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”.

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

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.

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.

10,500 m²
8 scientific labs
2 pilot plants
office work areas and an auditorium for 130 people
our structure

- 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.

### SCIENTIFIC TRUSTEES

<table>
<thead>
<tr>
<th>Trustee</th>
<th>Position and Institution</th>
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<tbody>
<tr>
<td>Prof. Dr. Nazim Muradov</td>
<td>Research Professor, Florida Solar Energy Center, USA</td>
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<td>Prof. Dr. Adriano García-Loygorri</td>
<td>Polytechnic University of Madrid, Spain</td>
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<tr>
<td>Prof. Dr. Antonio Monzón</td>
<td>Director of the Chemical Engineering and Environmental Technologies Department, University of Zaragoza, Spain</td>
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<tr>
<td>Dr. Iacovos Vasalos</td>
<td>Emeritus Professor, Chemical Process Engineering Research Institute, Greece</td>
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<tr>
<td>Prof. Dr. Francesc Castells</td>
<td>Emeritus Professor, Rovira and Virgili University, Spain</td>
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### EXPERT TRUSTEES

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<tr>
<td>Dr. José Jacinto Monge</td>
<td>Rey Juan Carlos University, Spain</td>
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<td>Mr. Íñigo Sabater</td>
<td>Vice President of Global Business Development, VESTAS, Spain</td>
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### COMPANIES TRUSTEES

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<td>Ms. Adriana Orejas</td>
<td>Repsol, S.A</td>
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<td>Prof. Dr. Máximo León</td>
<td>Director of Downstream Technology Projects, Spain</td>
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<tr>
<td>Prof. Dr. Carlos del Cañizo</td>
<td>Director of the Solar Energy Institute, Polytechnic University of Madrid, Spain</td>
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### INSTITUTIONAL TRUSTEES

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<tr>
<td>Prof. Dr. Juan Antonio Melero</td>
<td>Vice-Rector of Innovation and Transfer, Rey Juan Carlos University, Spain</td>
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<tr>
<td>Dr. Ramón Gavela</td>
<td>General Director, Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas, CIEMAT, Spain</td>
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### REGIONAL ADMINISTRATION REPRESENTATIVES

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<tr>
<td>Mr. Alejandro Arranz</td>
<td>General Director of Research and Innovation, Comunidad de Madrid, Spain</td>
</tr>
<tr>
<td>Mr. Rafael García</td>
<td>Deputy General Director for Research, Comunidad de Madrid, Spain</td>
</tr>
<tr>
<td>Mr. José de la Sota</td>
<td>Scientific and Technical Coordinator, Fundación para el conocimiento madri+d, Comunidad de Madrid, Spain</td>
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### SECRETARY

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<tr>
<td>Mr. Alejandro Blázquez</td>
<td>Consultalia</td>
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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 distribution by the 31st of December of 2017

- 23 Professors / Senior researchers / Senior assistant researchers 24%
- 19 Postdoctoral researchers 20%
- 32 Predoctoral researchers 33%
- 12 Technicians 12%
- 11 Management and administration 11%

61 students in connection with the IMDEA Energy Institute in 2017

- 31 Internships 50%
- 15 Master projects 25%
- 15 Bachelor projects 25%

Mobility actions in 2017

- 9 Secondments of Imdea Energy researchers
- 28 visiting researchers

Publications in indexed scientific journals

- 18 in 2010
- 32 in 2011
- 44 in 2012
- 60 in 2013
- 71 in 2014
- 81 in 2015
- 88 in 2016
- 90 in 2017

R&D results

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.
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€.
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 than 90 companies and has participated actively in 11 industrial events.

**COOPERATION WITH COMPANIES 2017**

ABENGOA

ene

Promat

albufera

Facsa

TETma

Galp

GS Inima

Proingesa

Isolux Corsán

Hygear

PVH

Bauhaus Luftfahrt

Iberdrola

Repsol

Meocal

Sener

Comessa

Connectis

EDF

Canal de Isabel I

aqualia

XXentria

Solar Technology Advisor

Seenso Renewal

Triphase
COOPERATION WITH RESEARCH INSTITUTIONS 2017

COOPERATION WITH UNIVERSITIES 2017
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.
networking
research lines

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.

