

imdea **energy** institute

research for a **sustainable energy** development

institute
iMdea
energy

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



f o r e w o r d

foreword



David Serrano

Director of the IMDEA Energy Foundation

Móstoles, September 2016

annual report
2015

It is a pleasure to introduce the Annual Report of the IMDEA Energy Institute, recording the most relevant outcomes and achievements corresponding to 2015. IMDEA Energy is an R&D institution, promoted by the Regional Government of “Comunidad de Madrid”, with the goal of contributing to the transition towards a low-carbon energy system. IMDEA Energy has been created under the legal form of a public foundation, which has made possible to set up a modern and flexible management system. Scientific excellence, international impact and cooperation with industry are the key drivers of its activities.

IMDEA Energy addresses a number of topics of high industrial and social relevance, well suited with the national and international programs on energy and environment. These topics include concentrating solar thermal power, production of sustainable fuels, energy storage materials and devices, smart management of electricity demand, energy systems with enhanced efficiency and valorization of CO₂ emissions.

The headquarters of IMDEA Energy are located in the Technological Park of Móstoles (Madrid), being provided with high efficiency energy systems and having been awarded with the Gold LEED certificate, which is a highly reputed international recognition for buildings with a minimum environmental impact. The research activities of IMDEA Energy are strongly supported by the availability of sophisticated scientific equipment and singular pilot plant infrastructures.

The personnel of IMDEA Energy is formed by a highly qualified and multidisciplinary team of researchers, who have come to the institute from a great variety of backgrounds and specializations: mechanical, electrical and chemical engineering, physics, biology, chemistry, biochemistry and environmental science, among others. By the end of 2015, the staff working in IMDEA Energy reached 83 persons. About two third of the researchers of the institute hold a PhD degree, which denotes their strong scientific background. In addition, during this year 53 B.Sc. and M.Sc. students have participated and collaborated in the different research topics of IMDEA Energy.

The external funding executed by the institute in 2015 reached 2.13 M€, which represents a 14% increase compared to 2014. Those funds came mainly 52 ongoing research projects granted by public administrations and private companies, with a strong contribution of international projects. Likewise, remarkable scientific results were obtained in 2015 as denoted by the 68 scientific works published in indexed journals and the 53 communications presented in scientific congresses.

In summary, I am glad to state that IMDEA Energy has become a reference institution in energy research at both national and international frameworks.

Finally, I would like to thank all the IMDEA Energy staff by its really strong effort and commitment along 2015, which have made possible to achieve the excellent results here reported, as well as to the continuous support received from the Regional Government of “Comunidad de Madrid”.

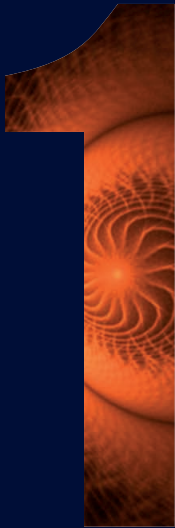
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The IMDEA Energy Institute is a research centre established by the Regional Government of Comunidad de Madrid and operates as a non-profit foundation. The Scientific Programme of the IMDEA Energy Institute aims at contributing to the future establishment of a sustainable energy system.

The ultimate goal of the IMDEA Energy Institute is to achieve outstanding scientific and technological contributions for reaching a sustainable energy system. The IMDEA Energy Institute is committed with strengthening and having a significant impact on the R&D activities on 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 addressed at the IMDEA Energy Institute are concentrated within the following six areas:

- Production of sustainable fuels for the transport sector: hydrogen, biofuels and fuels derived from wastes.
- Systems and solar energy technologies, with particular emphasis on solar thermal concentration.
- Energy storage coupled to renewable energies.
- Intelligent management of electricity demand.
- Development of energy devices with high-energy efficiency.
- Alternatives for decarbonization and valorization of CO₂.

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.



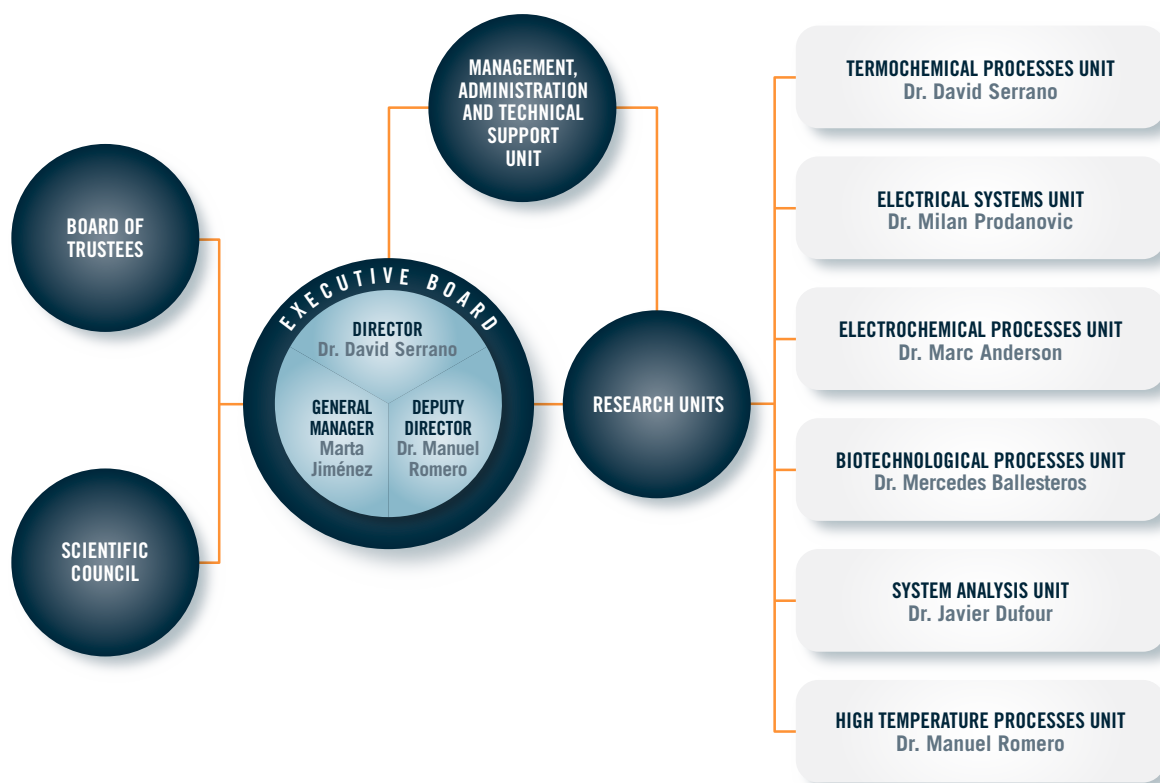
g o v e r n i n g b o d i e s a n d f u n c t i o n a l s t r u c t u r e



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The organization and functional structure of the IMDEA Energy Institute is summarized in the following figure with indication of its main bodies and units:



2.1. Board of Trustees

The Board of Trustees is the highest decision-making body of IMDEA Energy. It is responsible for its government, representation and administration, aiming to ensure the achievement of the objectives purposed by the institution. It is composed by scientists with international prestige, energy experts, and representatives of the regional administration, universities, public research centres, and industry sectors. The meetings of the Board of Trustees are held twice a year since its creation.





BOARD OF TRUSTEES

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*Scientific and Technical Coordinator
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Prof. Dr. Antonio Monzón

*Director of the Chemical
Engineering and Environmental
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Dr. Iacovos Vasalos

*Emeritus Professor
Chemical Process Engineering
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Spain*

Mr. Agustín Delgado

*Iberdrola, S.A.
Director of Innovation
Spain*

SECRETARY

Mr. Alejandro Blázquez

*Consultalia
Spain*

Standing Committee

The Standing Committee holds a large fraction of delegated powers of the Trust, with the aim to support the day-to-day operation of the Foundation. The composition of the Standing Committee as of December 31st, 2015 is listed below:

- Ilmo. Mr. José Manuel Torralba
Director of Universities and Research, Comunidad de Madrid
- Mr. Rafael García
Deputy General Director for Research, Comunidad de Madrid
- Mr. José de la Sota
Scientific and Technical Coordinator, Fundación para el Conocimiento Madri+d
- Mr. Julián García
Secretary

2.2. Scientific Council

The Scientific Council is aimed to advise and to help the Director of the Institute in elaborating the scientific programme and in establishing the goals to be achieved by periods of four years as well as of assessing the annual performance of the Institute.





SCIENTIFIC COUNCIL

Prof. Dr. Martin Kaltschmitt

Director of Institute of Environmental Technology and Energy, Hamburg University of Technology, Germany

Dr. Nazim Muradov

*Research Professor
Florida Solar Energy Center, University of Central Florida, USA*

Prof. Dr. Antonio Monzón Bescós

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

Dr. Carmen M. Rangel

*Research Coordinator
LNEG, Portugal*

Prof. Dr. Aldo Steinfeld

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

Prof. Dr. Iacovos Vasalos

*Emeritus Research Professor
Chemical Process Engineering Research Institute (CPERI), Greece*

Prof. Dr. Adriano García-Loygorri

*President of the Social Council
Polytechnic University of Madrid, Spain*

Dr. Francisco Gírio

*Coordinator of Bioenergy Unit
National Laboratory of Energy and Geology, LNEG, Portugal*

Prof. Dr. Francesc Castells

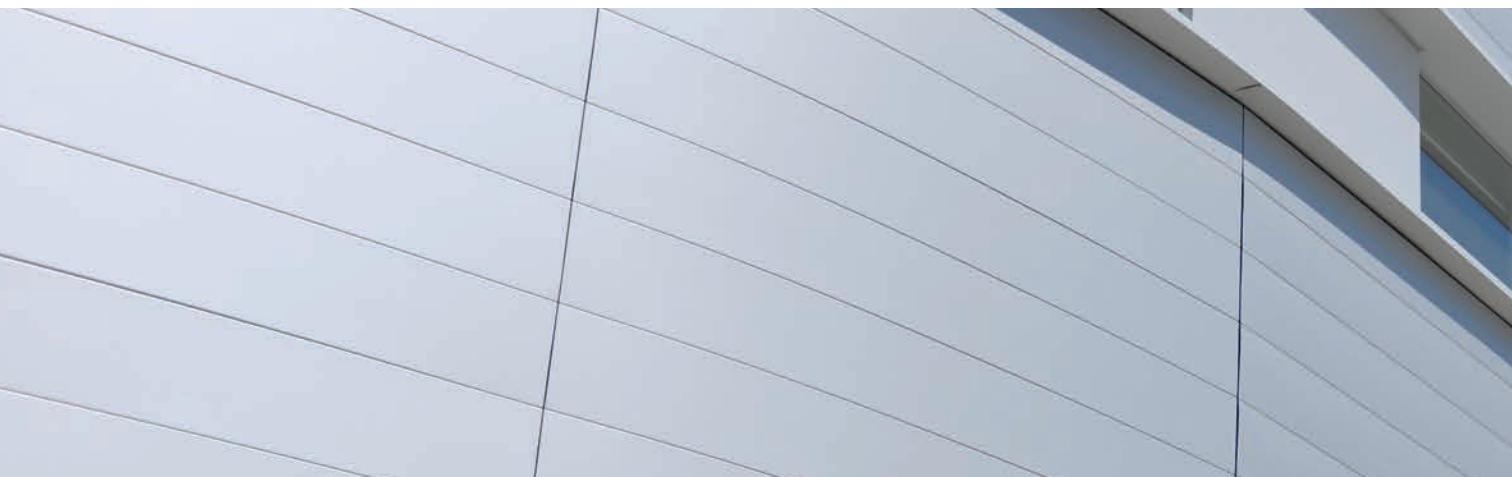
*Emeritus Professor
University Rovira and Virgili, Spain*

Prof. Dr. Manuel Berenguel

*Research Professor
Computer Science Department
University of Almeria, Spain*

Prof. Dr. Michael Froeba

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



2.3. Executive Board

The Executive Board is responsible for managing and dealing with the main business administration and scientific activities of the whole Institute, except those decisions taken by or shared with the Board of Trustees and the Standing Committee.

