISES Solar World Congress 2017

Venue: Abu Dhabi, UAE

Date: 29 October-02 November 2017

Organizer: ISES

76. Title: Design of a Calorimetric Facility to Assess Volumetric Receivers Employing a 42 kW High Flux Solar Simulator

Author: Luque, S.; González-Aguilar, J.; Romero, M.

Congress: ISES Solar World Congress 2017

Venue: Abu Dhabi, UAE

Date: 29 October-2 November 2017

Organizer: ISES

77. Title: Synchronverter small-signal modelling and eigenvalue analysis for battery systems integration

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

Congress: IEEE 6th International Conference on Renewable Energy Research and Applications (ICRERA) 2017

Venue: San Diego, USA

Date: 5-8 November 2017

Organizer: IJRER, IEEE

78. Title: Harmonic Virtual Impedance Design for a Synchronverter-based Li-ion Battery

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

Congress: IEEE 6th International Conference on Renewable Energy Research and Applications (ICRERA) 2017

Venue: San Diego, USA

Date: 5-8 November 2017

Organizer: IJRER, IEEE

2.6.3. Poster communications

1. Title: *Ba_{1-x}CaxTiO₃ Microwave-assisted hydrothermal synthesis*

Author: Salcedo, P.; Morán, E.; Villafuerte-Castrejón, M.E.; Vivar-Ocampo, R.; Pardo, L.

Congress: PIEZO2017: Electroceramics for End-Users IX

Venue: Cercedilla, Madrid, Spain

Date: 19-22 February 2017

Organizer: CSIC, UPM

2. Title: *Actividad de perovskitas de niobio y tántalo en la reducción fotocatalítica de CO₂*

Author: Fresno, F.; Jana, P.; Reñones, P.; Coronado, J.M.; Serrano, D.P.; de la Peña O'Shea, V.A.

Congress: Aportando valor al CO₂

Venue: Tarragona, Spain

Date: 9-10 May 2017

Organizer: PTECO₂; SusChem-Spain

3. Title: *Materiales híbridos en celdas fotoelectroquímicas para la descomposición de CO₂*

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

Congress: Aportando valor al CO₂

Venue: Tarragona, Spain

Date: 9-10 May 2017

Organizer: PTECO₂; SusChem-Spain

4. Title: *Polímeros conjugados porosos basados en unidades de Ditiotiofeno y sus híbridos con TiO₂ para fotosíntesis artificial*

Author: Liras, M.; García, A.; Reñones, P.; Barawi, M.; Pérez-Ruiz, R.; Fresno, F.

Congress: Aportando valor al CO₂

Venue: Tarragona, Spain

Date: 9-10 May 2017

Organizer: PTECO₂; SusChem-Spain

5. Title: *Fotofuel: red de excelencia para abordar los nuevos desafíos en la producción de biocombustibles solares*

Author: de la Peña-O'Shea, V.A.; Fresno, F.; Fierro, J.L.G.; Gimbert-Suriñach, C.; García, H.; Vilatela, J.J.; García-Aranda, M.A.; Illas, F.; Giménez, S.; Malato, S.; Andreu, T.

Congress: Aportando valor al CO₂

Venue: Tarragona, Spain

Date: 9-10 May 2017

Organizer: PTECO₂; SusChem-Spain

6. Title: *Hydrogen production by photocatalytic reforming of bioethanol over Pt/TiO₂ catalysts*

Author: Lirio, C.; Fresno, F.; de la Peña-O'Shea, V.A.; Serrano, D.P.; Coronado, J.M.

Congress: 2nd Biomass Resources for Renewable Energy Production Workshop (RESTOENE-2-CM)

Venue: Madrid, Spain

Date: 5-6 June 2017

Organizer: ICP; CIEMAT; URJC; IMDEA Energía; UAM; LABTE

7. Title: *Valorization of urban WASTEs to new generation of BIOethanol*

Author: Oliva, J.M.; Coll, C.; González, C.; Hayton, I.; Ballesteros, I.; Latorre, M.; Susmozas, A.; Moreno, A.D.; Ballesteros, M.

Congress: 2nd Biomass Resources for Renewable Energy Production Workshop (RESTOENE-2-CM)

Venue: Madrid, Spain

Date: 5-6 June 2017

Organizer: ICP; CIEMAT; URJC; IMDEA Energía; UAM; LABTE

8. Title: *Elucidating the role of lignocellulose composition on the catalytic fast copyrolysis with plastic wastes*

Author: Jiménez, S.; Peral, A.; Moreno, J.M.; Coronado, J.M.; Pizarro, P.; Serrano, D.P.

Congress: 2nd Biomass Resources for Renewable Energy Production Workshop (RESTOENE-2-CM)

Venue: Madrid, Spain

Date: 5-6 June 2017

Organizer: ICP; CIEMAT; URJC; IMDEA Energía; UAM; LABTE

9. Title: *Guaiacol and acetic acid blends hydrodeoxygenation over Ni₂P catalyst*

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

Congress: 2nd Biomass Resources for Renewable Energy Production Workshop (RESTOENE-2-CM)

Venue: Madrid, Spain

Date: 5-6 June 2017

Organizer: ICP; CIEMAT; URJC; IMDEA Energía; UAM; LABTE

10. Title: *Biomass pyrolysis over Mg-Al mixed oxides derived from hydrotalcite precursors: Influence of Mg/Al ratio*

Author: Guil-López, R.; Jiménez, S.; Pizarro, P.; Coronado, J.M.; Serrano, D.P.; Navarro, R.M.; Fierro, J.L.G.

Congress: 2nd Biomass Resources for Renewable Energy Production Workshop (RESTOENE-2-CM)

Venue: Madrid, Spain

Date: 5-6 June 2017

Organizer: ICP; CIEMAT; URJC; IMDEA Energía; UAM; LABTE

11. Title: *An analytical method to assess the impact of distributed generation and energy storage on reliability of supply*

Author: Escalera, A.; Hayes, B.; Prodanovic, M.

Congress: CIRED 2017

Venue: Glasgow, Scotland

Date: 12-15 June 2017

Organizer: IET

12. Title: *Design and synthesis of Conjugated Porous Polymers (CPPs) composed of BOPHY for photocatalytic applications*

Author: García, C.; Liras, M.; Fresno, F.; de la Peña-O'Shea, V.A.

Congress: XXXVI Reunión Bienal de la Real Sociedad Española de Química

Venue: Sitges, Spain

Date: 25-29 June 2017

Organizer: RSEQ



13. Title: *Fotofuel: red de excelencia para abordar los nuevos desafíos en la producción de combustibles solares*

Author: de la Peña-O'Shea, V.A.