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.
**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.
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.
Pilot Plants Facilities


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.

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.
research units

Thermochemical Processes Unit

High Temperature Processes Unit

Electrochemical Processes Unit
System Analysis Unit

Biotechnological Processes Unit

Electrical Systems Unit

Photoactivated Processes Unit

Advanced Porous Materials Unit
Thermochemical Processes Unit

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.

The main focus of TCPU is the development of multifunctional catalysts and active solids for producing sustainable fuels and chemicals.
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 RESTOENE2 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 μGC.
- 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, MMn₂O₄ (M=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. La₀.₆Sr₀.₄Mn₁₋ₓAlₓO₃) with activity for CO₂ splitting.
- Development of perovskites LSF for combining chemical looping reforming of methane with CO₂ splitting.
High Temperature Processes Unit

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.
- 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.

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

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.

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 Mn₃O₄/CeO₂ 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-electrochemical conversion (carbon fuel cells).
- Patent filed P201730170 on system of electricity generation by means of hybrid turbomachinery.
Electrochemical Processes Unit

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 MeO/Me\(^{2+}\) 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 (ECPUs) 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 ECPUs 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 ECPUs 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, hydrothermal and ultrasonic.
- Particle size and Z-potential analysis.
- Cell manufacturing equipment: electrode puncher, coin cell crimper, vacuum sealing machine.
- Potentiostats (30 channels x ±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 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 ±10V – 0.5A max.); booster 4A; impedance spectroscopy.

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.
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.
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 MICROALBAC (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 WASTE2BIO (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_LIGWASTE (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 archeas 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

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), and 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 CASCATBEL 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.

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

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

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![BaU scenario chart](image1.png)

![Energy planning diagram](image2.png)
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.
Feasibility of energy processes

- Biorefinery model in Aspen Plus for the production of derivatives of 5-hydroximethyl furfural.
- Scalability analysis of biofuels production from microalgae.
- Development of anaerobic digestion models for municipal solid waste, gardening waste, food waste and generic waste.
- Model and simulation of a biomass co-processing refinery.
- Creation of a model for the calculation and analysis of life cycle inventories of regional waste management systems.
- Identification and quantification of CO$_2$ sources for the production of synthetic solar fuels.
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
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 CO₂ photoreduction and H₂ production form H₂O and biomass-derived products). NOₓ 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 Formacion 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

- 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 heterojunctions with improved photocatalytic activity and extended absorption spectrum.
- Controlled deposition of metal nanoparticles as co-catalysts in mono- and bimetallic 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 CO$_2$ photoreduction with metal nanoparticle co-catalysts.
- H$_2$ production from biomass derivatives in real matrices.
- Scalability studies for CO$_2$ photoreduction catalysts.
- Preparation of thin films of all the new synthesised materials and evaluation as photoelectrodes in photoelectrochemical cells.
Advanced Porous Materials Unit

Dr. Patricia Horcajada
Senior Researcher
Head of the Unit
**R&D Objectives**

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

**Research lines**

- 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 Raphuel (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, mechano-chemical 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.