General Director: Prof. David Serrano

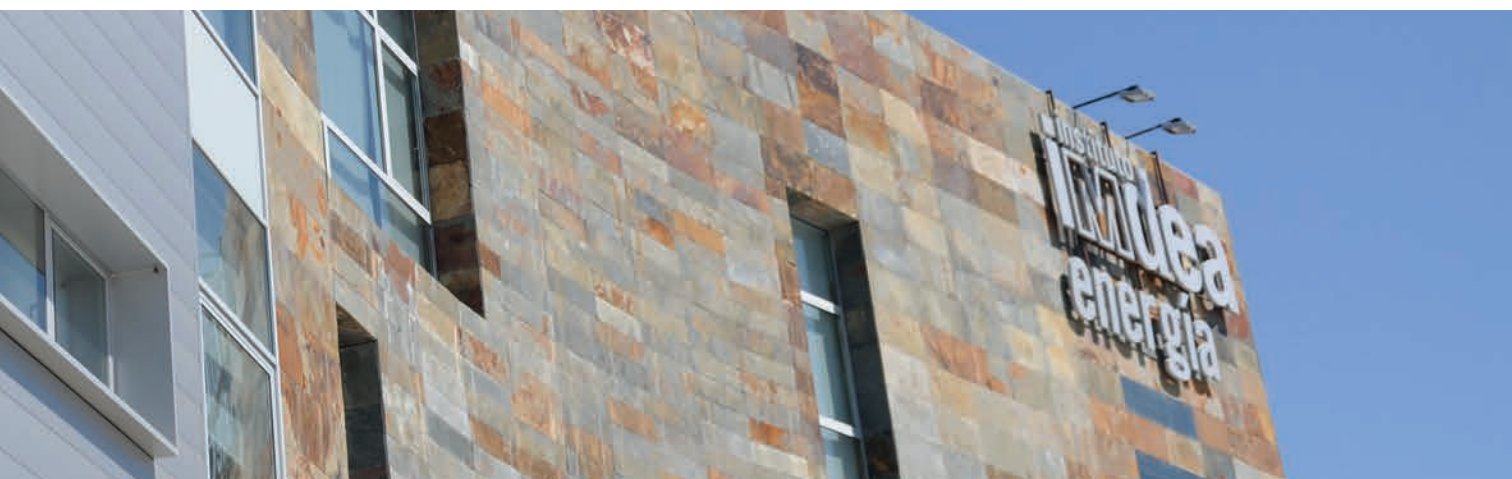
The General Director is the chief executive of the IMDEA Energy Institute and chairman of the Executive Board. It is elected by the Board of Trustees, being responsible for the management, supervision and promotion of the organization activities, including business and research administration. Moreover, he is in charge of representing the interests of the Institute both internally and externally according to the directions approved by the Board of Trustees.

Deputy Director: Dr. Manuel Romero

The Deputy Director supports the work and may take over some of the responsibilities of the General Director. Likewise, the Deputy Director may represent the IMDEA Energy Institute on behalf of the General Director.

General Manager: Ms. Marta Jiménez

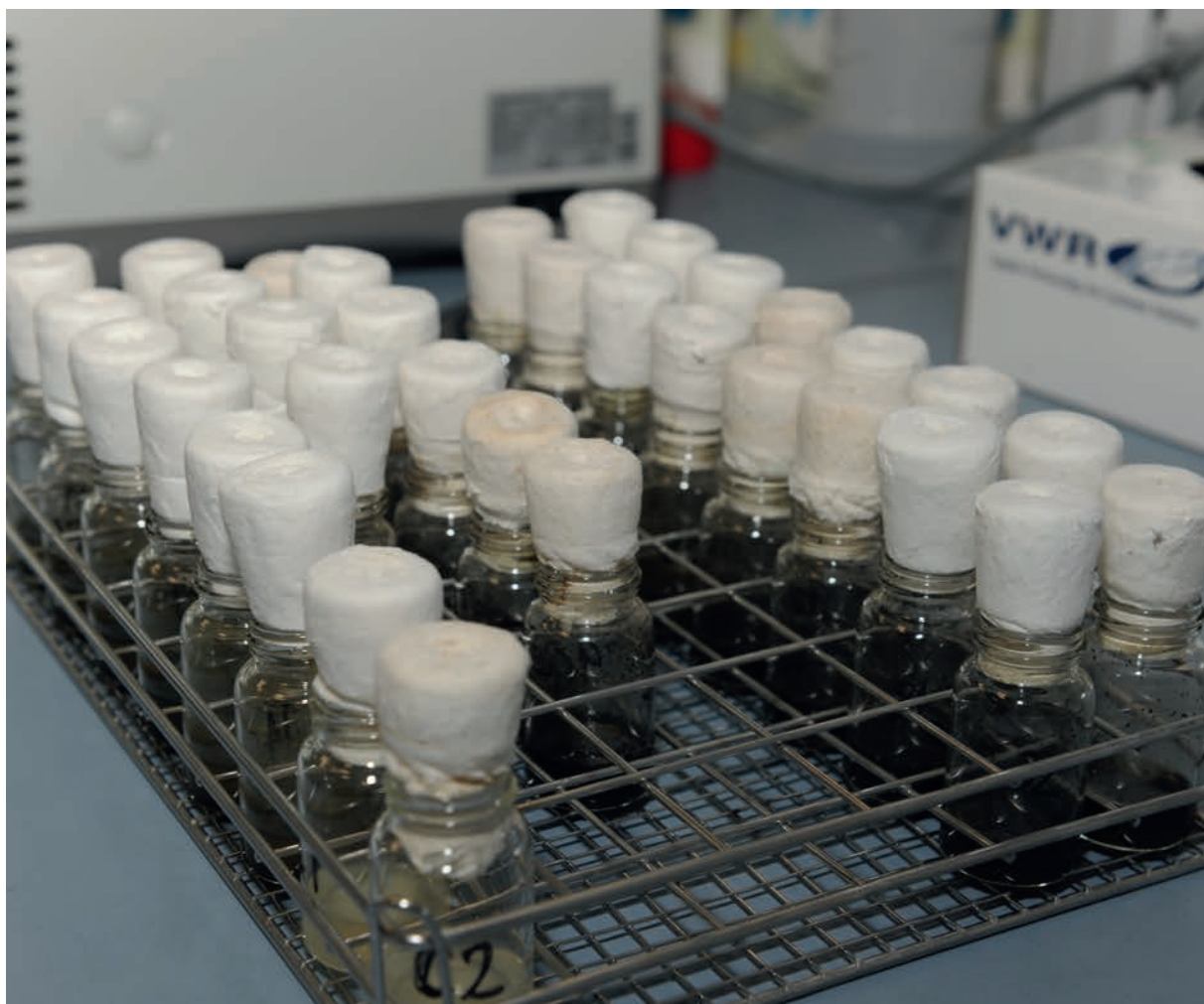
The General Manager is responsible for the management and coordination of the different administration issues, such as financial & accounting, legal aspects, human resources and general services. The latter includes all those services that support the day-to-day running activities of the different Research Units and administration staff of the Institute. The General Manager is also in charge of elaborating the general budget draft, which is submitted annually for approval by the Board of Trustees.



2.4. Research Units

Researchers and scientists in the IMDEA Energy Institute are organized in Research Units defined according to their expertise and specialization. The following six R&D Units have been operational during 2015:

- Thermochemical Processes Unit (TCPU)
- Electrochemical Processes Unit (ECPU)
- Biotechnological Processes Unit (BTPU). Joint Unit CIEMAT/IMDEA Energy.
- High Temperature Processes Unit (HTPU)
- Electrical Systems Unit (ESU)
- System Analysis Unit (SAU)



2.5. Management, Administration & Technical Support Unit

Management and administration activities include the following responsibilities:

- Financial management and human resources.
- Project Management.
- External relationships and technology transfer.
- Infrastructure and facilities management.
- Safety and health.



The technical support area is formed by technicians working in the IMDEA Energy laboratories, as responsible of managing and using scientific equipment and infrastructures.



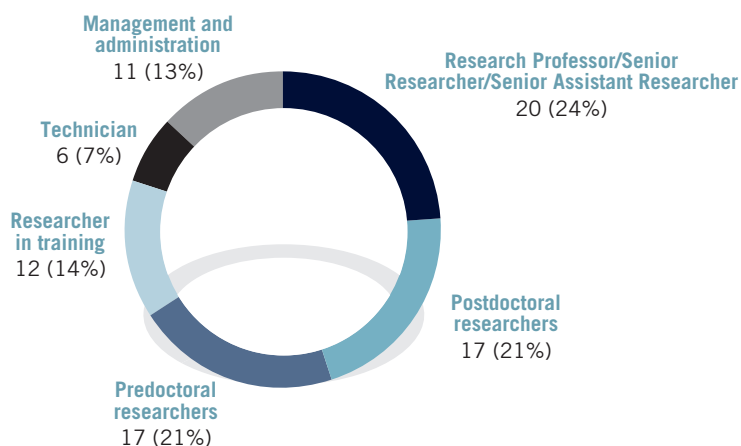
h u m a n
r e s o u r c e s



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By the 31st of December of 2015, people working in the IMDEA Energy Institute reached 83 persons, 72 researchers and technicians and 11 management staff. A 56% of researchers of the Institute in the year 2015 are doctors. Due to the international nature of the recruitment calls, and the highly competitive strategy for attracting researchers carried out, the staff of the Institute offers a wide variety of nationalities, with researchers from Germany, China, USA, Egypt, Spain, Ethiopia, India, Iran, Ireland, Italy, United Kingdom and Serbia.

In addition, about 52 undergraduate students have been doing different types of work and activities (internships and B.Sc and M.Sc final projects) in connection with the IMDEA Energy Institute. During 2015, 17 students have defended their bachelor project, 9 have defended their Master Project and 26 were doing internships.



research lines



- 4.1. **Production of sustainable fuels** [19]
- 4.2. **Concentrating solar power** [20]
- 4.3. **Energy storage coupled to renewable energies** [21]
- 4.4. **Smart management of electricity demand** [22]
- 4.5. **Energy systems with enhanced efficiency** [23]
- 4.6. **Confinement and valorization of CO₂ emissions** [24]

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4.1. Production of sustainable fuels

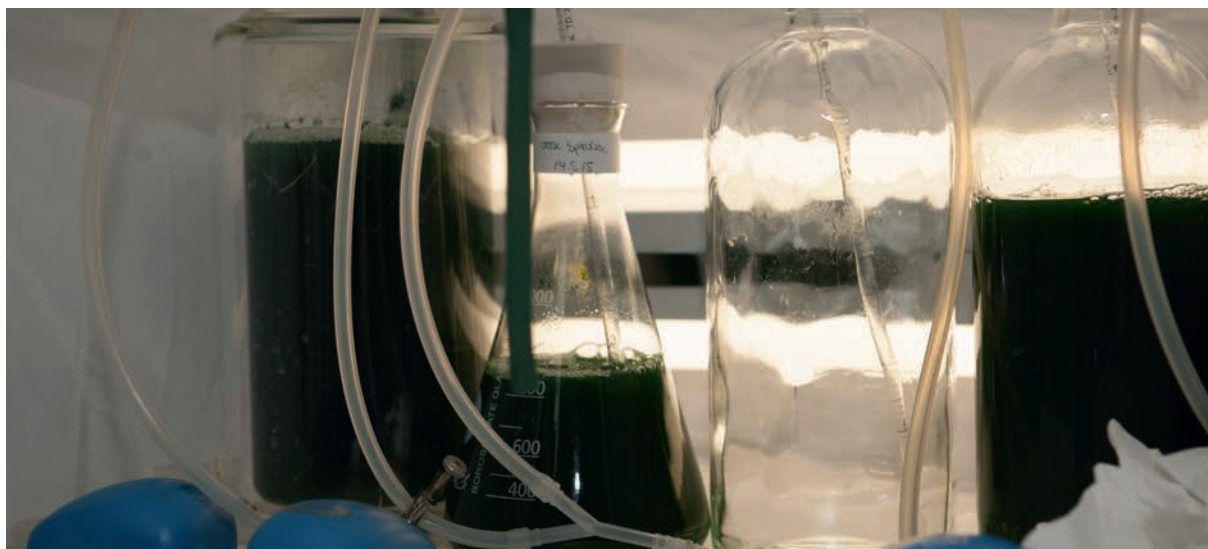
The transport sector plays a relevant role in the energy panorama of both Spain and “Comunidad de Madrid”. Most of the liquid fuels so far employed have a fossil origin, and therefore the transport sector is responsible in a large extent for the greenhouse gases emissions. Accordingly, the development of alternative and environmentally friendly fuels is of high interest. Within this research line two different areas are considered:

Advanced biofuels

- Development of innovative processes for the production of advanced biofuels from biomass resources different than those of common use by the food industry: production of bioethanol by hydrolysis and fermentation of lignocellulosic biomass; agriculture and forestry residues for the production of bio-oils and development of feasible processes for turning microalgae carbohydrates into biofuels and other bio-products.
- Optimization and improvement of biofuel production via flash pyrolysis or catalytic pyrolysis of lignocellulose biomass. This route also implies the subsequent catalytic hydrodeoxygenation processes for upgrading bio-oils. Research should concentrate on the development of very active and selective multifunctional catalysts and the possible integration of biomass transformation processes into oil refineries in order to develop and demonstrate the feasibility of the bio-refinery concept.

CO₂-free Hydrogen Production

- Development of hydrogen production via thermochemical and thermo-electrochemical processes using solar power and hybrid cycles. This line requires the development of new thermochemical cycles having high overall efficiencies and stability during the cyclic operation, as well as moderate working temperatures.



- Hydrogen generation by photocatalytic and photoelectrochemical dissociation of water. Although these transformations present the advantage of taking place at room temperature, the main challenge is the development of systems having high efficiency and stability under visible and near-UV light irradiation as to achieve an efficient solar energy conversion.