Congress: XXXVI Reunión Bienal de la Real Sociedad Española de Química

Venue: Sitges, Spain

Date: 25-29 June 2017

Organizer: RSEQ

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

Congress: Reunión de la Sociedad Española de Catálisis (SECAT'17)

Venue: Oviedo, Spain

Date: 26-28 June 2017

Organizer: SECAT

14. Title: *Towards conductive metal organic frameworks: template polymerization*

Author: Salcedo, P.; Navlon, S.; Atiezar, P.; Bordet, F.; Salles, H.; García, H.; Horcajada, P.

Congress: XXXVI Reunión Bienal de la Real Sociedad Española de Química

Venue: Sitges, Spain

Date: 25-29 June 2017

Organizer: RSEQ

17. Title: *Reformado de metano y disociación de CO₂ utilizando perovskitas La_{1-x}Sr_xFeO₃*

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

Congress: Reunión de la Sociedad Española de Catálisis (SECAT'17)

Venue: Oviedo, Spain

Date: 26-28 June 2017

Organizer: SECAT

15. Title: *Materiales híbridos orgánico-inorgánicos como catalizadores en la fotosíntesis artificial*

Author: García-Sánchez, A.; Liras, M.; Reñones, P.; Barawi, M.; Fresno, F.; de la Peña-O'Shea, V.A.

Congress: Reunión de la Sociedad Española de Catálisis (SECAT'17)

Venue: Oviedo, Spain

Date: 26-28 June 2017

Organizer: SECAT

18. Title: *Evaluación de diferentes sistemas catalíticos para la conversión de fenol en ciclohexanol y benceno utilizando reacciones de transferencia de hidrógeno desde isopropanol*

Author: García-Minguillán, A.M.; Briones, L.; Serrano, D.P.; Botas, J.A.; Escola, J.M.

Congress: Reunión de la Sociedad Española de Catálisis (SECAT'17)

Venue: Oviedo, Spain

Date: 26-28 June 2017

Organizer: SECAT

16. Title: *Hacia la fotosíntesis artificial: catalizadores para convertir el CO₂ y el agua en combustibles y materias primas utilizando el Sol como fuente de energía*

19. Title: *A rapid prototyping environment for DC and AC microgrids: Smart Energy Integration Lab (SEIL)*

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

Congress: The 2nd IEEE International Conference on DC Microgrids

Venue: Nuremberg, Germany

Date: 27-29 June 2017

Organizer: IEEE PES; IEEE Power Electronics Society

20. Title: Decorating of N-doped graphene by NiCoMnO₄ nanoparticles for highly efficient bifunctional electrocatalysis of oxygen reactions
Author: Pendashteh, A; Palma, J.; Anderson, M.; Marcilla, R.

Congress: Photo-ElectroCatalysis at the Atomic Scale (PECAS)

Venue: San Sebastián, Spain

Date: 27-30 June 2017

Organizer: UPV/EHU

21. Title: *Elucidating the role of lignocellulose composition on its catalytic fast co-pyrolysis with plastic wastes assisted by ZSM-5 zeolite*
Author: Jiménez, S.; Peral, A.; Coronado, J.M.; Pizarro, P.; Serrano, D.P.

Congress: 7th FEZA Conference "The ZEOLITES: Materials with Engineered Properties"

Venue: Sofia, Bulgaria

Date: 3-7 July 2017

Organizer: Bulgarian Zeolite Association

22. Title: *PI passivity-based control of modular multilevel converters for multi-terminal HVDC systems*

Author: Bergna-Díaz, G.; Zonetti, D.; Sánchez, S.; Tedeschi, E.; Ortega, R.

Congress: 2017 IEEE 18th Workshop on Control and Modeling for Power Electronics (COMPEL)

Venue: Stanford, California, USA

Date: 09-12 July 2017

Organizer: IEEE PELS

23. Title: *Protein photohaptation by beta-lactams. Photobinding of ezetimibe to human serum albumin*

Author: Jiménez, M.C.; Pérez-Ruiz, R.; Limones-Herrero, D.; Andreu, I.; Lence, E.; González-Bello, C.; Miranda, M.A.

Congress: 28th International Conference on Photochemistry (ICP2017)

Venue: Strasbourg, France

Date: 16-21 July 2017

Organizer: Universidad de Strasbourg; CNRS

24. Title: *Nanoscaled zinc pyrazolate metal-organic frameworks as oral drug delivery systems*

Author: Rojas, S.; Carmona, F.J.; Maldonado, C.R.; Horcajada, P.; Hidalgo, T.; Serre, C.; Navarro, J.A.; Barea, E.

Congress: 24th Congress and General Assembly of the International Union of Crystallography

Venue: Hyderabad, India

Date: 21-28 August 2017

Organizer: IUCr

25. Title: *Metal-Organic Frameworks based on conjugated organic ligands for optoelectronic applications*

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

Congress: 24th Congress & General Assembly of the International Union of Crystallography 2017

Venue: Hyderabad, India

Date: 21-28 August 2017

Organizer: IUCr

26. Title: *Structural elucidation of multi-cation arrangements in metal-organic frameworks*

Author: Castillo, C.; de la Peña-O'Shea, V.A.; Puente-Orech, I.; Romero de Paz, J.; Sáez-Puche, R.; Gutiérrez-Puebla, E.; Gándala, F.; Monge, A.

Congress: 24th Congress and General Assembly of the International Union of Crystallography 2017

Venue: Hyderabad, India

Date: 21-28 August 2017

Organizer: IUCr

27. Title: *Understanding of structural changes in bare and MnO₂ decorated CNT fibers in ionic liquids*

Author: Pendashteh, A.; Senokos, E.; Vilatela, J.J.; Marcilla, R.

Congress: 649. WE-Heraeus-Seminar: "In operando characterization of energy materials"

Venue: Bad Honnef, Germany

Date: 23-27 August 2017

Organizer: FZ Jülich

28. Title: *A life-cycle perspective in energy systems modelling: nuclear extension scenarios for Spain*

Author: García-Gusano, D.; Martín-Gamboa, M.; Iribarren, D.; Dufour, J.

Congress: 8th International Conference on Life Cycle Management (LCM2017)

Venue: Luxembourg

Date: 3-6 September 2017

Organizer: Luxembourg Institute of Science and Technology (LIST); University of Luxembourg; ArcelorMittal

29. Title: *Life-cycle performance of kerosene produced through biomass gasification and Fischer-Tropsch synthesis*

Author: Iribarren, D.; Martín-Gamboa, M.; Cruz, P.L.; Delgado-Casado, L.C.; Dufour, J.

Congress: 8th International Conference on Life Cycle Management (LCM2017)

Venue: Luxembourg

Date: 3-6 September 2017

Organizer: Luxembourg Institute of Science and Technology (LIST); University of Luxembourg; ArcelorMittal

30. Title: *Combined use of data envelopment analysis and Life Cycle Assessment for gradual operational and environmental benchmarking in terms of continuous improvement*

Author: Iribarren, D.; Álvarez-Rodríguez, C.; Martín-Gamboa, M.; Vázquez-Rowe, I.; Lorenzo-Toja, Y.; Dufour, J.