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

- Design and synthesis of organic cation (benzimidazolium, triazolium) based bismuth halides as photovoltaic materials: control of \([\text{Bi}_m\text{I}_n]^{-}\) 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.
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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; Autonoma 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; Biodesma; Micro algae Solutions; Laboratorios Actafarma; Isolux Corsá; 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  
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 €
<table>
<thead>
<tr>
<th>No.</th>
<th>Title/Acronym</th>
<th>Partners</th>
<th>Period</th>
<th>Funding Institution/Program</th>
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<tr>
<td></td>
<td>IMDEA Energy Institute external funding: 160,926 €</td>
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<tr>
<td>12.</td>
<td>Flow batteries for electrical energy storage/BAT-FLU</td>
<td>IREC (Coordinator); Fundació Institut Català de Nanociencia i Nanotecnología; Castilla La-Mancha University; Cidetec Foundation; Tecnalia Research &amp; Innovation Foundation; CSIC; Tekniker Foundation; IMDEA Energy Institute</td>
<td>2015-2017</td>
<td>Ministry of Economy and Competitiveness/State Program for Promotion of Scientific and Technical Reseach Excellence. <strong>Acciones de dinamización “Redes de excelencia” 2015</strong></td>
</tr>
<tr>
<td>13.</td>
<td>Production of clean transportation biofuels from lignocellulosic biomass/SUGTOBIO</td>
<td>URJC (Coordinator); ICP-CSIC; IMDEA Enegy Institute; Autónoma University of Madrid; CIEMAT</td>
<td>2015-2017</td>
<td>Ministry of Economy and Competitiveness/State Program for Promotion of Scientific and Technical Reseach Excellence. <strong>Acciones de dinamización “Redes de excelencia” 2015</strong></td>
</tr>
<tr>
<td></td>
<td>IMDEA Energy Institute external funding: 189,970 €</td>
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<td></td>
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</tbody>
</table>
15. **Title/Acronym:** Innovative materials for application in advanced supercapacitor/MATCAP  
   **Partners:** IMDEA Energy Institute (Coordinator); CIC Energune; Repsol; Solvionic; AVANZARE 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 Institute 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 Construccio, Equipament i Explo- tacio del Laboratori de Ilum de Sincroto; Universidad de Barcelona; Universitat Jaume I de Castello; Fundacio Institut de Recerca de l Energia de Catalunya; ICIQ; PSA
Period: 2017-2019
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 lignocellullosic biomass/CASCATBEL  
**Partners:** IMDEA Energy Institute (Coordinador); 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  
**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  
**IMDEA Energy Institute external funding:** 199,791 €

8. **Title/Acronym:** Valorization of urban WASTE}s 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; Universita degli Studi di Palermo, Universita degli Studi di Napoli Federico II; Universita 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 Melofo; Autoridad Portuaria de Huelva; SOLTEL IT Solutions; Universidad de Santiago de Compostela; Port Authority of Gijon; Sociedad Estatal de Correos y Telégrafos; SOULMAN Insightful Thinking; ENAGAS Transporte; ENDESA Energía; MOLGAS Energía; EVARM Innovación; Mantenimiento de instalaciones de gas y servicios auxiliares; REPSOL Comercial de productos petrolíferos; Dourogás Natural- medição e exploração de sistema de gás; GALP Gas Natural; Universidade De tras-os-montes e alto douro; Gas Natural Europe; Ghenova Ingeniería; AUDIGNA; San-José López  
**Period:** 2017-2019  
**Funding Institution/Program:** European Union/H2020. Call CEF-Transport-2016-MAP General  
**IMDEA Energy Institute external funding:** 20.654 €
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 V₂O₅/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 €
<table>
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<tr>
<th>Title/Acronym</th>
<th>Description</th>
<th>Company</th>
<th>Period</th>
<th>IMDEA Energy Institute external funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.</td>
<td>Development of an organic flow drum based on redox pairs for electric vehicles and stationary storage/BAFO-2</td>
<td>PV HARDWARE SOLUTIONS/REPSOL (Spain)</td>
<td>2017-2018</td>
<td>346,682 €</td>
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<tr>
<td>11.</td>
<td>Study on the behavior of materials to the exposure of different irradiance ranges</td>
<td>PROMAT Ibérica (Spain)</td>
<td>2017</td>
<td>3,420 €</td>
</tr>
<tr>
<td>12.</td>
<td>Cost evaluation of lithium-ion batteries integrated in electrical networks</td>
<td>Inversiones Financieras Perseo (Spain)</td>
<td>2017</td>
<td>26,126 €</td>
</tr>
<tr>
<td>13.</td>
<td>Selected H₂ Production Routes/RevH2</td>
<td>The Catalyst Group Resources (USA)</td>
<td>2017</td>
<td>3,690 €</td>
</tr>
<tr>
<td>14.</td>
<td>Design of the measurement and verification system of the national energy efficiency plan (PLANEE) of Ecuador/SMLEAP</td>
<td>Fundación Tecnalia Research &amp; Innovation (Spain)</td>
<td>2017</td>
<td>7,680 €</td>
</tr>
<tr>
<td>15.</td>
<td>H₂ production via electrolysis routes/RevH2-2</td>
<td>The Catalyst Group Resources (USA)</td>
<td>2017</td>
<td>1,257 €</td>
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<td>16.</td>
<td>Testing and evaluation of reflective mirror under concentrating solar light exposure</td>
<td>XXENTRIA Technology Materials (Taiwan)</td>
<td>2017-2018</td>
<td>17,500 €</td>
</tr>
</tbody>
</table>
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  
Funding Institution: Ministry of Economy and Competitiveness  
IMDEA Energy Institute external funding: 82,400 €  
Ms. Paula Navalpotro