4.2. Concentrating solar power

The approval in the past few years of specific financial incentives in Spain, USA, Italy, Algeria, India and China and some relevant projects funded by the World Bank in developing countries like Egypt, Mexico and Morocco, have served as technology and market drivers reaching 5,000 MW of installed capacity by end 2015. In most cases Spanish companies are leading the developments and subsequently revitalizing the demand of R&D. Nevertheless, the current generation of solar thermal power plants is still based on conservative schemes and technological devices which do not exploit the enormous potential of concentrated solar energy in terms of achieving high temperature, high efficiency and dispatchability. The main technological challenges to be faced by the concentrating solar energy technologies and focusing the research in the Institute are:

- Significant improvement of global profitability of solar thermal power plants, through a cost reduction of the main system components like absorbers, receivers and solar concentrators, the reduction of associated O&M and elaboration of testing procedures and measurement techniques. In particular the research in IMDEA Energy is focused onto high-flux/high-temperature ultra-modular solar systems that might be easily deployed in urban areas with low environmental impact involving advanced optical engineering design and characterization.
- Development of efficient solar receivers for temperatures well beyond 1,000°C that might untap the use of solar energy in new power conversion cycles and industrial applications, with particular emphasis in the use of moving particle receivers and volumetric receivers with porous absorbers for heat transfer enhancement with advanced thermal fluids, both pressurized and under vacuum.
- Development of specific concentrating solar technology for solar fuels and chemicals production based upon thermochemical and thermo-electrochemical routes like solar reactors, heat exchangers and associated upstream and downstream equipment. Main objective is the solarisation of energy intensive processes aimed at decarbonizing the production of commodities; high value chemicals and clean fuels.

- Better integration of CSP systems into thermal power plants, new power cycles like supercritical Brayton or supercritical Rankine; highly regenerative thermodynamic cycles or direct power conversion technologies. The main goal is to develop advanced schemes with a significant impact in the cost reduction of the electricity produced and the identification of optimized sizing and integration of storage systems to increment value of dispatch control according to time of delivery pricing.

4.3. Energy storage coupled to renewable energies

The main objective of the R&D in this field is to develop technologies and systems for the storage of energy enabling the increased penetration of renewable energies and the distributed generation of electricity. The energy storage systems that are considered of interest for the IMDEA Energy Institute research programme are the following:

Electrochemical energy storage

- High energy-density electrochemical capacitors for stationary and transport applications, with focus on using both electrochemical double layer capacitor and pseudocapacitor approaches. Emphasis is placed on non-conventional electrolytes such as hydrogels, ionic liquids, polymeric ionic liquids, and electrode materials alternative to activated carbons, such as carbon fibers, carbon nanotubes and metal oxide nanoparticles.
- Low-cost flow batteries for stationary applications in solar and wind power plants with research on (a) new highly reversible redox couples as advanced electrolytes with higher energy efficiency and lower cost, and (b) nanoporous separators as an alternative to traditional ion exchange membranes increasing proton selectivity via pore size exclusion.
- High-performance flow batteries based on the use of organic redox couples, to avoid transition metals, making the electrolytes more environmentally friendly and providing unusually high energy densities that would make flow batteries useful in transport applications.





- Electrically rechargeable metal-air batteries characterized for their very high energy densities and with abundant and low cost raw materials (sodium, magnesium and aluminum), which make them ideal candidates for transport applications, where Li-ion systems do not reach the cost and performance objectives.

Thermal and thermochemical energy storage

- Materials for thermal storage through water adsorption on porous materials for low temperature (80-120 °C) seasonal storage.
- Development of phase change materials (PCM) with macro-encapsulated structures and storage systems optimized for heat transfer during melting and solidification for medium temperature applications (250-400 °C) in solar thermal power plants and industrial waste heat recovery.
- Thermal energy storage with gas/solid systems in thermoclines and moving bed exchangers for advanced heat transfer fluids like air streams highly charged in particles or pellets.
- Development of thermochemical storage systems making use of high temperature redox reactions for high temperature (400-900 °C) like transition metals such as the pair $\text{Mn}_2\text{O}_3/\text{Mn}_3\text{O}_4$, with emphasis on materials with improved mechanical properties, cyclability, kinetics and energy storage capacity per volume, as well as the optimization of direct and indirect heat transfer reactors.

4.4. Smart management of electricity demand

- New management algorithms for introducing more flexibility in achieving energy balance in all principal subsystems forming electricity networks - generation, distribution and consumption. Centralised and decentralised control architectures, real-time measurement and control, and more intensive use of energy storage systems are some of the proposed solutions. It is also relevant the creation of new energy-aware services and demand response schemes for final energy users, network operators and energy providers. Development of new power network models that include both dynamic and stochastic properties for the connected network devices is one of the principal tasks.
- “Smart Neighbourhoods”, “Smart Buildings” and “Smart Homes”. Starting from the definition of local energy demand, energy supply available and relevant cost information, an optimal hybrid generation system can be proposed. This coordinated scheme is possible to apply on different power levels and can produce significant cost and





energy savings as well as an additional level of flexibility in meeting the energy demand. Effects of integration of on-site renewable generation for improving autonomy, self-consumption and net balance are all under investigation.

- Energy efficiency in industrial applications. Development of the next generation of industrial control systems is necessary to achieve high efficiency of energy consumption and high flexibility of energy demand. This also assumes research and development of real-time algorithms for estimation and optimisation of energy consumption and control of available energy storage devices and power electronics interfaces.
- Integration of energy storage to electricity networks. Various scenarios on how distributed energy storage devices (including electric vehicle battery storage) can be used to contribute to network control, increase capture from intermittent energy sources and provide vehicle charging are investigated.
- Electrical energy conversion and power interfaces. Power electronics converters emulating operation and dynamics of real distribution feeders, generators and load profiles provide the testing environment for development and implementation of algorithms for future power networks. The system optimisation targets can be then flexibly changed to match any power network scenario and verify the control criteria set.

4.5. Energy systems with enhanced efficiency

- Better integration of solar thermal power plants in advanced thermodynamic cycles and/or cogeneration systems and the connection to the smart electricity management of demand.
- Hybridization of several renewable energy sources for applications in dwellings, hotels, commercial centres, power plants and communities. The optimization of this integration implies the design of efficient integration schemes, flowsheeting and performance analysis with appropriate tools. Controllability and management of demand are also key aspects in this research field.
- Polygeneration and efficient end-use of energy are topics of enormous impact on energy saving and efficiency enhancement. Since most polygeneration systems make use of rejected heat, for example from gas turbines, solar receivers, chemical reactors or heat-exchangers operating at moderate temperature, they are strongly connected to new developments on thermal power generation systems.
- Development of water treatment technologies with a very efficient use of the energy supplied to remove dissolved ions from hard, brackish or sea water and the produc-



tion of the smallest possible amount of effluents. This should be based on novel deionization technologies but also in the appropriate design of the electrochemical reactor and of the treatment process, as well as the selection of adequate operating conditions.

4.6. Confinement and valorization of CO₂ emissions

- Evaluation of the viability of the different alternatives under consideration for CO₂ confinement: storage in exhausted mine sites, accumulation in the deep waters of the ocean and confinement in form of carbonates and solid carbon, by means of life cycle analysis.
- Development of CO₂ valorization routes by its transformation into high-demand valuable products. Since this kind of processes is in most cases endothermic, solarisation of the CO₂ transformation becomes necessary in order to get a positive overall energy balance. This can be accomplished by photocatalytic or thermocatalytic routes. In this respect the main challenge is to achieve larger production yields, since those obtained up to now are far from being competitive with other technologies. Likewise, the demand of the transformed products is a key reference in order to determine the feasibility of the different alternatives considered.

The six priority topics of research cover high impact technology developments towards a sustainable energy economy and therefore require permanent technology watching and an objective assessment under systematic system analysis methodologies. Therefore, IMDEA Energy has a transversal line of research for the complete techno-economic evaluation of energy systems, including exergy and energy analyses. Sustainability of the whole chain is assessed by multicriteria Life Cycle Analysis and social aspects. It also includes roadmapping and prospective of future energy scenarios.



scientists and research units



- 5.1. Thermochemical Processes Unit [26]
- 5.2. High Temperature Processes Unit [30]
- 5.3. Electrochemical Processes Unit [34]
- 5.4. Biotechnological Processes Unit [37]
- 5.5. Electrical Systems Unit [40]
- 5.6. System Analysis Unit [43]

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5.1. Thermochemical Processes Unit

Research activities

One of the main objectives of the thermochemical processes unit (TCPU) is to provide technological alternatives to current dependence on fossil fuels, and more particularly for the transportation sector. Obviously, this is a very ambitious goal, which is indeed pursued by research groups around the world, and it requires a multidisciplinary approach to identify the most reliable and sustainable resources and processes in terms of cost and efficiency, according the niches of end use. Within this context, the activity of the TCPU focuses on the study of catalysts for application in some chemical transformations that definitely play an important role in the establishment of a more rational energy model.

In the year 2015, special attention has been paid to the development of routes for the generation of hydrogen without associated CO_2 emissions. In this regard, some of the most promising approaches are the dissociation of water using thermochemical cycles coupled with technologies of solar concentration or the use of photocatalytic processes in more benign conditions of operation. With respect to this latter process, it is important to highlight that the UPTQ researchers have recently developed a very efficient photocatalysts from modification of NaTaO_3 by introducing Nb into the structure and increasing the surface area through a hydrothermal treatment. In addition, the unit has been working of chemical modification of the thermochemical cycle of MnO-NaOH for hydrogen production at less harsh conditions of temperature and reducing the corrosion processes. In parallel, the development of new perovskites with redox capacity has also approached as possible materials active for the thermal water splitting at lower temperatures than CeO_2 .



The possible use of biomass residues from agriculture or forestry as resources for the production of a second generation bio-fuels, are among the strategic research lines of TCPU. Within this context, optimization of heterogeneous catalysts for pyrolysis is currently underway as an effective alternative to reduce the oxygen content of bio-oils.

With this objective several metallic oxides like ZrO_2 , TiO_2 , ZnO and MgO supported on mesostructured materials and zeolites have been used. In parallel, the research group has been actively working in the hydrotreating of both, bio-oils produced by flash-pyrolysis and triglycerides from specific energy crops such as camelina, in order to explore the upgrading of these feedstocks, as to improve their compatibility with conventional fuels. This research line relies crucially in the design of multi-functional heterogeneous catalysts with enhanced selectivity and stability. In this field, very positive results have been obtained using hydrogenating active phases based on transition metal or metal phosphides dispersed on micro -mesoporous supports with moderate acidity.

Another relevant field of research for the TCPU is the fixation of atmospheric CO_2 throughout the conversion into useful chemicals, in a process which mimics the photosynthesis of plants. This is a very challenging approach for tackling greenhouse emissions, which require a long-term investigation and implies the design of new photoactive components based on semiconductor and hybrid organic-inorganic materials. Although the efficiency of this technology is still very low and accordingly it is far from what it would require its commercial development, it offers great potential for the storage of solar energy in chemicals such as light hydrocarbons (mainly methane), methanol or even CO . In addition, this process could help to significantly reduce CO_2 emissions. In this context, the investigations of the TCPU have also approached the fundamental understanding of the mechanisms governing the photoactivation process using spectroscopic techniques such as TAS (Transient Absorption Spectroscopy) and high pressure XPS (NAPS-Synchrotron ALBA).

Finally, another area of activity of this unit is the development of improved materials with thermal storage capacity, as a way to enhance the production of electricity in solar thermal plants. In the case of high temperature applications it has been proposed to work in redox reactions with transition metals such as the pair $\text{Mn}_2\text{O}_3/\text{Mn}_3\text{O}_4$. In this system modification of the chemical composition and morphology are crucial aspects that determine the stability and kinetics of redox processes.

As a summary, it can be concluded that considering that most of the above mentioned processes involve the use of heterogeneous catalysts or reactive solids, it is worth noting the expertise of the TCPU is developing macro, meso and microporous materials with different physicochemical characteristic, can be conveniently adapted to a wide variety of energetic processes.

scientists



Prof. Dr. David P. Serrano

Research Professor
 Head of the Unit

He is Full Professor of Chemical Engineering at Rey Juan Carlos University and Director of IMDEA Energy. He is also the Head of the Thermochemical Processes Unit. He received his Ph.D from Complutense University of Madrid (1990) awarded with the Extraordinary Mention and he has been Visiting Scholar in the California Institute of Technology (CALTECH, 1991) and in the California University of Santa Barbara (2006). He was appointed as Professor at Complutense University of Madrid (1990-1999), and subsequently at Rey Juan Carlos University. In the latter, he has been in charge of different management and academic positions: Coordinator of the Environmental Sciences Area (1999-2001), Vice-rector for Research and Technological Innovation (2001-2002) and Head of the Chemical and Environmental Technology Department (2002-2007). His main research interests are development of novel zeolitic and mesostructured materials, plastic wastes valorisation, production of advanced biofuels from different biomass sources and hydrogen production free of CO₂ emissions. He has been involved in more than 50 research projects funded by both public and industrial partners. He is author of about 175 publications in scientific journals, 5 patents and of 4 books. Besides he has presented more than 200 communications in scientific conferences. At present, his h index is 40. He has supervised 21 Ph.D. theses. He is member of the editorial board of several journals and of the scientific council of CIESOL and the German Biomass Research Centre.