Congress: 8th International Conference on Life Cycle Management (LCM2017)

Venue: Luxembourg

Date: 3-6 September 2017

Organizer: Luxembourg Institute of Science and Technology (LIST); University of Luxembourg; ArcelorMittal

31. Title: *Aromatic substitutions of aryl halides enabled by dual photoactivation of a small organic dye*

Author: Neumeier, M.; Sampedro, D.; de la Peña-O'Shea, V.A.; von Wangelin, A.J.; Pérez-Ruiz, R.

Congress: 26th International Conference on Heterocycles (ISHC2017)

Venue: Regensburg, Germany

Date: 3-8 September 2017

Organizer: University of Regensburg

32. Title: *Biphotonic catalyzed C-C coupling reactions*

Author: Pérez-Ruiz, R.; García Lopez-Calixto, C.; Liras, M.; de la Peña-O'Shea, V.A.

Congress: 26th International Conference on Heterocycles (ISHC2017)

Venue: Regensburg, Germany

Date: 3-8 September 2017

Organizer: University of Regensburg

33. Title: *A novel functional 3D porous metal-organic framework built from bismuth and a tetracarboxylate building block*

Author: Vilela, S.M.F.; Devic, T.; P. Horcajada, P.

Congress: International Symposium on composites of metal and covalent organic frameworks: fundamental design and applications

Venue: Granada, Spain

Date: 12-14 September 2017

Organizer: University of Granada

34. Title: *Energy and exergy analysis of a solar thermo-electro-chemical power plant based on fuel cells*

Author: Díaz, E.; Romero, M.; González-Aguilar, J.

Congress: SolarPACES 2017

Venue: Santiago de Chile, Chile

Date: 26-29 September 2017

Organizer: SolarPACES

35. Title: *Optimization of an Integrated Solar Combined Cycle*

Author: Reyes-Belmonte, M.A.; Pino, F.J.; Romero, M.; Suárez, C.; González-Aguilar, J.; Guerra, J.

Congress: SolarPACES 2017

Venue: Santiago de Chile, Chile

Date: 26-29 September 2017

Organizer: SolarPACES

36. Title: *Elucidating the role of lignocellulose composition on the catalytic fast co-pyrolysis with plastic wastes*

Author: Jiménez-Sánchez, S.; Peral, A.; Moreno, J.M.; Coronado, J.M.; Pizarro, P.; Serrano, D.P.

Congress: GEZ Summer School on Zeolites. New trends & future challenges

Venue: Móstoles, Madrid, Spain

Date: 27-29 September 2017

Organizer: Grupo Español de Zeolitas (GEZ)

37. Title: *Expanding scenario analysis by means of life-cycle indicators: the case of coal extension in Spain*

Author/es: García-Gusano, D.; Iribarren, D.; Dufour, J.

Congress: 10th World Congress of Chemical Engineering (WCCE2017)

Venue: Barcelona, Spain

Date: 1-5 October 2017

Organizer: ANQUE, AIQS, Enginyers Industrial de Catalunya, SEQUI

38. Title: *Encapsulation of $\text{CaO}/\text{Ca}(\text{OH})_2$ pellets by sol-gel method for thermochemical heat storage*

Author: Arconada, N.; Briones, L.; Sanz, E.; Peral, A.; Escola, J.M.; Romero, M.; Sanz, R.; González-Aguilar, J.

Congress: 10th World Congress of Chemical Engineering (WCCE2017)

Venue: Barcelona, Spain

Date: 1-5 October 2017

Organizer: ANQUE, AIQS, Enginyers Industrial de Catalunya, SEQUI

39. Title: *Single-Loop All-Pass-Filter-based Active Damping for VSCs with LCL filters Connected to the Grid*

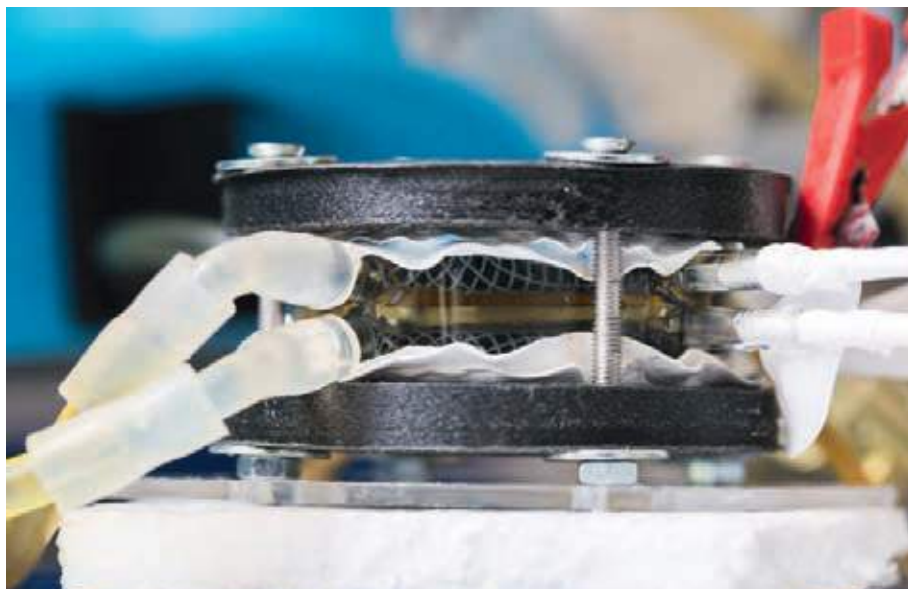
Author/es: Roldán-Pérez, J.; Bueno, E.; Peña-Alzola, R.; Rodríguez-Cabero, A.