Funding Institution: European Union  
IMDEA Energy Institute external funding: 50,634 €  
Dr. Elia Tomás

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

Period: 2016-2018  
Funding Institution: Ministry of Economy, Industry and Competitiveness  
IMDEA Energy Institute external funding: 98.684 €  
Dr. Rebeca Marcilla
Period: 2016-2018  
Funding Institution: Ministry of Economy, Industry and Competitiviness  
IMDEA Energy Institute external funding: 98,684 €  
Dr. Victor 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

Project/Acronym: Integración de sistemas de conversión termo-elecctro-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

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 Competitiviness  
IMDEA Energy Institute external funding: 82,000 €  
Mr. Mario Sánchez
2. Scientific Results

2.1. Publications in journals with an impact index


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


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


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-


59. Sastre, D.; Carrillo, A.J.; Serrano, D.P.; Pizarro, P.; Coronado, J.M. “Exploring the redox behaviour of La0.6Sr0.4Mn1−xAlxO3 Perovskites for CO₂-splitting in thermochemical cycles”. Topics in Catalysis, 2017, 60 (15-16), 1108-1118.


2.2. Patents

2.2.1. Granted patents


2.2.2. Submitted patents


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.; Caamaño Fernández, A.J.; Rojo Álvarez, J.L.; Ramos López, F.J.; Ramiro Bargueño, J.; de la Peña-O’Shea, V.A.; Jaque García, D.


2.3. Books/Chapters of books


2.4. Non indexed publications

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


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:** Hidrodesoxigenación catalítica de biooils de pirólisis sobre fosfuros metálicos soportados  
   **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: Třesí', 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 DeGli 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: Friedich-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 NiCoMnO$_4$/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 (IEEES-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: Berlin, 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: Berlin, 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

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
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-Italian-Spanish Symposium on Catalysis (CIS-7)
Venue: Třešť, 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*
21. Title: Performance of MCM-22 zeolite for upgraded bio-oil production by lignocellulose catalytic pyrolysis
Congress: 7th Czech-Italyn-Spanish Symposium on Catalysis (CIS-7)
Venue: Třešť, 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.
Venue: Murcia, Spain

25. Title: Bioethanol production: Developing yeast strains tolerant to inhibitors and mechanical stress through an evolutionary engineering approach
Author: Salor, J.M.
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*  
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 tánalto 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: *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.; Irribarren, D.; Dufour, J.  
Congress: HYdrogen-PoWer Theoretical and Engineering Solutions International Symposium (HYPOTHESES 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.

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 multifunctional material for large-area flexible all-solid-state EDLC  
Author: Senokus, 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.
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  
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.

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  
Congress: Workshop on Layered Materials  
Venue: Třešť, Czech Republic  
Date: 1-5 September 2017  
Organizer: Jiří Čejka, Petr Nachtigall, Vítězslav 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.
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
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: Hydrideoxygenation over Ni2P/ZSM-5 catalyst: guaiacol and acetic acid blends
Author: Gutierrez-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
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
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
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 La₁₋ₓSrₓFeO₃ (x= 0, 0.0, 0.0, 0.0, 0.0, 1) PEROVSKITES
Authors: 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
Authors: 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 del proceso
Authors: 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  
**Authors:** 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  
**Authors:** 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  
**Authors:** 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  
**Authors:** 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  
**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:** Rodriguez-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: $Ba_{1-x}Ca_xTiO_3$ 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 CO$_2$  
Author: Fresno, F.; Jana, P.; Reñones, P.; Coronado, J.M.; Serrano, D.P.; de la Peña O’Shea, V.A.  
Congress: Aportando valor al CO$_2$  
Venue: Tarragona, Spain  
Date: 9-10 May 2017  
Organizer: PTECO$_2$; SusChem-Spain