Dr. Juan M. Coronado

Senior Researcher

He received his Ph.D. in Chemistry from the Complutense University of Madrid in 1995. In 1997 he was awarded a grant of the "Marie Curie" EU program and spent two years as a postdoctoral fellow at the University of Dundee (UK). He was a "Ramón y Cajal" researcher at the ICP-CSIC. Since 2005 he was a tenured scientist at CIEMAT. In 2009 he was appointed as a senior researcher at IMDEA Energy. His scientific activity is mainly focused on the development of processes for the production of sustainable biofuels using advanced hydrodeoxygenation catalysts, the photocatalytic valorization of CO₂ and on the development of new materials for the thermochemical storage. He has published more than 95 research papers, he has been co-editor of one special issue, and he has presented more than 100 communications to international and national conferences. He has participated in 15 research projects funded by different public institutions and companies.





Dr. Victor A. de la Peña

Senior Researcher

He obtained his PhD in 2003 at Catalysis and Petrochemistry Institute of CSIC. In 2004, he was awarded with a “Juan de la Cierva” fellowship at the Barcelona University and since 2008 he is a “Ramón y Cajal”. Among other topics, his research interests are focused on heterogeneous catalysis, theoretical chemistry and in-situ characterization fields and their application on selective reactions of energetic interest. During the last years his research activities are mainly based on solar Fuels production (Artificial Photosynthesis), including water splitting and CO₂ photoreduction. He is author of 58 publications in peer-reviewed journals and 2 world patent. He has participated in more than 50 scientific conferences, and he has been involved in 18 research projects. His activities in the TCPU have been focused on CO₂ valorization and photocatalytical hydrogen production.



Dr. Patricia Pizarro

Senior Associated Researcher

She received her Ph.D in Chemical Engineer in 2005 with extraordinary Award from the Rey Juan Carlos University, where she is now Associated Professor. She is an expert in the preparation of mesostructured and zeolitic materials. She has published 43 scientific articles and presented over 70 communications to conferences and she has participated in 31 research projects granted by different institutions. In addition, she has supervised 21 Research Final Projects at Rey Juan Carlos University and she has co-supervised a Ph.D thesis. Her activities within the TCPU have been mainly related to the lines of biofuel production and thermochemical storage



Dr. Prabhas Jana

Senior Assistant Researcher

He moved to IMDEA Energy after finishing his Ph.D in the National Chemical Laboratory (NCL), Pune (India). He has a considerable expertise on the preparation of catalysts including those based on supported gold nanoparticles. He is author of 30 articles in several international journals and he holds 4 U.S. patents. He has participated in 5 projects of IMDEA Energy, mainly related to biofuel and hydrogen production using different technologies.

5.2. High Temperature Processes Unit

Research activities

The High Temperature Processes Unit (HTPU) has as main objective the development of efficient and cost-effective high temperature technologies and applications with special emphasis on the use of Concentrating Solar Power. The commercial deployment of CSP systems in Spain and elsewhere are still based on first generation technologies. Therefore, the R&D effort focuses on the development of new solar concentrators, absorbers, high-temperature materials, heat transfer fluids, heat storage and thermodynamic and thermoelectrochemical cycles of high efficiency.

The development of modular solar central receiver schemes for high and ultra-high temperature applications is one of the key topics of research of the HTPU. Sizing and optical analyses of those systems imply the improvement of ray tracing techniques. In 2015, it has been completed the feasibility study and optical design of a modular plant with 169 small heliostats to achieve a high irradiance up to 5000 kW/m^2 , this is the preliminary step for the detailed engineering of a solar facility to be implemented at IMDEA Energy Institute in 2016 within the framework of the EC project Sun-to-Liquid.

High temperature solar receivers making use of volumetric porous absorbers or directly illuminated particle receivers are two of the key topics of research of HTPU. In 2015 it has been completed the numerical and experimental analysis of a new volumetric absorber that consists of a stack of thin multi-channel monoliths with square cross section channels and where the relative position between consecutive layers is shifted in the transversal direction. For experimental characterization of absorber materials a fully equipped test bench has been improved and used to characterize the thermal performance of a ceramic monolith and an original structure manufactured by Selective Laser Melting within the framework of collaborations with China and Italy. This second option with SLM has led to a joint patent in Italy. Particle receivers based upon the use of rotary kilns or circulating fluidized beds were also subject of research and development for thermal and



high temperature

chemical applications. In 2015, a new type of rotary kiln has been tested and a system performance analysis of solar thermal power plants with a novel heat transfer fluid based upon air highly charged in particles has been carried out.

Thermal energy storage (TES) systems based on phase change materials (PCM) and reversible chemical reactions can be smaller, more efficient and a lower cost alternative to sensible thermal storage systems for application to solar thermal electricity. The programme of work of HPTU in 2015 has included the numerical analysis of encapsulated PCM and the experimental study of thermochemical systems. IMDEA Energy has completed the research on storage systems based upon manganese oxides as potential candidates for solar thermal power plants by using a 100 Wh test bed to characterize the gas-solid reactions operating with pellets at different fluidization regimes up to 1100°C.

Solar fuels and chemicals are a medium to long-term application of CSP systems with an enormous potential. However the redox systems analyzed require solving the optimization of the integration of the chemical process into a solarized scheme. In 2015, the HTPU has focused its research in the production of hydrogen by solar pyrolysis and gasification of low-grade carbonaceous materials and the use of thermochemical cycles with fluidized bed reactors. In both cases the tests were carried out at the 7kWe solar simulator. The apparent kinetics model of the solarized process of pyrolysis and gasification has been developed. Finally, a screening of active materials for the production of hydrogen by means of wall-flow catalytic solar reactors has been done.

Activities of HTPU in 2015 also involved a number of flowsheetings and elaboration of integration schemes associated to the use of new heat transfer fluids in solar thermal power plants, like the use of air high charged in particles; the use of advanced thermodynamic cycles (e.g. supercritical); high temperature steam electrolyzers in direct steam generation solar thermal power plants with central receivers and linear Fresnel reflectors (PhD Dissertation Javier Sanz, URJC), as well as the production of hydrogen by solar reforming of bioethanol and by thermochemical cycles.



scientists



Dr. Manuel Romero

Research Professor
Head of the Unit

Farrington Daniels Award 2009 (solar energy research award for his dedication to CSP research since 1982 and his contribution in early commercial implementation of solar central receiver power plants). In 2008 he received the award I3 as senior researcher within the National Programme of R&D for the intensification of research, Spanish Ministry of Science and Innovation. Since January 2012 to December 2015 he was the Vice-President of ISES (International Solar Energy Society). At present he is President of the Spanish Solar Energy Association, AEDES. Guest Professor at the ETH Zurich in summer 2007 and summer 2014. Former Director of the Plataforma Solar de Almería (Spain) and Director of the Renewable Energy Division of CIEMAT. He has participated in 55 collaborative R&D projects. Former ExCo Member of the IEA Solar Heating and Cooling Implementing Agreement and the Solar Power and Chemical Energy Systems (SolarPACES). He is member of the Editorial Board of the International Journal of Energy Research (IJER) published by Wiley & Sons since December 2009. From 2007 to 2013 he has been Associate Editor of the ASME Journal of Solar Energy Engineering. He was Associate Editor of the International Journal of Solar Energy of Elsevier since January 2002 till January 2007. Editor of 7 books related to solar concentrating technologies. Author of 3 chapters in handbooks of solar energy, 68 papers in scientific journals and more than 100 publications in books of proceedings with ISBN and peer review. He is co-inventor of eight patents on solar technologies and applications.

Dr. José González-Aguilar

Senior Researcher

MSc in Physics (University of Cantabria, Spain, 1994). Ph.D. in Physics (University of Cantabria, Spain, 1999). Habilitation à Diriger des Recherches (University Paul Sabatier, Toulouse, France, 2007). Ramón y Cajal research Fellow 2009. Maître assistant associé at the Ecole nationale supérieure des Mines de Paris (2006 - 2009). Research engineer at Center of Energy and Processes, ARMINES/MINES ParisTech, France (2000 - 2006). EU TMR postdoctoral position (2000-2004, Center of Energy and Processes, ARMINES/MINES ParisTech, France). He has co-directed 4 doctoral theses (2 more in progress) as well as numerous master theses. He has collaborated in 27 national and international (7) research projects. Author or co-author of 57 papers in peer review journals, 2 chapters in handbooks on renewable energy, 110 communications in national and international conferences and five patents. Guest Editor of Solar Energy Journal for the Special Issue SWC2013 and Associated Editor of Solar Energy Journal from 2015. Member of the scientific committee in the SolarPACES 2014, 2015, 2016 and Hypothesis 2015. Secretary of the Spanish Association on Solar Energy AEDES (2012 - present).

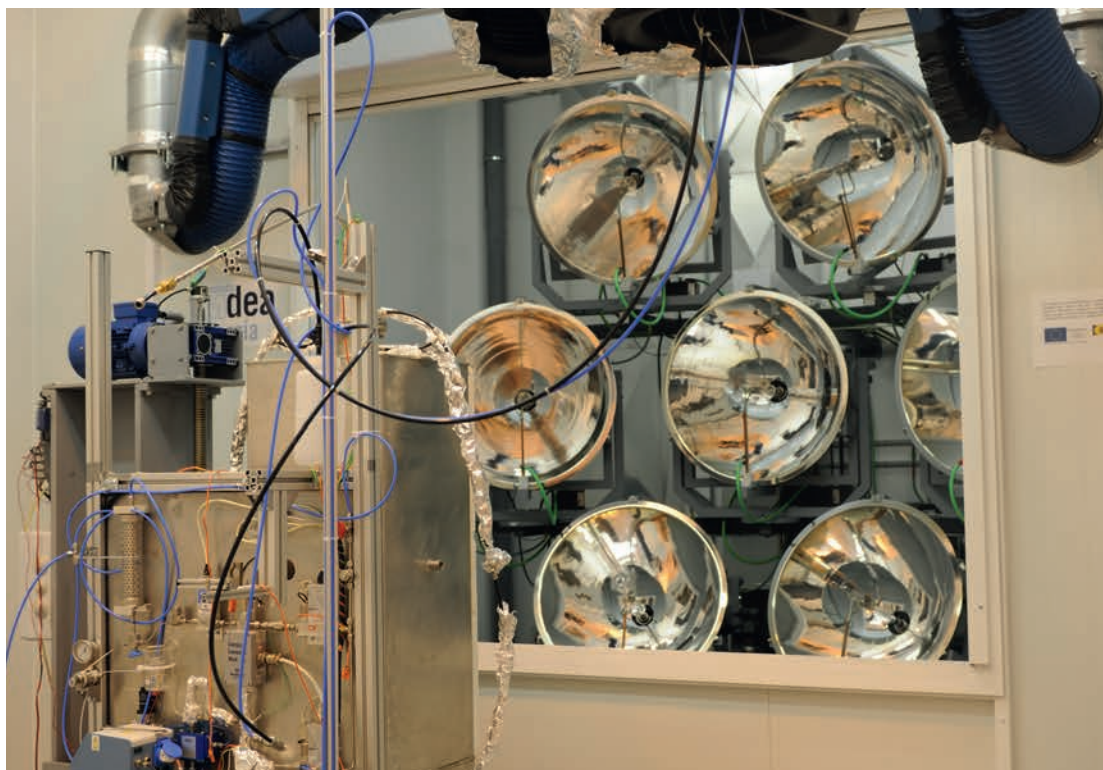




Salvador Luque

Senior Assistant Researcher

Aerospace Engineer (School of Aeronautics, Polytechnic University of Madrid, 2005), he received his PhD at the Osney Thermofluids Laboratory of the University of Oxford in 2011, with a thesis entitled "A fully-integrated approach to gas turbine cooling system research". After the doctorate, and also at Oxford, he has respectively occupied the positions of Post-Doctoral Research Assistant, Senior Research Fellow and Lecturer (at St. Anne's College) in the undergraduate core courses of Structures and Mechanics. He is the author of 15 peer-reviewed publications in international journals and technical conferences, and has co-supervised several undergraduate projects and master theses.



5.3. Electrochemical Processes Unit

Research activities

One of the main objectives of the Electrochemical Processes Unit (ECPU) is to develop new concepts and technologies for electrochemical energy storage. The storage systems developed by the ECPU can be applied to stationary renewable power sources and to the electrification of transport. Another objective of the Unit is the development of water treatment technologies through electrochemical capacitors not needing high pressures or membranes. In this case the main goal is energy efficiency, but reducing the production of effluents and minimizing operating costs are added values.

Regarding stationary applications of the electrochemical storage, the ECPU has been working with high capacity technologies such as flow batteries; while for high power and fast response electrochemical capacitors have been studied. In the area of electric vehicles, the main weakness is the short driving range caused by the low storage capacity per weight or volume. The ECPU is studying new technologies than could cope with such disadvantage using metal-air batteries and electrochemical capacitors.

The most relevant results in 2015 regarding low-cost flow batteries were the commissioning of a new test bench and the testing of a battery of 5 kW power and 5 kWh capacity, as well as the design and development of a prototype of flow cell of very low cost making use of large size electrodes.

Regarding flow batteries of high energy density, during 2015 several combinations of organic redox pairs were identified with high solubility in organic solvents commonly used in Li-ion batteries that would allow to reach 4-5 times higher storage densities than the flow batteries made of vanadium. These results open the possibility to use this type of batteries as main storage system in electrical vehicles.