Congress: IEEE Energy Conversion Congress & Exposition (ECCE2017)

Venue: Cincinnati, USA

Date: 1-5 October 2017

Organizer: IEEE





3. Training and dissemination activities

3.1. Mobility actions

IMDEA Energy researchers

1. Stay at Institut Lavoisier, Versailles, France

Period: 1 week, 2017

Funding Institution: IMDEA Energy Institute

Dr. Patricia Horcajada

2. Stay at ETH Zürich, Switzerland

Period: 3 months, 2017

Funding Institution: Ministry of Education, Culture and Sports

Dr. José González

3. Stay at University of Aveiro, Portugal

Period: 3 months, 2017

Funding Institution: Ministry of Economy, Industry and Competitiveness

Ms. Paula Navalpotro

4. Stay at KU Leuven, Belgium

Period: 1 month, 2017

Funding Institution: European Union (EUALGAE project)

Dr. Cristina González

5. Stay at Instituto Superior Técnico, University of Lisboa, Portugal

Period: 1,5 months, 2017

Funding Institution: IMDEA Energy Institute

Mr. Pablo Salcedo

6. Stay at University of New South Wales, Sydney, Australia

Period: 4 months, 2017

Funding Institution: IMDEA Energy Institute

Dr. Enrique García-Quismondo

7. Stay at Institute of Electrical Engineering, Chinese Academy of Sciences, Beijing, China

Period: 2 weeks, 2017

Funding Institution: European Union (STAGE-STE project)

Dr. Salvador Luque

8. Stay at University of Alcalá, Spain

Period: 4 months, 2017

Funding Institution: IMDEA Energy Institute

Ms. Ana Arenas

9. Stay at Synchrotron SOLEIL, France

Period: 1 week, 2017

Funding Institution: IMDEA Energy Institute

Dr. Patricia Horcajada

Visiting researchers

1. Jelena Godrijan

Origin Institution: PROMES-CNRS, Francia

Host Unit: Biotechnological Processes Unit

Period: 3 months, 2017

Activity: Short term scientific mission (EUALGAE project)

2. Ece Kendir

Origin Institution: Hacettepe University, Turkey

Host Unit: Biotechnological Processes Unit

Period: 3 months, 2017

Activity: In-situ enzyme production from Bacteria (EUALGAE project)

3. Corrado Landi, ERASMUS Student

Origin Institution: University of Salerno, Italy

Host Unit: Electrochemical Processes Unit

Period: 6 months, 2017

Activity: Removal and recovery of heavy metals from water streams by capacitive deionization

4. Roberto Napoli, ERASMUS Student

Origin Institution: University of Salerno, Italy

Host Unit: Electrochemical Processes Unit

Period: 6 months, 2017

Activity: Integral water treatment system combining Capacitive Deionization and Electro-oxidation

5. Silvia Quaresma

Origin Institution: Instituto Superior Técnico, Lisboa, Portugal

Host Unit: Advanced Porous Materials Unit

Period: 1,5 months, 2017

Activity: Synthesis of materials. Characterization XRD, DLS, IR, TGA

6. María Orfila

Origin Institution: Rey Juan Carlos University, Spain

Host Unit: High temperature Processes Unit

Period: 1 week, 2017

Activity: Perovskites water splitting in a high flux solar simulator

7. Stefan Brandleberger

Origin Institution: DLR, Cologne, Germany

Host Unit: High temperature Processes Unit

Period: 10 days, 2017

Activity: Visiting researcher working in the field of flux measurement systems

8. Mattia Roccabruna

Origin Institution: Fondazione FBK, Trento, Italia

Host Unit: High temperature Processes Unit

Period: 10 days, 2017

Activity: Visiting researcher working in the field of volumetric solar receivers (STAGE-STE project)

9. Rim Jabali

Origin Institution: University of Sfax, Tunisia

Host Unit: Advanced Porous Materials Unit

Period: 3 months, 2017

Activity: Synthesis and characterization of metal-organic frameworks

10. Lena Böhre

Origin Institution: TUUH, Switzerland

Host Unit: High temperature Processes Unit

Period: 4 months, 2017

Activity: Operation and characterization of a 250kW heliostat field with 169 units

11. Ellen Kadja Lima de Morais

Origin Institution: Universidade Federal do Rio Grande do Norte, Brazil

Host Unit: Thermochemical Processes Unit

Period: 6 months, 2017

Activity: Biomass and plastics pyrolysis using beta zeolite catalysts with hierarchical porosity

12. Vicente José Canals Guinand

Origin Institution: Universidad de las Illes Balears (UIB), Spain

Host Unit: Electrical Processes Unit

Period: 4 months, 2017

Activity: Application of non-conventional computational intelligence methodologies to highly distributed electricity networks: Balearic Islands Case Study

13. Andrés Badel

Origin Institution: MIT, USA

Host Unit: Electrochemical Processes Unit

Period: 2 months, 2017

Activity: Development of a Membrane-Free redox Flow Battery by using immiscible electrolytes

14. Yang Wang

Origin Institution: Tianjin University, China

Host Unit: Electrochemical Processes Unit

Period: 6 months, 2017

Activity: Capacitive Desionization

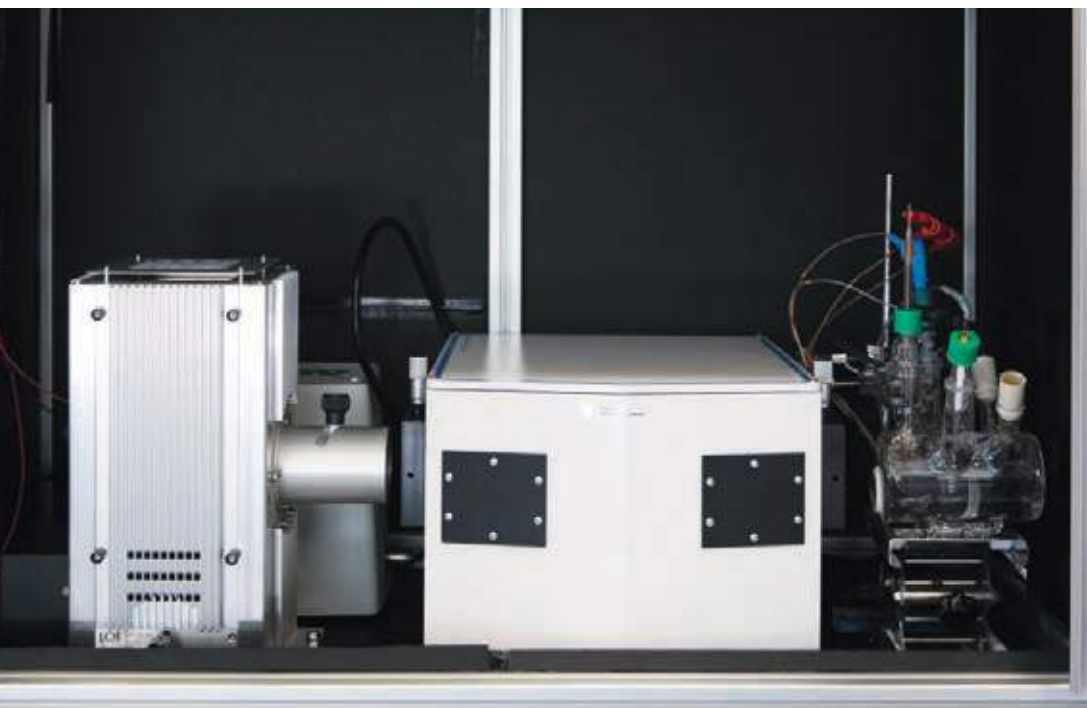
15. Sandra Álvarez

Origin Institution: Rey Juan Carlos University, Spain

Host Unit: High temperature Processes Unit

Period: 1 month, 2017

Activity: Synthesis of materials for Energy storage



16. Francisco Javier Pino

Origin Institution: University of Seville, Spain

Host Unit: High temperature Processes Unit

Period: 2 weeks, 2017

Activity: Combined cycle modelling using Thermoflex (STAGE-STE project)