3. Title: Materiales híbridos en celdas fotoelectroquímicas para la descomposición de CO$_2$  
Author: Barawi, M.; García, A.; Alfonso, E.; García, C.; Liras, M.; Fresno, F.; de la Peña O’Shea, V.A.  
Congress: Aportando valor al CO$_2$  
Venue: Tarragona, Spain  
Date: 9-10 May 2017  
Organizer: PTECO$_2$; SusChem-Spain

4. Title: Polímeros conjugados porosos basados en unidades de Ditiotiopheno y sus híbridos con TiO$_2$ para fotosíntesis artificial  
Author: Liras, M.; García, A.; Reñones, P.; Barawi, M.; Pérez-Ruiz, R.; Fresno, F.  
Congress: Aportando valor al CO$_2$  
Venue: Tarragona, Spain
5. Title: Fotofuel: red de excelencia para abordar los nuevos desafíos en la producción de biocombustibles solares  
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 coypyrolysis 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  
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

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

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

16. Title: Hacia la fotosíntesis artificial: catalizadores para convertir el CO2, el agua y combustibles y materias primas utilizando el Sol como fuente de energía  
Congress: Reunión de la Sociedad Española de Catálisis (SECAT’17)  
Venue: Oviedo, Spain  
Date: 26-28 June 2017  
Organizer: SECAT

17. Title: Reformado de metano y disociación de CO2 utilizando perovskitas La1-xSrxFeO3  
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

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

19. Title: A rapid prototyping environment for DC and AC microgrids: Smart Energy Integration Lab (SEIL)
20. Title: Decorating of N-doped graphene by NiCoMnO$_4$ 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 photohaptenation 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.