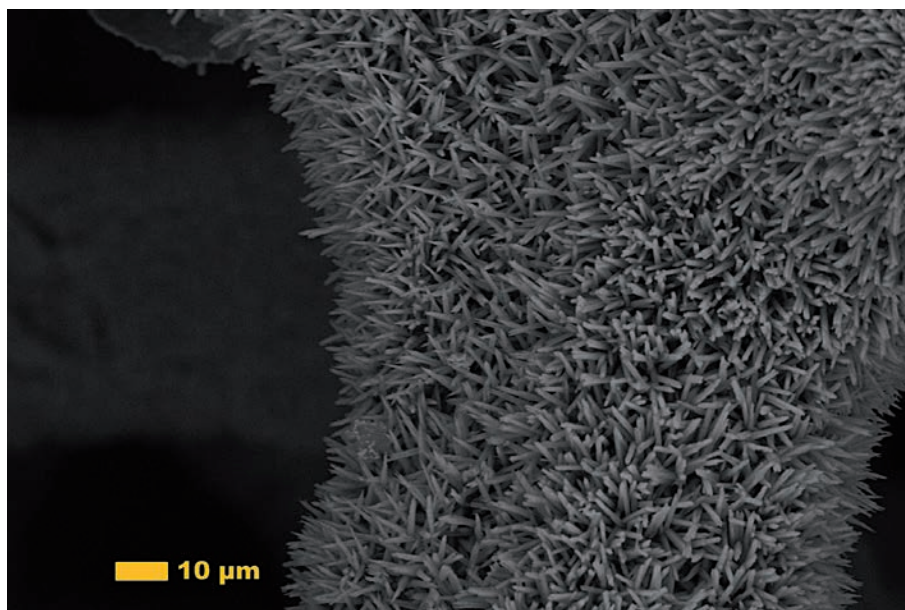


The theoretical energy density of metal-air batteries is much higher than that of Li-ion batteries, their great drawback being they are not rechargeable. In 2015 the ECPU has been working in the development of new electrodes and electrolytes to achieve higher degree of reversibility in Al-air cells at lab-scale. Until now, more than 100 cycles of partial charge/discharge have been achieved.

In the field of electrochemical capacitors, during 2015 some flexible devices have been developed that were produced by procedures simpler and cheaper than conventional ones. On the other hand, very interesting results have been obtained with hybrid devices combining ultracapacitors with double electrochemical layer and electrolytes with redox activity, similarly to flow batteries.

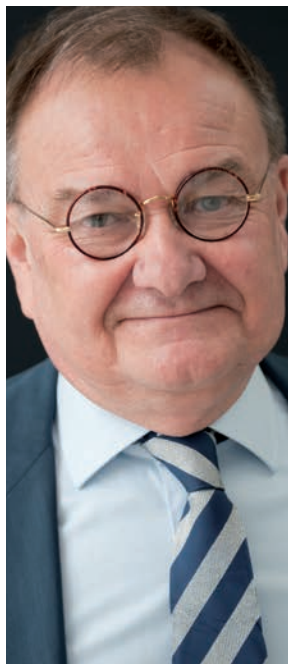
In the field of water treatment, activities in 2015 have included the evaluation for the first time of the treatment of brine coming from rejection of brackish water after reverse osmosis, with a total content of salt of 10,000-20,000 ppm. Early tests demonstrate that the process is technically feasible. In the near future it is expected to build up prototypes with electrodes at industrial size to confirm lab-scale data and to analyze the operational conditions more suitable.

The ECPU activities on testing and characterization of batteries and capacitors have continued in 2015 in close cooperation with the Unit of Electrical Systems aiming at developing charge/discharge equipment for unusual testing conditions, with high accuracy and flexibility. In particular, new testing protocols have been identified to test the health status of batteries with less uncertainty and predict lifetime more accurately.





scientists



Prof. Dr. Marc A. Anderson

Research Professor,
Head of the Unit

He is also Emeritus Professor in the Department of Civil and Environmental Engineering of the University of Wisconsin – Madison. The topics of his research activity cover a wide range of subjects such as catalysis, inorganic membranes, membrane reactors, quantum dots, colloid chemistry, adsorption on hydrous oxides, photocatalysis, photoelectrocatalysis, batteries, electrochemical capacitors, capacitive deionization and sensors. Regarding his scientific results Prof. Anderson is author of over 200 peer-reviewed papers, totalling nearly 12000 citations. He has 12 publications with more than 200 citations and 30 with more than 100 citations. His historical h index is 60. During his career he has raised over \$20 million in total research funds, nearly all from extramural grants and contracts. Regarding his technological results, he is author of 36 patents; some of them have been licensed or sold by Wisconsin Alumni Research Foundation (WARF), generating revenues of more than \$1.5 million. Additionally, he has gained \$1.6 million in gifts by companies to University of Wisconsin Foundation. With respect to his training results, along his professional career Prof. Anderson has successfully supervised 47 Doctoral Theses.

Dr. Jesús Palma

Senior Researcher, Co-head
of the Unit

His research activities include capacitors and batteries as forms of energy storage, energy conversion with high temperature fuel cells, electrochemical synthesis and destruction of organic and inorganic compounds and treatment of industrial residues and effluents. He is specialized in industrial research, process design and scale-up from laboratory to industrial scale through the design and operation of prototypes and pilot plants. He has participated in more than 50 national and international research projects and feasibility studies, leading about 30 of them for a total budget over 5 M€. He has supervised 5 PhD researchers and several Master theses and Undergraduate projects. He has co-authored over 30 papers in peer-reviewed journals and his h index in the last 5 years is 10.



Dr. Rebeca Marcilla

Senior Researcher

She got her PhD degree in Chemistry at the University of the Basque Country (2006). She had a research stay at the Eindhoven University of Technology. After her PhD she joined the technological center CIDETEC (Centre for Electrochemical Technologies). She was awarded with a prestigious “Ramón y Cajal” fellowship in 2011. She is specialized in the research and development of electrochemical energy storage devices, in particular supercapacitors, flow batteries and metal-air batteries, by using ionic liquid and polymeric ionic liquid-based electrolytes. She is author of 55 papers published in ISI listed journals, and her h index is 25. She has supervised 4 PhD Researchers and several Master Thesis and Undergraduate students. She has been Principal Investigator in 7 projects and has collaborated in 6 more projects managing a total budget over 1 M€.



5.4. Biotechnological Processes Unit (Joint Unit CIEMAT / IMDEA Energy)

Research activities

The goal of UPBT is to gain knowledge and develop processes and technologies to produce biofuels via biological processes focusing on two technologies selected by the European Industrial Initiative on Bioenergy as promising candidates for commercialization in Europe in the mid-term: i) production of ethanol and other bio-alcohols and ii) generation of energy from photosynthetic micro-organisms.

In the area of production of cellulosic bioethanol, the research at UPBT has been focused on the improvement of fermentability of the lignocellulosic hydrolyzed compounds with the aim of augmenting the yield of manufacturing of ethanol. Some detoxification processes were developed based on the use of oxidoreductases as alternative to the conventional physical and chemical processes that require additional equipment and produce residual compounds. In this field there was strong collaboration with the relevant European companies of biotechnology for the production of enzymes.

With regard to the microalgae research line, the developed activity focused on the combined production of biomass, and the subsequent conversion to biogas, with the wastewater treatment. In the UPBT the work analyzed the capacity of microalgae and cyanobacteria to oxidize and remove organic contaminants, like nitrogen and phosphorous, present in waste water. Once completed the process of treatment of the waste water, the objective is to optimize the transformation of the algal biomass to methane through anaerobic digestion. Different pre-treatment methods have been tested (physical, chemical and enzymatic) to break the cell wall of the microalgae with the aim to increment the accessibility of the anaerobic bacteria to the organic matter and to increment the production of methane.



scientists



Dr. Mercedes Ballesteros

Principal Researcher,
Head of the Unit

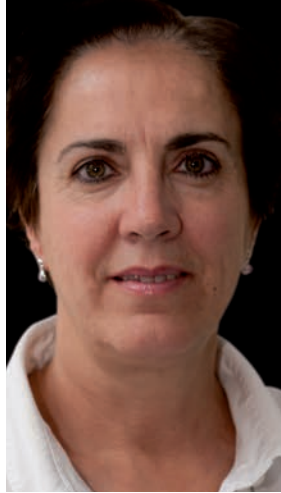
She is PhD in Biology by the Autonomous University of Madrid and Master in Biotechnology by the Complutense University of Madrid. She has developed her scientific career in the field of biofuels and biochemical production from biomass. She has participated in more than 60 R&D projects on biomass research and is author of over 100 peer review papers and book chapters. She is co-author of 9 patents and reviewer for the European Commission, the Ibero-america Science and Development (CYTED) and the Spanish Ministry of Science, among others. External consultant for ECLAC of United Nations and the Spanish Agency for International Cooperation (AECID). Spanish representative in the European Bioenergy Industrial Initiative of the SET Plan and CIEMAT representative in the EERA Bioenergy. Dr. Ballesteros is a Member of the Spanish Society for Biotechnology (SEBIOT), of the European Biofuels Technology Platform (EBTP) and Vice-president of the Spanish Biomass Association (ADABE). She is also the Spanish representative in the European Bioenergy Industrial Initiative of the Strategy Energy Technology Plan, member of the Steering Group in the European Energy Research Alliance in Bioenergy and member of the Coordinator Core in the Spanish Technology Platform (Bioplat).



Dr. Cristina González

Senior Assistant Researcher

PhD by University of Valladolid, Spain. Previously to that, she worked at the Environmental Engineering Department in the University of Cincinnati (USA) where she also obtained a Master on Environmental Science (2005). During her PhD, she made a stay at Wageningen University (The Netherlands) to work on biogas production using lignocellulosic substrates. After her PhD, she joined the technological Center ITACyL (Spain) where she continued working on lab and real-scale plants dealing with livestock effluent. After that, she got a postdoc position at the Biotechnology Lab in the French National Institute for Agricultural Research (LBE-INRA, France) to work on the optimization of biogas production using microalgae. She has background on advanced processes for biofuel production using lignocellulosic biomass and microalgae. She is co-author of 45 scientific publications and book chapters and reviewer of international journals. Additionally, she has been involved in European and national funded research projects, as well as projects with private companies.



Dr. María José Negro

Senior Associated Researcher

Senior Researcher at Renewable Energies Department of CIEMAT. She has a PhD by Complutense University of Madrid. Her background is on development of biochemical processes for the production of bioethanol from lignocellulosic biomass. She is co-author of more than 35 peer-reviewed papers and book chapters and co-inventor of 2 patents. She has supervised 1 PhD and 2 Master theses. She has participated as external evaluator of research projects (FONDECYT-Chile, NWO-Netherlands); also she is referee of several international journals.



Dr. Ignacio Ballesteros

Senior Associated Researcher

He is a Senior Researcher at CIEMAT. He obtained his Ph.D. degree in Biology at the University of Alcalá de Henares in 2000. His entire research career has been developed within the Department of Renewable Energy at CIEMAT. His research has focused on the production of biofuels and their use in the transport sector, mainly in bioethanol production processes from lignocellulosic biomass: characterization of raw materials; lignocellulosic biomass pre-treatment; hydrolysis of polysaccharides (acid and enzymatic) and fermentation. He is co-author of more than 40 peer-reviewed papers and book chapters, and co-inventor of 3 patents. He has participated in more than 30 national and international research projects, focusing on the production of bioethanol from biomass. He has supervised 2 PhD Thesis.



5.5. Electrical Systems Unit

Research activities

The main objective of the Electrical Systems Unit is to participate actively in the under-going process of the paradigm change regarding how electrical energy is generated, distributed, stored and consumed. Substantial improvements are necessary in energy management and power conversion systems applied in generation, transmission and distribution systems so they can provide the required level reliability and robustness. The principal challenge is, therefore, creation of new, highly coordinated, decentralised management algorithms that would take advantage of the increased information flows provided by real-time monitoring and control resources.

Active management of distribution power networks is the principal research line. The emphasis of the work is now on development of new services and related tools for distribution system operators (DSOs) and incorporation of residential and industrial users to the management schemes. New, intelligent schemes for solving distribution network issues like state estimation, demand forecasting, voltage control, and congestion management have been sought. Exploring demand management and coordinated demand response schemes and their application in industrial and buildings sector are some of the main research challenges. Also, reliability of distribution power networks with high penetration of renewable technology has been studied.