17. Martin Thelen

Origin Institution: DLR, Germany

Host Unit: High temperature Processes Unit

Period: 2 weeks, 2017

Activity: DLR secondment for SUN-to-LIQUID project

18. Stefan Zoller

Origin Institution: ETH Zürich, Switzerland

Host Unit: High temperature Processes Unit

Period: 5 months, 2017

Activity: ETH secondment for SUN-to-LIQUID project

19. Adriano Patané

Origin Institution: ETH Zürich, Switzerland

Host Unit: High temperature Processes Unit

Period: 5 months, 2017

Activity: ETH secondment for SUN-to-LIQUID project

20. Ernest Eric Koeppf

Origin Institution: ETH Zürich, Switzerland

Host Unit: High temperature Processes Unit

Period: 5 months, 2017

Activity: ETH secondment for SUN-to-LIQUID project

21. Sara Rafiei

Origin Institution: University of Isfahan, Iran

Host Unit: Advanced Porous Materials Unit

Period: 5 months, 2017

Activity: Synthesis and characterization of MOFs

22. Andreas Kunzmann

Origin Institution: Friedrich-Alexander-Universität Erlangen Nürnberg (FAU), Alemania

Host Unit: Photoactivated Processes Unit

Period: 3 months, 2017

Activity: Comparative experiments of solar fuels production using different photocatalysts

23. Sara Paulina Cuellar

Origin Institution: KU Leuven, Belgium

Host Unit: Biotechnological Processes Unit

Period: 1 month, 2017

Activity: Cyanobacteria biomass utilization as a carbohydrate-rich substrate for anaerobic digestion and wastewater treatment

24. Marleen Haering

Origin Institution: Universität Regensburg (UR), Germany

Host Unit: Photoactivated Processes Unit

Period: 1 month, 2017

Activity: NSAID prodrug/drug release by photolysis

25. Carlos Larrea

Origin Institution: ETH Zürich, Switzerland

Host Unit: High temperature Processes Unit

Period: 2 months, 2017

Activity: Experimentally assess the performance of the 50Kw solar reactor on the solar tower at IMDEA Energía

26. Patrick Davenport

Origin Institution: ETH Zürich, Switzerland

Host Unit: High temperature Processes Unit

Period: 2 weeks, 2017

Activity: ETH secondment for SUN-to-LIQUID project

27. Daniele Candelaresi

Origin Institution: Università degli Studi di Cassino del Lazio Meridionale, Italy

Host Unit: System Analysis Unit

Period: 2 weeks, 2017

Activity: Sustainability assessment of Energy systems

28. Ioanna-Idyli Betsi-Argyropoulou

Origin Institution: Technical University of Crete, Greece

Host Unit: High temperature Processes Unit

Period: 3 months, 2017

Activity: CeO_x structures for hydrogen production by concentrating solar energy

3.2. Organization of scientific events

1. Meeting of the Working Group on Flow Batteries of the International Electrotechnical Commission (IEC)

Venue: IMDEA Energy Institute, Madrid, Spain

Date: 17-19 January 2017

Organizer: IMDEA Energy; PVH

2. Workshop: "Perspectives of the Electrical Storage"

Venue: IMDEA Energy Institute, Madrid, Spain

Date: 20 January 2017

Organizer: IMDEA Energy; PVH

3. Meeting IMDEA Energy-Polytechnic University of Madrid

Venue: IMDEA Energy Institute, Madrid, Spain

Date: 6 March 2017

Organizer: IMDEA Energy; UPM

4. Meeting IMDEA Energy-Embassy of the Czech Republic

Venue: IMDEA Energy Institute, Madrid, Spain

Date: 26 May 2017

Organizer: IMDEA Energy; Embassy of the Czech Republic in Spain

5. 1st Workshop UAM-FRONCAT and IMDEA Energy-PHOTPRO

Venue: IMDEA Energy Institute, Madrid, Spain

Date: 2 June 2017

Organizer: IMDEA Energy; UAM

6. 2nd Biomass Resources for Renewable Energy Production Workshop (RESTOENE-2-CM)

Venue: Miraflores de la Sierra, Madrid, Spain

Date: 5-6 June 2017

Organizer: ICP; CIEMAT; URJC; IMDEA Energy; UAM; LABTE

7. Meeting IMDEA Energy-Gas Natural Fenosa

Venue: IMDEA Energy Institute, Madrid, Spain

Date: 12 June 2017

Organizer: IMDEA Energy; Gas Natural Fenosa

8. Meeting n° 53 of the AEC Community Environment

Venue: IMDEA Energy Institute, Madrid, Spain

Date: 27 June 2017

Organizer: IMDEA Energy; AEC

9. Workshop PRICAM project "Electrical networks of the future"

Venue: IMDEA Energy Institute, Madrid, Spain

Date: 28 September 2017

Organizer: PRICAM consortium

10. Seminar "Characterization of nanoporous materials: recent advances"

Venue: IMDEA Energy Institute, Madrid, Spain

Date: 19 October 2017

Organizer: IMDEA Energy; IESMAT

11. Workshop: Energy research and national and European programs

Venue: IMDEA Energy Institute, Madrid, Spain

Date: 13 November 2017

Organizer: IMDEA Energy; Club Español de la Energía; URJC

12. IV Congreso Smart Grids

Venue: UPM, Madrid, Spain

Date: 23 November 2017

Organizer: TECMARED Group; IMDEA Energy (colaborator)

13. Meeting of the Automotive ACS Committee

Venue: IMDEA Energy Institute, Madrid, Spain

Date: 14 December 2017

Organizer: Comité AEC de Automoción; IMDEA Energy

14. 6th Annual Workshop of Young Researchers of IMDEA Energy Institute

Venue: IMDEA Energy Institute, Madrid, Spain

Date: 15 December 2017

Organizer: IMDEA Energy

3.3. Internal seminars

1. Lecture: PhD Thesis

Speaker: Dr. David Serrano (IMDEA Energy)

Date: 13/01/2017

2. Oral Presentation: Power is nothing without control

Speaker: Dr. Javier Roldán (IMDEA Energy)

Date: 17/02/2017

3. Oral Presentation: Concentrated solar power plants concepts based on fuel cells

Speaker: Elena Díaz (IMDEA Energy)