24. Title: Nanoscaled zinc pyrazolate metal-organic frameworks as oral drug delivery systems
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 MnO$_2$ decorated CNT fibers in ionic liquids
Author: Pendashteh, A.; Senokus, E.; Vilatela, J.J.; Marcilla, R.
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.; Vázque-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.
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  
**Authors:** 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 CaO/Ca(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  
**Authors:** 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 Competitiviness  
   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
<table>
<thead>
<tr>
<th>5. Silvia Quaresma</th>
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<tbody>
<tr>
<td><strong>Origin Institution:</strong> Instituto Superior Técnico, Lisboa, Portugal</td>
</tr>
<tr>
<td><strong>Host Unit:</strong> Advanced Porous Materials Unit</td>
</tr>
<tr>
<td><strong>Period:</strong> 1.5 months, 2017</td>
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<tr>
<td><strong>Activity:</strong> Synthesis of materials. Characterization XRD, DLS, IR, TGA</td>
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<th>6. María Orfila</th>
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<tr>
<td><strong>Origin Institution:</strong> Rey Juan Carlos University, Spain</td>
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<tr>
<td><strong>Host Unit:</strong> High temperature Processes Unit</td>
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<tr>
<td><strong>Period:</strong> 1 week, 2017</td>
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<tr>
<td><strong>Activity:</strong> Perovskites water splitting in a high flux solar simulator</td>
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<th>7. Stefan Brandleberger</th>
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<tr>
<td><strong>Origin Institution:</strong> DLR, Cologne, Germany</td>
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<tr>
<td><strong>Host Unit:</strong> High temperature Processes Unit</td>
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<tr>
<td><strong>Period:</strong> 10 days, 2017</td>
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<tr>
<td><strong>Activity:</strong> Visiting researcher working in the field of flux measurement systems</td>
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<th>8. Mattia Roccabruna</th>
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<tr>
<td><strong>Origin Institution:</strong> Fondazione FBK, Trento, Italia</td>
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<tr>
<td><strong>Host Unit:</strong> High temperature Processes Unit</td>
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<tr>
<td><strong>Period:</strong> 10 days, 2017</td>
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<tr>
<td><strong>Activity:</strong> Visiting researcher working in the field of volumetric solar receivers (STAGE-STE project)</td>
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<th>9. Rim Jabali</th>
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<tr>
<td><strong>Origin Institution:</strong> University of Sfax, Tunisia</td>
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<tr>
<td><strong>Host Unit:</strong> Advanced Porous Materials Unit</td>
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<tr>
<td><strong>Period:</strong> 3 months, 2017</td>
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<tr>
<td><strong>Activity:</strong> Synthesis and characterization of metal-organic frameworks</td>
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<th>10. Lena Bühre</th>
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<tr>
<td><strong>Origin Institution:</strong> TUUH, Switzerland</td>
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<td><strong>Host Unit:</strong> High temperature Processes Unit</td>
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<tr>
<td><strong>Period:</strong> 4 months, 2017</td>
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<tr>
<td><strong>Activity:</strong> Operation and characterization of a 250kW heliostat field with 169 units</td>
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<tr>
<th>11. Ellen Kadja Lima de Morais</th>
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<tbody>
<tr>
<td><strong>Origin Institution:</strong> Universidade Federal do Rio Grande do Norte, Brazil</td>
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<tr>
<td><strong>Host Unit:</strong> Thermochemical Processes Unit</td>
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<tr>
<td><strong>Period:</strong> 6 months, 2017</td>
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<tr>
<td><strong>Activity:</strong> Biomass and plastics pyrolysis using beta zeolite catalysts with hierarchical porosity</td>
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<th>17. Martin Thelen</th>
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<td><strong>Origin Institution:</strong> DLR, Germany</td>
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<td><strong>Host Unit:</strong> High temperature Processes Unit</td>
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<td><strong>Period:</strong> 2 weeks, 2017</td>
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<td></td>
<td><strong>Activity:</strong> DLR secondment for SUN-to-LIQUID project</td>
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<th>18. Stefan Zoller</th>
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<td><strong>Origin Institution:</strong> ETH Zürich, Switzerland</td>
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<td><strong>Host Unit:</strong> High temperature Processes Unit</td>
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<td><strong>Period:</strong> 5 months, 2017</td>
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<td><strong>Activity:</strong> ETH secondment for SUN-to-LIQUID project</td>
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<th>19. Adriano Patané</th>
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<td><strong>Origin Institution:</strong> ETH Zürich, Switzerland</td>
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<td><strong>Host Unit:</strong> High temperature Processes Unit</td>
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<td><strong>Period:</strong> 5 months, 2017</td>
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<td><strong>Activity:</strong> ETH secondment for SUN-to-LIQUID project</td>
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<th>20. Ernest Eric Koepf</th>
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<td><strong>Origin Institution:</strong> ETH Zürich, Switzerland</td>
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<td></td>
<td><strong>Host Unit:</strong> High temperature Processes Unit</td>
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<td></td>
<td><strong>Period:</strong> 5 months, 2017</td>
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<tr>
<td></td>
<td><strong>Activity:</strong> ETH secondment for SUN-to-LIQUID project</td>
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<tr>
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<th>21. Sara Rafiei</th>
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<tr>
<td></td>
<td><strong>Origin Institution:</strong> University of Isfahan, Iran</td>
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<tr>
<td></td>
<td><strong>Host Unit:</strong> Advanced Porous Materials Unit</td>
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<td></td>
<td><strong>Period:</strong> 5 months, 2017</td>
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<tr>
<td></td>
<td><strong>Activity:</strong> Synthesis and characterization of MOFs</td>
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<th>22. Andreas Kunzmann</th>
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<tr>
<td></td>
<td><strong>Origin Institution:</strong> Friedrich-Alexander-Universität Erlangen Nürnberg (FAU), Alemania</td>
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<tr>
<td></td>
<td><strong>Host Unit:</strong> Photoactivated Processes Unit</td>
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<tr>
<td></td>
<td><strong>Period:</strong> 3 months, 2017</td>
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<tr>
<td></td>
<td><strong>Activity:</strong> Comparative experiments of solar fuels production using different photocatalysts</td>
</tr>
</tbody>
</table>
| **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: CeOx structures for hydrogen production by concentrating solar energy |
3.2. Organization of scientific events

   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 nº 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 (collaborator)

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 photoelectrocatalytic (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

   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

    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

    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 Garcia (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. **GENER 2017**  
**Business beyond borders. International Matchmaking 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. Alumbreros, 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  
B. Sc. in Chemical Engineering, Rey Juan Carlos University  
**Project title:** Diseño y evaluación de un electroizador 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  
**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

19. Galdón, Sandra  
M Sc. in Chemical 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

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 Pendashth, 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 fotorreforzmado 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. Martín, 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-Órgánicas (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-Órganicas (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. Víctor 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