“Smart buildings” and “smart homes”, their energy management, coordination and integration to power networks, are all of increased importance to this research unit. Holistic, probabilistic and user oriented approaches have are all been used for modelling energy demand of a building. Meanwhile, options for renewable integration and storage device utilisation are sought in order to improve the building autonomy and increase its self-consumption. Likewise, it is investigated the flexibility of demand in various types of

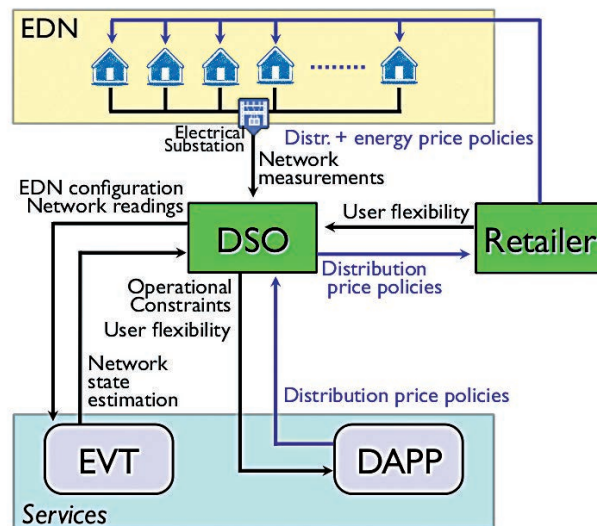


buildings and for the applications used to manage the flow in electrical networks and the improvement in the offer of markets. Finally, real-time optimal energy resource management techniques aimed at the minimisation of operational costs are under development.

Another closely related topic is energy management of microgrids where both islanded and grid-connected networks are considered. Control and operational aspects of power converters, renewable and storage management, proactive and optimal dispatch algorithms and stability analysis for small power networks are all studied. Any energy scenario or particular event of interest for renewable and storage integration can now be recreated in “Smart Energy Integration Lab” and the proposed control algorithms validated. Weak grids and the impact of power generation on their stability and operation have become topics of crucial interest both at academic and industrial level.

One of the well-established lines of research is energy efficiency in industrial applications. By using detail modelling of the consumption profiles and pattern, the options for possible energy saving are sought. Principal technologies behind the implementation of the proposed energy efficiency schemes are information systems, power electronics converters and energy storage systems.

Energy storage systems, their charge/discharge process, their integration to power networks and their application to electric vehicles have been of particular interest. The research activities focused on the development of battery test equipment based on advanced power electronics interfaces and also development of management and control algorithms for storage applications in power networks integrating renewable energy.





scientists



Dr. Milan Prodanovic

Senior Researcher,
Head of the Unit

B.Sc. degree in Electrical Engineering from the University of Belgrade, Serbia in 1996 and obtained his Ph.D. degree from Imperial College, London, UK in 2004. From 1997 to 1999 he was engaged with GVS engineering company, Serbia, developing power electronic circuits and control algorithms for inverter and UPS systems. He has been Work Package leader in a number of national and international projects and was closely collaborating with his partners in UK, Belgium, Switzerland, Kenya and Japan. He authored several journal and conference papers and is holder of 3 international patent applications in the area of energy efficiency and converter control. His research interests lie in design and control of power electronic systems, real-time simulation of power networks, decentralized control of distribution power networks and microgrids and energy efficiency in industrial applications.



5.6. System Analysis Unit

Research activities

The analysis of sustainability of energy systems, including social and economic aspects and indicators, has been one of the principal research lines at System Analysis Unit (SAU) in 2015. The integration of social and economic aspects and indicators into life cycle assessment methodology has been investigated. Also in this field, there were studied the most adequate social indicators to be implemented in the LCA+DEA (Life Cycle Assessment plus Data Envelopment Analysis) and the application to the field of hydrogen production.

With regard to the environmental aspects, the research on eco-design of industrial intermediate products has continued. The main result in 2015 has being the development of a methodology to harmonize the life cycle assessment with the objective to refer all of them to the same functional unit, scope of the system and evaluation method, so that they can be comparable.

Regarding system modelling, several scenarios were proposed and elaborated for the energy model of the “Comunidad de Madrid” by using LEAP (Long-range Energy Alternatives Planning) methodology. Since the model has a strong technology basement, the scenarios have been developed from both sides, the demand side and the supply side, for different technology alternatives. In 2015 several local models have been developed that may serve as useful tools for the definition of energy plans and policies at municipal level. It has been established an Index of Sustainable Economic Welfare (ISEW) for Spain. This index is based on 30 categories (economical, social and environmental) and serves to identify the most critical aspects impacting on welfare of citizens and the comparison among countries.





As a hybrid of previous lines of research, collaboration with the Institute of Energy Technology of Norway (IFE) has been developed with the result of an Excel-based tool for the multicriteria analysis of sustainability of LCA integrated with energy models. The tool has been used to study the electricity model of Norway based mostly in renewable energy.

In the field of simulation and optimization of processes, software has been developed for the realization of exergy balances at system level and/or components. This software is compatible and easy to integrate with most commercial software.

Regarding scientific results, the predictive model for pyrolysis of biomass was completed. The model implements more than 150 reactions with their respective kinetics and more than 30 model compounds providing an accurate prediction of production of different products and the final composition. This model is under negotiation for commercialization. Likewise, a detailed analysis of alternatives for the gasification of biomass has been completed. In addition, during 2015, new lines of research have started oriented towards the definition of flow diagrams of bio-refineries of higher feasibility, and the co-processing of biomass products in oil refineries. A study for the production of bio-fuels from municipal wastes has been started.

Finally, in 2015 a new analysis has started on the functional design and techno-economic feasibility study of a device for the capture of CO₂ in urban environment.



scientists



Dr. Javier Dufour
Senior Researcher
Head of the Unit

BSc and PhD in Chemical Sciences from Complutense University of Madrid, where he developed his teaching career since 1991 until 2003. He was grant-fellow at the National Centre for Metallurgical Research (CSIC). In October 2003, he joined Rey Juan Carlos University, where he is currently Associate Professor. In July 2010, he was appointed Head of the System Analysis Unit of the IMDEA Energy Institute, where his activities focus on process design, simulation and optimization, life cycle management and energy modelling. He is author of 76 papers published in international journals, more than 140 contributions to conferences and 3 patents. He has collaborated in 53 research projects, funded by private and public institutions. He was the leader of 29 of them. He is Chairman of the Spanish Network for Life Cycle Assessment (esLCA), awarded as excellence network by the Spanish Ministry of Economy and Competitiveness; and Operating Agent of Task 36 of the Hydrogen Implementing Agreement of the International Energy Agency. He has been awarded with the AETEPA Prize for the best research work in the paintings field (EUROCOAT 94 conference), the Educa.net Prize to the best educative scientific blog in Renewable energy (2014 edition) and the A3E-EI Prize (2015) to the best energy management by the project "Zero-emissions campus: Energy efficiency as pillar of the sustainability".

Dr. Diego Iribarren
Senior Assistant Researcher

He received his Ph.D. (2010) and B.Sc. (2005) degrees in Chemical and Environmental Engineering from the University of Santiago de Compostela. His current research activity focuses on the advanced analysis of energy systems under technical, economic, environmental and social perspectives. Among his research lines, the development and application of novel methods combining data envelopment analysis (DEA) and life-cycle approaches (life cycle sustainability assessment, assessment of carbon footprint, emergy analysis, etc.) is highlighted. He has been involved in more than 25 research projects and contracts at both national and international levels, and has published more than 50 contributions to national and international conferences, more than 40 articles in peer-reviewed international journals and 5 book chapters. He participates actively in the Spanish Network for Life Cycle Assessment and in international networks such as the European Energy Research Alliance and the IEA Hydrogen Implementing Agreement.



facilities and scientific infrastructures



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6.1. Building and general infrastructures

The building and laboratories of IMDEA Energy Institute are located at the Technological Park of Mostoles on a land with 10,000 m². The building counts on scientific labs, 2 pilot plants, offices and an auditorium for 130 people.

During 2015 it has been intensified the use of the building by holding numerous events, conferences, workshops, scientific meetings, among others. These activities has increased even more, national and international the visibility of the R&D capabilities of the Institute and have released the excellent research facilities, which make IMDEA Energy a partner of great potential for companies, research centers and universities.

6.2 Scientific equipment and laboratories

Considering the multidisciplinary character of energy research, the Institute is furnished with diverse scientific equipment devoted to support and complement the experimental research performed by the different research units.

Laboratory of Thermal and Chemical Analysis

- ICP-OES (Chemical Measurements) Perkin Elmer OPTIMA 7300DV with autosampler.
- Microwave for sample Digestion Anton Parr Multiwave 3000.
- Thermal Diffusivity Measurements Equipments Netzsch LFA 457 Microflash.
- Thermo Gravimetric Analyser (TGA/DSC) TA Instrument.
- New Thermo-Gravimetric Analyser (TGA/DSC) for measurements at high temperature and under reactive atmosphere (water vapour) Netzsch Jupiter F3 449.





Laboratory of Spectroscopy

- UV/Vis/NIR Spectrometer (Optical Properties Measurements) Perkin Elmer Lambda 1050.
- Fluorescence Spectrometer (Optical Properties Measurements) Perkin Elmer Ls 55.
- Two FTIR Spectrometer NICOLET 6700 with MCT detector and provided with the following accessories TG-FTIR, DRIFT Chamber, ATR Cell, Veemax, and Fiber Optic.
- Laser Raman Spectrometer Jasco NRS-5100 with two laser sources ($\lambda = 532\text{nm}$ and 785 nm) with a LINKAM atmospheric chamber.

Laboratory of Structural and Textural Properties

- Multipicnometer (Materials Density Measurements) Quantachrome Instruments MVP.6DC.
- Quadrasorb (Analysis of Textural Properties) Quantachrome Instruments SI MP-9.
- Autosorb (Analysis of Textural Properties) Quantachrome Instruments Asiq Mv022.
- Chemisorption Analyzer (reduction/desorption/oxidation, provided with Thermal Conductivity Detector (TCD) or Mass Spectrometry, Micromeritics Autochem II.
- XRD diffractometer X'Pert Por MPD.
- XRD diffractomer BrukerD8 Advanced provided with a high temperature cell and a Ag source for performing Pair Distribution Function analysis (PDF).

Laboratory of Microscopy

- Bench-top Scanning Electron Microscope Model Hitachi TM-1000. It includes an Energy Dispersive X-Ray analyzer from Oxford Instruments.
- Atomic Force Microscope Model Park XE-100.
- Stereo microscope with transmitted and reflected light with continuous zoom 0.67-4.5x.
- Biological optical microscope with 5 plan achromatic objectives (4 x, 10 x, 20 x, 40 x and 100 x immersion). Both optical microscopes are equipped with 3-Megapixel CCD digital camera.



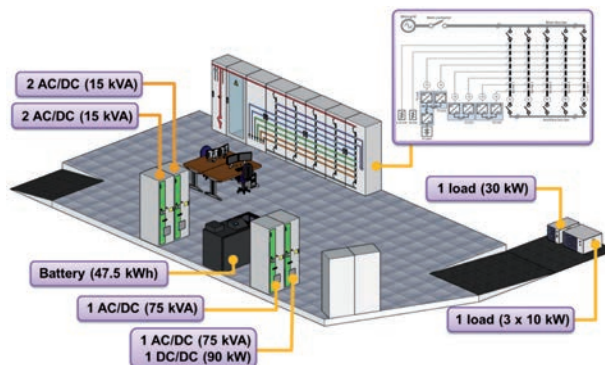
6.3 Pilot plants

The Institute is provided with several pilot plants conceived as singular experimental facilities:

Smart Energy Integration Lab

The Electrical Systems Unit has created a test environment specifically designed for research, development and testing of control algorithms in energy systems. This environment is named “Smart Energy Integration Lab” because of its inherent flexibility allowing rapid development of control systems required for management and connection of energy resources to electricity networks. The approximate lab capacity for power processing is 210 kVA and the lab consists of a set of power electronics converters, resistive loadbanks, 47.5 kWh battery system, distribution panels and monitoring and control systems. This platform allows analysis, development and testing of energy resource integration to AC and DC networks and simulation and operation of distribution power networks, islanded networks and microgrids under most realistic test conditions. The results obtained from this test environment are more reliable and accurate than any results obtained through model based computer simulation.

What distinguishes this laboratory is its flexibility in implementation of control algorithms and simple access to all test and management data from any part of the network. The lab microgrid is capable of recreating a large number of different events that occur in real power networks and, therefore, represents a useful tool when it comes to research, development and implementation of energy management algorithms. For example, the lab network is capable of emulating at the same time a generation and load mix consisting of various wind, photovoltaic and conventional generators and passive and active loads all together connected to a wide area network whose dynamic is emulated in real-time. The role for the power converters acting as energy resources in such network is simply defined by assigning a different control block to each one of them. In addition to this, the battery system installation offers all the flexibility needed for the development of management algorithms for future power network.