Date: 17/02/2017

4. Lecture: Electro-oxidación de materiales carbonosos: funcionalización selectiva y estrategias de estabilización para el diseño de materiales avanzados

Speaker: Raúl Berenguer (University of Alicante, Spain)

Date: 08/03/2017

5. Oral Presentation: Solar energy conversion through photoelectrochemical devices for water splitting reaction and smart windows

Speaker: Dra. Mariam Barawi (IMDEA Energy)

Date: 17/03/2017

6. Oral Presentation: Life-cycle sustainability assessment of hydrogen energy systems

Speaker: Antonio Valente (IMDEA Energy)

Date: 17/03/2017

7. Lecture: Solar fuel generation by photo-electrocatalytic (PECa) approach: development of multifunctional nanostructured electrodes and choice of the reactor configuration

Speaker: Claudio Ampelli (University of Messina, Italy)

Date: 30/03/2017

8. Oral Presentation: DC power grids. Challenges and opportunities

Speaker: Dr. Miguel Jiménez (IMDEA Energy)

Date: 21/04/2017

9. Oral Presentation: Bio-oil hydrodeoxygenation: going forward

Speaker: Santiago Gutiérrez (IMDEA Energy)

Date: 21/04/2017

10. Lecture: An Introduction To Scientific Publishing

Speaker: Dr. Lan Song (Elsevier-Leiden University, Netherlands)

Date: 11/05/2017

11. Oral Presentation: X-ray Photoelectron Spectroscopy and Ionic Liquids

Speaker: Dr. Ignacio Villar (IMDEA Energy)

Date: 19/05/2017

12. Oral Presentation: Lignocellulosic Bioethanol production: Developing robust yeasts through an evolutionary engineering approach

Speaker: José M. Salor (IMDEA Energy)

Date: 19/05/2017

13. Lecture: Click nanocatalysis, one molecule at a time

Speaker: Prof. Dr. Juan César Scaiano (University of Ottawa, Canada)

Date: 05/06/2017

14. Oral Presentation: Towards the Development of Membrane-Free Redox Flow Batteries

Speaker: Dr. Rebeca Marcilla (IMDEA Energy)

Date: 16/06/2017

15. Oral Presentation: Hybrid Materials based on Fused Thiophene Moieties as Solar Fuels Catalyst

Speaker: Alba García (IMDEA Energy)

Date: 16/06/2017

16. Oral Presentation: Seven years of the Systems Analysis Unit

Speaker: Dr. Diego Iribarren (IMDEA Energy)

Date: 14/07/2017





17. Oral Presentation: Conjugated Porous Polymers (CPPs) based on BOPHY: Design, synthesis and behaviour as photocatalysts

Speaker: Carmen García (IMDEA Energy)

Date: 14/07/2017

18. Lecture: Study of Modified Imine-based Covalent Organic Frameworks for its Potential Application in Fuel Cell

Speaker: Dr. Carmen Montoro (Autonoma University of Madrid, Spain)

Date: 20/07/2017

19. Oral Presentation: Five years of contribution to electrochemical energy storage

Speaker: Dr. Edgar Ventosa (IMDEA Energy)

Date: 21/09/2017

20. Oral Presentation: Light-matter interactions: evolution towards a Green Photochemistry

Speaker: Dr. Raúl Pérez (IMDEA Energy)

Date: 21/09/2017

21. Lecture: Application of non-conventional computational intelligence methodologies to highly distributed electricity networks: Balearic Islands Case Study

Speaker: Dr. Vicente José Canals (University of the Balearic Islands)

Date: 22/09/2017

22. Oral Presentation: In situ investigation of materials for thermochemical heat storage at low and high temperature

Speaker: Dr. Juan Coronado (IMDEA Energy)

Date: 20/10/2017

23. Oral Presentation: Correlation Of Structure And Properties Of Niobium- and Tantalum-Based Oxide Materials For Sustainable Applications

Speaker: Dr. Artem Babaryk (IMDEA Energy)

Date: 20/10/2017

24. Lecture: Olive-derived biomass as a source of energy and chemicals

Speaker: Dr. Eulogio Castro (University of Jaén, Spain)

Date: 25/10/2017

25. Lecture: Current US algae biorefineries, projects and perspectives

Speaker: José A. Olivares (Los Alamos National Laboratory, USA)

Date: 08/11/2017

3.4. Participation in science dissemination activities

1. GENERA 2017

Business beyond borders. International Match-making Event

Speaker: Marín, F.

Venue: IFEMA, Madrid, Spain

Date: 28 February-1 March 2017

Organizer: Madri+d Foundation

2. European researchers' night 2016

Activity: The universe of energy

Venue: IMDEA Energy Institute, Móstoles, Madrid, Spain

Date: 29 September 2017

Organizer: IMDEA Energy

3. Science Week of Comunidad de Madrid (2017)

Activity: Energy for a sustainable world

Venue: IMDEA Energy Institute, Móstoles, Madrid, Spain

Date: 6-9 November 2017

Organizer: IMDEA Energy

3.5. Training activities

1. Al Ridouan, Baraa

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

Internship work: Projection of scenarios and integration of life cycle indicators

Supervisor: Dr. Javier Dufour, SAU

Period: October 2017-January 2018

2. Alonso, Irene

B. Sc. in Environmental Engineering, Universidad Rey Juan Carlos

Project title: Estudio tecno-ambiental de la coproducción de biohidrógeno y electricidad

Supervisor: Esperanza Montero, SAU

Date of defense: July 2017

3. Alumbros, Sara

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

Internship work: Energy modeling of the introduction of biofuels in the Community of Madrid. ACV of routes to obtain biofuels

Supervisor: Dr. Diego García, SAU

Period: October 2016-February 2017

4. Ávila, Régulo

M Sc. in Renewable Energies and Electrical Systems, Carlos III University of Madrid

Project title: Amortiguamiento activo de convertidores electrónicos con filtros resonantes

Supervisor: Dr. Javier Roldán, ELSU

Date of defense: September 2017

5. Balsalobre, Manuel

B Sc. in Engineering Industrial Technologies, Rey Juan Carlos University

Project title: Dimensionado de una batería para el abastecimiento de una estación de recarga de vehículos eléctricos

Supervisor: Dr. Jesus Palma, ECPU

Date of defense: October 2017

6. Baquet, Jose Manuel

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

Project title: Estudio comparativo de sistemas de producción de microalgas: Columnas de burbujeo y "raceways"

Supervisor: Dr. Ignacio de Godos, BTPU

Date of defense: July 2017

7. Barreto, Luisa Fernanda

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

Project title: Ingeniería evolutiva de *Saccharomyces cerevisiae* con el fin de aumentar su tolerancia a los inhibidores y al estrés mecánico para su utilización en procesos de producción de etanol lignocelulósico