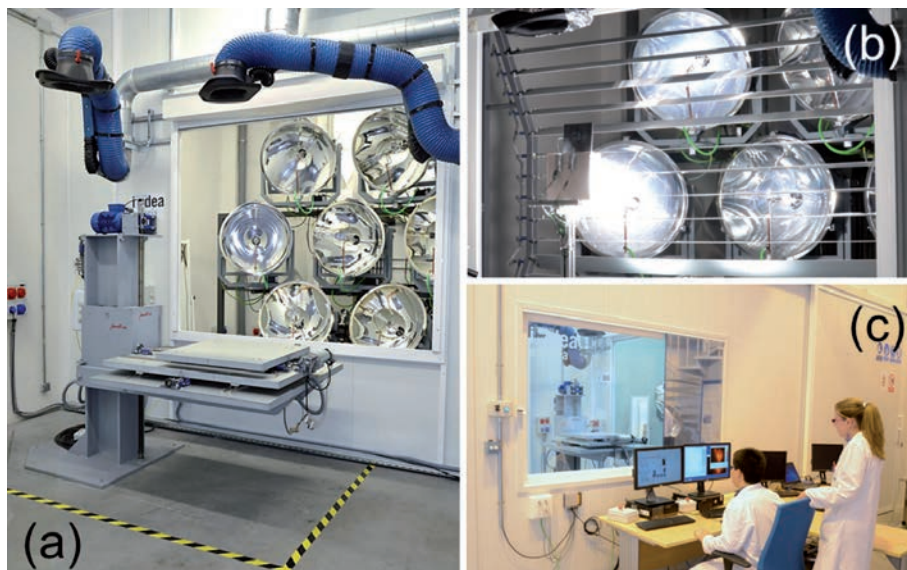


High Flux Solar Simulator

The 42 kWe high-flux solar simulator (HFSS) (called KIRAN42) is a facility that recreates in the laboratory the high flux densities met in solar concentrating systems in well-defined conditions without the external perturbations due to the intermittency of the solar resource. This HFSS allows achieving up to 14 kW of radiant energy with a peak flux of 3,500 kW/m².

The associated pilot plant is divided in two compartments. One room contains the highflux solar simulator (including reflectors, lamps and power supplies...) and the shutter (which is required to attenuate the radiation generated by the lamps). The second room is devoted to house the experimental test beds. It is supplied with electricity, gases, water cooling circuit, gas extraction and a positioning table with a maximum load capacity of 300 kg.

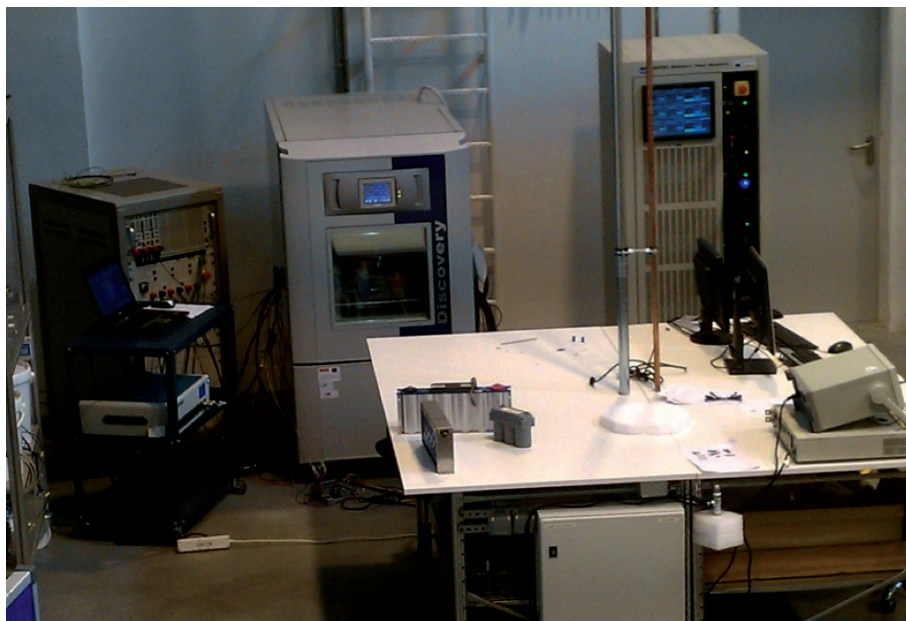
KIRAN42 is composed of seven independent units distributed at the vertices and center of a regular hexagon. Each unit consists of an elliptical aluminum reflector and a 6 kWe short-arc Xenon lamp mounted on a common support, which provides two degrees of freedom in azimuth and elevation. The facility design allows different aiming point strategies (and therefore various flux density distributions) on the working plane. Finally, the overall pilot plant is monitored and controlled by means of network composed by cRIO and cDAQ instruments under LabView



Front view of solar simulator array and test table (a), exploded view of lamps (b) and control system (c)

Electrochemical Devices Test Laboratory (EDTL)

This experimental facility has been designed for testing cells, modules and small packs of batteries and electrochemical capacitors under controlled temperature and humidity conditions. Electrical tests are made with two types of cyclers, one with 3 low power channels (300 W each) and the other with 3 high power channels (8 kW each). The parallel interconnections of channels allow operating voltages and currents of 30 V and 180 A in the low power cycler, and up to 120 V and 600 A in the high power unit. The control system allows programming charge and discharge cycles under controlled power, voltages, currents and resistances. Additionally, frequency domain response analyses can be performed. The laboratory includes a bench test unit designed for flow batteries and capacitive deionization reactors. It includes two electrolyte circuits with holding tanks, recirculation pumps, temperature control loops, valves, pipes and instruments for temperature, flow rate, pressure, pH, rH, and conductivity measurements. Tests programming, process control and data acquisition are made with LabVIEW programming platform.





Photobioreactors pilot plant

The pilot plants consist of two types of photobioreactors, namely open (raceways) and closed to the atmosphere (bubbled-columns). The working volume of the raceways is 0.35 m^3 each. In the case of the closed photobioreactor, it consists of three modules of 4 columns each module. Each column has a working volume of 0.076 m^3 . The pilot plant is highly versatile since the reactors may be operated independently or in sequential mode. The photobioreactors are fully equipped to monitor the microalgae cultivation online. This singular infrastructure has been designed in order to compare and optimise two of the most common algae cultivation systems.



Pilot Plant for the Production of Advanced Biofuels

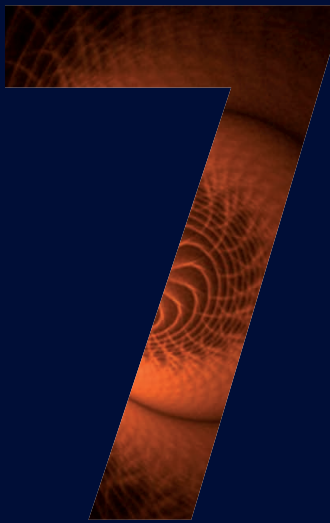
The pilot plant for the production of advanced biofuel via thermochemical transformation was designed to carry out the following processes:

- **Catalytic Pyrolysis of Biomass.** The system consists of a fluidized bed reactor which is fed by an Archimedes screw with the lignocellulosic biomass located in two hoppers. The unit operates with (catalytic pyrolysis) or without catalyst (thermal pyrolysis) under a high flow of N_2 to achieve very short residence times. The reactor operates at atmospheric pressure and temperatures between 400 and 600 °C. The gas stream produced is passed through successive filters for collecting solid particles and heat exchangers so the bio-oils is condensed and collected in a reservoir for further treatment.
- **Hydrodeoxygenation.** Fast pyrolysis oil can be introduced via a high pressure high accuracy liquid pump in a continuous fixed bed reactor where it is subjected to a treatment of catalytic hydrodeoxygenation at temperatures up to 400 °C and using hydrogen pressures up to 50 bar. The outlet stream of the reactor should go through-out a gas-liquid separator to split the two products and collect the upgraded biofuel.

These two separate reactors can operate independently or coupled in series depending of the characteristics of the assay. An online microGC is connected to the system for the continuous analysis of the gas stream.



R & D projects, contracts and grants



7.1. R&D projects and contracts [55]

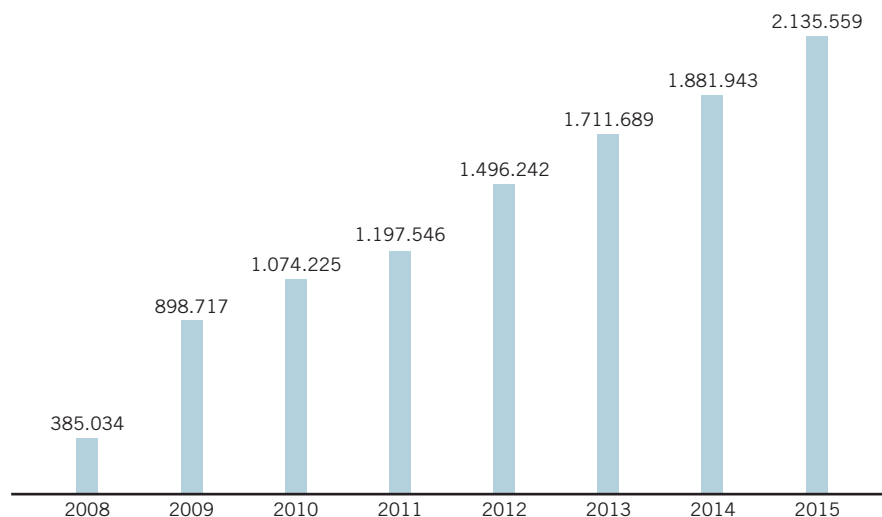
7.2. Researcher grants and mobility actions [67]

annual report
2015



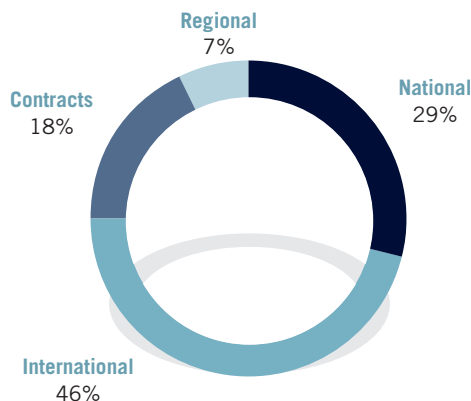
The total external funding obtained and spent by IMDEA Energy coming from R&D projects, contracts with companies and personnel grants during 2015 reached the amount of 2.13 M€.

The following figure shows the evolution of the total external funding executed by IMDEA Energy Institute in the period 2008 – 2015.



7.1. R&D projects and contracts

The external funding obtained and spent by IMDEA Energy Institute from R&D projects and contracts with companies during 2015 has reached the amount of 1,830,868 €. The main source of the external funding in 2015 came from international R&D programs (46%), following by projects corresponding to calls of national R&D programs (29%), contracts with companies (18%) and finally from regional projects (7%). The total number of R&D projects and contracts with companies active in 2015 was 52: 5 of them were regional projects, 25 national projects, 9 international projects and 13 contracts with companies.



Regional projects

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 €

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: 143,451 €

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 €

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 €

Title/Acronym: Industrial applications of spirulina/INSPIRA1

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

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 €

National projects

Title/Acronym: Oxygen generation and transport by based-on manganese oxides solar thermochemical processes/SOLAR02

Partners: IMDEA Energy Institute (Coordinator); IBERDROLA; Fundación Ciudad de la Energía

Period: 2012-2015

Funding Institution/Program: Ministry of Economy and Competitiveness/ Subprogram of Fundamental non-oriented research

IMDEA Energy Institute external funding: 205,700 €

Title/Acronym: Development of a process at pilot plant scale for the production of advanced biofuels by hydrodeoxygenation of second generation vegetable oils and pyrolysis bio-oils

Partners: Abengoa Research (Coordinator); IMDEA Energy Institute; Camelina Company España

Period: 2012-2015

Funding Institution/Program: Ministry of Economy and Competitiveness/ Sub-program INNPACTO 2012

IMDEA Energy Institute external funding: 308,150 €

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

Partners: IMDEA Energy Institute (Coordinator); Repsol; Solvionic

Period: 2013-2016

Funding Institution/Program: Ministry of Economy and Competitiveness/ Subprogram of Fundamental non-oriented research

IMDEA Energy Institute external funding: 174,330 €



Title/Acronym: Design of multifunctional redox systems based on mesoporous transition metal oxides for thermochemical energy storage/MULTISTOR

Partners: IMDEA Energy Institute (Coordinator); Repsol; Abengoa Hidrógeno

Period: 2013-2016

Funding Institution/Program: Ministry of Economy and Competitiveness/ Subprogram of Fundamental non-oriented research

IMDEA Energy Institute external funding: 140,400 €

Title/Acronym: Integration of renewable energy in the smart grid/RESmart

Partners: Carlos III University (Coordinator); IMDEA Energy Institute; Unión Fenosa Distribución

Period: 2014-2016

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: 65,340 €

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: 2014-2017

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 €

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

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

Period: 2014-2017

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

Title/Acronym: Dissemination and support to companies regarding Carbon Footprint Register/RHueCa

Partners: Asociación sostenibilidad y energías renovables (Coordinator); IMDEA Energy Institute; Inabensa; Eagle digital technologies

Period: 2014-2015

Funding Institution/Program: Ministry of Industry, Energy and Tourism/ Apoyo a agrupaciones empresariales innovadoras

IMDEA Energy Institute external funding: 17,508 €

Title/Acronym: Multifunctional Hybrid photocatalysts for artificial photosynthesis/Hybrid-Leaf

Partners: IMDEA Energy Institute

Period: 2014-2015

Funding Institution/Program: Ministry of Economy and Competitiveness/ State Program for Promotion of Scientific and Technical Research Excellence. Acciones de dinamización “Proyectos Europa Excelencia”

IMDEA Energy Institute external funding: 85,000 €

Title/Acronym: Enzymatic, chemical and engineering challenges to the use of agroforestry resources nonfood (lignocellulose) in a more sustainable bio-economy and cleaner