Supervisor: Dr. Elia Tomás, BTPU

Date of defense: September 2017

8. Barrios, Víctor

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

Internship work: Support tasks in the biofuel production line

Supervisor: Dr. Juan Coronado, TCPU

Period: October 2016-June 2017

9. Cordero, José Miguel

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

Internship work: Catalytic photoreduction of CO₂

Supervisor: Dr. Víctor de la Peña, PAPU

Period: March-May 2017

10. Cubero, Carlos

M Sc. in Renewable Energies and Electrical Systems, Carlos III University of Madrid

Project title: Diseño e implantación de un controlador de planta fotovoltaica

Supervisor: Dr. Javier Roldán, ELSU

Date of defense: September 2017

11. Cuesta, Jaime

B. Sc. in Materials Engineering, Complutense University of Madrid

Project title: Materiales para fotovoltaica

Supervisor: Dr. Patricia Horcajada, Dr. Sergio Vilela, APMU

Date of defense: July 2017

12. De Gregorio, Pedro José

B. Sc. in Chemistry, Complutense University of Madrid

Internship work: Synthesis and characterization of organic ligands of the polyphosphonate type

Supervisor: Dr. Patricia Horcajada, Dr. Sergio Vilela, APMU

Period: July-September 2017

13. Delgado, Alfonso

M Sc. in Chemical Engineering, Rey Juan Carlos University

Project title: Diseño y evaluación de un electro-lizador de carbonatos fundidos acoplado a una planta termosolar

Supervisor: Dr. Manuel Romero, Dr. Miguel Angel Reyes, HTPU

Date of defense: July 2017

14. Díaz, Irene

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

Internship work: Synthesis and characterization of macroencapsulated PCM from inorganic salts

Supervisor: Dr. Beatriz Lucio, Lucía Arribas, HTPU

Period: June-August 2017

15. Esperanza, Paula

M Sc. in Chemical Engineering, Rey Juan Carlos University

Project title: Pirólisis catalítica de biomasa lignocelulósica y residuos plásticos para la producción de bio-oil

Supervisor: Dr. Patricia Pizarro, TCPU

Date of defense: July 2017

16. Fernández, Jessica

B Sc. in Environmental Engineering, Rey Juan Carlos University

Project title: Análisis de ciclo de vida de la producción de bioetanol a partir de remolacha azucarera

Supervisor: Dr. Javier Dufour, SAU

Date of defense: July 2017

17. Fernández, Pablo

Profesional Training, IES-Virgen de la Paloma

Internship work: Support tasks in the High Temperature Process Unit

Supervisor: Elena Díaz, HTPU

Period: April-June 2017

18. Galdón, Sandra

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

Internship work: Photocatalytic reduction tests of CO₂ in gas phase

Supervisor: Dr. Fernando Fresno, PAPU

Period: December 2016-January 2017

19. Galdón, Sandra

M Sc. in Chemical Engineering, Rey Juan Carlos University

Project title: Desarrollo de fotocatalizadores basados en metales del grupo 5 para la reducción de CO₂

Supervisor: Dr. Fernando Fresno, PAPU

Date of defense: July 2017

20. García, Mario

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

Project title: Análisis del ciclo de vida de la obtención de biocombustibles a partir de la pirólisis de la microalga *Chlorella vulgaris*

Supervisor: Dr. Javier Dufour, SAU

Date of defense: July 2017

21. Garrido, Juan Carlos

Profesional Training, IES-Virgen de la Paloma

Internship work: Support tasks in the Thermochemical Processes Unit

Supervisor: Dr. Juan Coronado, TCPU

Period: April-June 2017

22. Gómez, Alejandro

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

Internship work: Synthesis and processing of porous materials based on metal oxides

Supervisor: Dr. Patricia Horcajada (APMU) y Lucía Arribas (HTPU)

Period: March -August 2017

23. Gómez, Gabriel

B Sc. in Chemical Engineering, Rey Juan Carlos University

Project title: Diseño de una planta de pirolisis catalítica de biomasa lignocelulósica para producción de bio-oil

Supervisor: Dr. Patricia Pizarro, TCPU

Date of defense: July 2017

24. Hazetova, Kateryna

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

Internship work: Synthesis of mixed oxides and their application as electrodes for electrochemical energy storage

Supervisor: Dr. Rebeca Marcilla, Dr. Afshin Pendashteh, ECPU

Period: March-May 2017

25. Herrero, Adrián

Profesional Training, IES-Benjamín Rua

Internship work: Support tasks in the Electrical Systems Unit

Supervisor: Dr. Javier Roldán Pérez, ELSU

Period: March-June 2017

26. Herrero, David

Profesional Training, IES- Salesianos de Atocha

Internship work: Support tasks in the High Temperature Process Unit

Supervisor: Dr. Salvador Luque, HTPU

Period: March-June 2017

27. Hospital, Daniel

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

Internship work: Water treatment with energy efficient processes

Supervisor: Dr. Enrique García-Quismondo, ECPU

Period: March-August 2017

28. Iñiguez, Marco

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

Internship work: Water treatment with energy efficient processes

Supervisor: Dr. Jesus Palma, Dr. Julio Lado, ECPU

Period: October-December 2017

29. Istrate, Ioan-Robert

B Sc. in Environmental Engineering, Rey Juan Carlos University

Project title: Análisis prospectivo de la internalización de externalidades socioambientales en la producción de electricidad en España

Supervisor: Dr. Javier Dufour, SAU

Date of defense: July 2017

30. Jarillo, Mónica

Profesional Training, IES-Virgen de la Paloma

Internship work: Support tasks in the Photo-Activated Process Unit

Supervisor: Dr. Víctor de la Peña, PAPU

Period: April-June 2017

31. Lucero, Sandra

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

Internship work: Support tasks for the biofuel production line

Supervisor: Dr. Juan Miguel Moreno, TCPU

Period: June-March 2018

32. Lirio, Carlos

M Sc. in Energy and fuels for the future, Autonoma University of Madrid

Project title: Estudio de la reacción de fotorre-formado de bioetanol

Supervisor: Dr. Fernando Fresno, PAPU

Date of defense: June 2017

33. Llamas, Mercedes

M Sc. in Industrial and Environmental Biotechnology, Complutense University of Madrid

Project title: Aislamiento y caracterización de paredes celulares de microalgas y su influencia en digestión anaerobia

Supervisor: Dr. Cristina González, BTPU

Date of defense: July 2017



34. Marín, Juan Carlos

B Sc. in Environmental Engineering, Rey Juan Carlos University

Project title: Análisis del ciclo de vida de la captura directa de CO₂ atmosférico

Supervisor: Dr. Javier Dufour, SAU

Date of defense: December 2017

35. Martín, Juan

Profesional Training, IES-Salesianos de Atocha

Internship work: Support tasks in the Photo-Activated Process Unit

Supervisor: Dr. Víctor de la Peña, PAPU

Period: March-June 2017

36. Martín, Sara

B. Sc. in Chemistry, Complutense University of Madrid

Project title: Materiales de carbono desordenado a partir de polímeros de coordinación cristalinos (MOFs)

Supervisor: Dr. Patricia Horcajada, APMU

Date of defense: June 2017

37. Martín, Sara

B. Sc. in Chemistry, Complutense University of Madrid

Internship work: Synthesis and characterization of polydentate organic ligands

Supervisor: Dr. Patricia Horcajada, APMU

Period: July-September 2017

38. Martínez, Mathias

B. Sc. in Chemical Engineering, Universitat Rovira i Virgili

Internship work: Development of a carbon footprint calculator to be potentially integrated into Simcem

Supervisor: Dr. Jose Luis Gálvez, SAU

Period: September-October 2017

39. Martínez del Olmo, Santiago

M Sc. in Chemical Engineering, Rey Juan Carlos University

Project title: Pirólisis rápida de lignina comercial

Supervisor: Dr. Patricia Pizarro, TCPU

Date of defense: December 2017

40. Mazuera, Juan C.

M Sc. in Renewable Energies and Electrical Systems, Carlos III University

Project title: El impacto de la Generación Distribuida y el Almacenamiento de Energía sobre la Continuidad del Suministro en Redes de Distribución

Supervisor: Dr. Milan Prodanovic, ELSU

Date of defense: September 2017

41. Mena, Daniel

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

Internship work: Support tasks in the biofuel production line

Supervisor: Héctor Hernando, TCPU

Period: June-August 2017

42. Molinero, Javier

B. Sc. in Electrical Engineering, Automatic Electronics and Applied Physics, Polytechnic University of Madrid

Internship work: Analysis of the optics of the heliostat field of the IMDEA Energy Institute

Supervisor: Dr. José González, HTPU

Period: November 2017-April 2018

43. Navarro, Daniel R.

B. Sc. in Materials Engineering, Complutense University of Madrid

Project title: Preparación de Redes Metal-Orgánicas (MOFs) con alto potencial en aplicaciones energéticas

Supervisor: Dr. Patricia Horcajada, APMU

Date of defense: June 2017

44. Navarro, Celia

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

Internship work: Support tasks in the biofuel production line

Supervisor: Héctor Hernando, TCPU

Period: February-July 2017

45. Ñique, Jorge Luis

M Sc. in Renewable Energies and Electrical Systems, Carlos III University

Project title: Control de convertidores electrónicos bajo faltas y huecos de tensión

Supervisor: Dr. Javier Roldán, ELSU

Date of defense: September, 2017

46. Ordoñez, Miguel

B. Sc. in Electrical Engineering, Automatic Electronics and Applied Physics, Polytechnic University of Madrid

Internship work: Development of a model of the solar field of the IMDEA Energy Institute

Supervisor: Dr. José González, HTPU

Period: November 2017-April 2018

47. Ortega, Carlos

M Sc. in Chemical Engineering, Rey Juan Carlos University

Project title: Simulación del coprocesado de biochar en unidades de coquización

Supervisor: Dr. Javier Dufour, SAU

Date of defense: December 2017

48. Pérez, Daniel

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

Internship work: Substitution of inorganic active redox materials by organic active redox materials in flow batteries

Supervisor: Dr. Edgar Ventosa, ECPU

Period: September-February 2018

49. Pérez, Laura Maria

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

Project title: Análisis del ciclo de vida de la producción de queroseno a partir de energía solar de concentración. Producción de queroseno a partir de energía solar de concentración

Supervisor: Dr. Javier Dufour, SAU

Date of defense: July 2017 y December 2017

50. Pérez, Gemma

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

Internship work: Support tasks in the biofuel production line

Supervisor: Dr. Juan Coronado, TCPU

Period: September 2016-May 2017

51. Sanabria, Raquel

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

Internship work: Design, assembly and testing of flow batteries

Supervisor: Dr. Edgar Ventosa, ECPU

Period: June 2017-August 2017

52. Sanabria, Raquel

M Sc. in Chemical Engineering, Rey Juan Carlos University

Project title: Development of a flow battery based on electroactive organic molecules

Supervisor: Dr. Edgar Ventosa, ECPU

Date of defense: December 2017

53. Sánchez, Iván

B. Sc. in Environmental Engineering, Rey Juan Carlos University

Internship work: Documentation, simulation and environmental analysis in circular economy projects

Supervisor: Dr. Jose Luis Gálvez, SAU

Period: June 2017-February 2018

54. Sánchez, Sandra

B Sc. in Environmental Engineering, Rey Juan Carlos University

Project title: Obtención de etanol a partir de biomasa lignocelulósica e impacto ambiental del proceso

Supervisor: Dr. Elia Tomás, BTPU

Date of defense: June 2017

55. Soto, Maria Mercedes

Profesional Training, I IES-Virgen de la Paloma

Internship work: Support tasks in the Electrochemical Processes Unit

Supervisor: Dr. Julio Lado, ECPU

Period: October-December 2017

56. Tilve, David

B. Sc. in Materials Engineering, Complutense University of Madrid

Project title: Preparación de Redes Metal-Orgánicas (MOFs) para componentes de pilas de combustible

Supervisor: Dr. Patricia Horcajada, Dr. Sergio Vilela, APMU

Date of defense: July 2017

57. Toquero, Kevin

B. Sc. in Audiovisual Systems Engineering, Carlos III University

Internship work: Diseño y puesta en marcha de una aplicación Web para gestión de una base de datos relacionada con materiales y procesos asociados a la Fotosíntesis Artificial

Supervisor: Dr. Víctor de la Peña, PAPU

Period: May 2016-May 2017

58. Trujillo, Carlos

B. Sc. in Chemical Engineering, Castilla La Mancha University

Internship work: Development of a membrane-free flow battery through the use of immiscible electrolytes

Supervisor: Dr. Rebeca Marcilla, ECPU

Period: September-November 2017

59. Veliz, Clara

M Sc. in Energy and fuels for the future, Autonoma University of Madrid

Project title: Síntesis de metal organic frameworks para su uso como fotocatalizadores en la reducción del CO₂ y la producción de H₂

Supervisor: Dr. Victor de la Peña, PAPU

Date of defense: July 2017

60. Waliño, Francisco Manuel

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

Internship work: Simulation support, life cycle analysis, process definition

Supervisor: Dr. Javier Dufour, SAU

Period: April-July 2017

61. Waliño, Francisco Manuel

B Sc. in Energy Engineering, Rey Juan Carlos University

Project title: Optimización multicriterio de la coproducción de biocombustibles avanzados y electricidad

Supervisor: Dr. Javier Dufour, SAU

Date of defense: July 2017