Partners: CIB-CSIC (Coordinator); INIA; CIEMAT; EYOWN Technologies; Alcalá University; ICP-CSIC; Valladolid University; IRNASE-CSIC; Barcelona University; IMDEA Energy Institute; Jaén University; Celulosas de Levante; Instituto de Biotecnología de León; CRAG; Polytechnic University of Catalonia; Foresa-Industrias químicas del noroeste; Biopolis; Santiago de Compostela University; CID-CSIC; CIFOR-INIA; Vigo University; Zaragoza University; IATA-CSIC

Period: 2014-2015

Funding Institution/Program: Ministry of Economy and Competitiveness/ State Program of Research, Development and Innovation Oriented Challenges of the Society. Proyectos de investigación fundamental orientada y acciones complementarias del INIA



Title/Acronym: New challenges in the production of solar fuels/FOTOFUEL

Partners: IMDEA Energy Institute (Coordinator); ICP-CSIC; ICIQ; UPV-CSIC; IMDEA Materials Institute; ALBA-CELLS; University of Barcelona; Universitat Jaume I de Castello; Plataforma Solar de Almería; MATGAS

Period: 2014-2016

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

IMDEA Energy Institute external funding: 17,218 €

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 €

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: 2015-2017

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 €

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



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

Project: Solar fuels by artificial photosynthesis with multifunctional hybrid catalysts/ SolarFuel

Partners: IMDEA Energy Institute (Coordinator)

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 €

Title/Acronym: Production of second generation biofuels from lignocellulosic biomass

Partners: IMDEA Energy Institute

Funding Institution/Program: IBERDROLA Foundation/ Call for research funding in energy and environment 2015-2016

Period: 2015-2016

IMDEA Energy Institute external funding: 20,000 €

Title/Acronym: Multifunctional materials for chemical energy storage by photocatalytic processes

Partners: IMDEA Energy Institute

Funding Institution/Program: IBERDROLA Foundation/ Call for research funding in energy and environment 2015-2016

Period: 2015-2016

IMDEA Energy Institute external funding: 20,000 €





Title/Acronym: Stability and control in weak grids/ARGES

Funding Institution/Program: IBERDROLA Foundation/ Call for research funding in energy and environment 2015-2016

Period: 2015-2016

IMDEA Energy Institute external funding: 20,000 €

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

Partners: Albufera Energy Storage (Coordinator); ALEASTUR; GFM; ITMA; 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: 128,538 €

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 €

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: 417,733 €

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

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

Period: 2015-2018

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

IMDEA Energy Institute external funding: 160,926 €

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

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

Period: 2015-2017

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

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

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

Period: 2015-2017

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

International projects

Title/Acronym: Thermochemical energy storage for concentrated solar power plants/ TCSPower

Partners: Deutsches Zentrum für Luft- und Raumfahrt (Coordinator); Deutsches Zentrum für Luft- und Raumfahrt (Coordinator); Siemens CSP; Siemens AG; Bühler; Eramet et Comilog Chemicals; IMDEA Energy Institute; Paul Scherrer Institute; Universität Siegen

Period: 2011-2015

Funding Institution/Program: European Union/ FP7-Cooperation. Call identifier: FP7-ENERGY-2011-1

IMDEA Energy Institute external funding: 452,082 €

Title/Acronym: Concentrated Solar Power in Particles/CSP2

Partners: Centre National de la Recherche Scientifique (Coordinator); The University of Warwick; Eidgenössische Technische Hochschule Zürich; IMDEA Energy Institute; COMESSA; TORRESOL Energy Investments; TORRESOL ENERGY O&M; European Powder & Process Technology

Period: 2011-2015

Funding Institution/Program: European Union/ FP7-Cooperation. Call identifier: FP7-ENERGY-2011-1

IMDEA Energy Institute external funding: 203,478 €



Title/Acronym: Energy demand aware open services for smart grid intelligent automation/SmartHG

Partners: Sapienza University of Rome (Coordinator); Sapienza University of Rome (Coordinator); Aarhus University; IMDEA Energy Institute; Joint Institute for Power and Nuclear Research; ATANVO; GridManager; Develco Product; Panoramic Power; Solintel; SEAS-NVE; Kalundborg Municipality; Minskenergo

Period: 2012-2015

Funding Institution/Program: European Union/ FP7-Cooperation. Call identifier: FP7-ICT-2011-8

IMDEA Energy Institute external funding: 441,750 €

Title/Acronym: Training network in innovative polyelectrolytes for energy and environment/RENAISSANCE

Partners: University of the basque country (Coordinator); CNRS-University of Bordeaux I; Max Planck Institute of Colloids and Interfaces; Linköping University; University of Liege; IMDEA Energy Institute; Kitozyme; Procter & Gamble Italia; Procter & Gamble Services Company

Period: 2012-2016

Funding Institution/Program: European Union/ FP7-People Program. Call identifier FP7-PEOPLE-2011-ITN

IMDEA Energy Institute external funding: 223,481 €

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

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

Period: 2013-2017

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

IMDEA Energy Institute external funding: 900,217 €

Title/Acronym: Scientific and Technological Alliance for Guaranteeing the European Excellence in Concentrating Solar/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-Cooperation. Call identifier: FP7-ENERGY-2013-IRP

IMDEA Energy Institute external funding: 472,102 €



Title/Acronym: Checking the actual sustainability of renewables. Developing of new tools/SuReTool

Partners: IMDEA Energy Institute (Coordinator); IFE

Period: 2014-2015

Funding Institution/Program: European Economic Area (EEA)/ NILS Ciencia y Sostenibilidad/EEA Grants-Call: Coordinated Mobility of Researchers

IMDEA Energy Institute external funding: 15,580 €

Title/Acronym: European network for algal-bioproducs/EUALGAE

Partners: IMDEA Energy Institute (Coordinator); Wageningen University; Istituto per lo Studio degli Ecosistemi; Institute National de la Recherche Agronomique; Biefeld University; Laboratorio Nacional de Energia e Geologia; Katholieke Universiteit Leuven; Agricultural University of Athens; Bioforsk; Ege University

Periodo: 2015-2019

Funding Institution/Program: European Union/ COST actions

IMDEA Energy Institute external funding: 14,087 € (estimated GP1)

Title/Acronym: Hybrid Materials for Artificial Photosynthesis/HyMap

Partners: IMDEA Energy Institute (Coordinator)

Period: 2015-2020

Funding Institution/Program: European Union/ ERC-Consolidator Grants

IMDEA Energy Institute external funding: 2,506,738 €

Contracts with companies and other organizations

Title/Acronym: Energy efficiency in systems for vibration testing

Company: IMV Corporation (Japan)

Period: 2010-2016

IMDEA Energy Institute external funding: 155,024 €

Title/Acronym: Development of a rechargeable metal-air battery

Company: Albufera Energy Storage (Spain)

Period: 2013-2015

IMDEA Energy Institute external funding: 40,000 €

Title/Acronym: Consulting on the state of the art in nanotechnology for energy applications

Institution: IMDEA Nanoscience Institute (Spain)

Period: 2014-2015

IMDEA Energy Institute external funding: 3,500 €



Title/Acronym: Next generation battery testing equipment/NGBTE

Company: IMV Corporation (Japan)

Period: 2014-2016

IMDEA Energy Institute external funding: 271,347 €

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 €

Title/Acronym: Ecodesign of products2

Company: Repsol (Spain)

Period: 2014-2015

IMDEA Energy Institute external funding: 13,092 €

Title/Acronym: Investigation of the electrochemical properties of fibers based on carbon nanotubes and graphene

Institution: Edgar M. Muñoz de Miguel (Spain)

Period: 2015

IMDEA Energy Institute external funding: 4,607 €

Title/Acronym: Lipid production in microalgae applying infrared radiation

Company: Green Future Consulting (Spain)

Period: 2015

Importe contratación: 2,480 €



Title/Acronym: Organic flow battery for ultrafast charge of electric vehicles in conventional petrol pumps /BAFO

Period: 2015-2016

Company: Repsol (Spain)

IMDEA Energy Institute external funding: 234,494 €

Title/Acronym: Simulation of PERSEO process/SIMPER

Company: KIC Innoenergy Iberia/IMECAL (Spain)

Period: 2015-2016

IMDEA Energy Institute external funding: 11,250 €

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

Company: Ingenia Solar Energy (Spain)

Period: 2015-2016

IMDEA Energy Institute external funding: 108,161 €

Title/Acronym: Development of cathode materials for primary zinc air batteries

Company: CEGASA PORTABLE ENERGY (Spain)

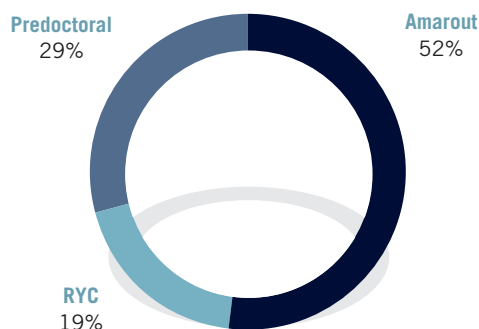
Period: 2015-2016

IMDEA Energy Institute external funding: 31,082 €

7.2. Researcher grants and mobility actions

7.2.1. Researcher grants

The external funding executed by IMDEA Energy from grants and fellowships during 2015 has been the amount of 304,691 €. The main source of external funding has been the European Programme Amarout (52%), followed by, the Ramón y Cajal (RYC) program (19%) and finally by grants for hiring predoctoral researchers (29%). The Institute had 20 grants active during 2015.





Program: Ramón y Cajal 2011

Project: Intelligent power interfaces for real-time management of future power networks

Period: 2012-2016

Funding Institution: Ministry of Economy and Competitiveness

IMDEA Energy Institute external funding: 168,600 €

Dr. Milan Prodanovic

Program: Ramón y Cajal 2011

Project: Application of ionic liquid-based materials in high performance supercapacitor

Period: 2012-2016

Funding Institution: Ministry of Economy and Competitiveness

IMDEA Energy Institute external funding: 168,600 €

Dr. Rebeca Marcilla

Program: Fellowship of Ministry of Higher Education

Project: Characterization and development of indigenous microalgae for biofuels production

Period: 2012-2016

Funding Institution: Ministry of Higher Education

IMDEA Energy Institute external funding: 108,000 €

Mr. Ahmed Abdel-Mohsen Mahdy

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

Period: 2013-2015

Funding Institution: European Union

IMDEA Energy Institute external funding: 35,702 €

Dr. Tadhg O'Mahony

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

Period: 2013-2015

Funding Institution: European Union

IMDEA Energy Institute external funding: 41,868 €

Dr. Jian Li

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

Period: 2013-2016

Funding Institution: European Union

IMDEA Energy Institute external funding: 55,756 €

Dr. Barry Hayes

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

Period: 2013-2016

Funding Institution: European Union

IMDEA Energy Institute external funding: 54,517 €

Dr. Sankaranayanan Thangaraju

Program: Predoctoral Research Grant (FPI)

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

Program: Contract FPI

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

Period: 2014-2017

Funding Institution: Ministry of Economy and Competitiveness

IMDEA Energy Institute external funding: 82,400 €

Ms. Paula Navalpotro

Program: Call for research funding in Energy and Environment 2014-2015

Project: New flexible systems for thermochemical energy storage by redox cycles

Period: 2014-2015

Funding Institution: IBERDROLA Foundation

IMDEA Energy Institute external funding: 20,000 €

Mr. Alfonso Carrillo

Program: “Marie Curie” AMAROUT Europe II. FP7-People Program. Call identifier FP7-PEOPLE-2011-COFUND Period: 2014-2016

Funding Institution: European Union

IMDEA Energy Institute external funding: 43,860 €

Dr. Elia Tomás

Program: “Marie Curie” AMAROUT Europe II. FP7-People Program. Call identifier FP7-PEOPLE-2011-COFUND Period: 2014-2016

Funding Institution: European Union

IMDEA Energy Institute external funding: 34,264 €

Dr. Puiki Leung

Program: “Marie Curie” AMAROUT Europe II. FP7-People Program. Call identifier FP7-PEOPLE-2011-COFUND **Period:** 2014-2016

Funding Institution: European Union

IMDEA Energy Institute external funding: 37,485 €

Dr. Afshin Pendashteh

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

Period: 2014-2016

Funding Institution: European Union

IMDEA Energy Institute external funding: 6,544 €

Dr. Lida Heidari

Program: Acciones de programación conjunta tipo COFUND

Project/Acronym: AMAROUT-Sp

Period: 2014-2015

Funding Institution: Ministry of Economy and Competitiveness

IMDEA Energy Institute external funding: 19,427 €

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

Period: 2015-2016

Funding Institution: European Union

IMDEA Energy Institute external funding: 26,153 €

Dr. Fernando Fresno

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

Period: 2015-2016

Funding Institution: European Union

IMDEA Energy Institute external funding: 28,102 €

Dr. Salvador Luque

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

Period: 2015

Funding Institution: European Union

IMDEA Energy Institute external funding: 10,140 €

Dr. Beatriz Molinuevo





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

Period: 2015-2016

Funding Institution: European Union

IMDEA Energy Institute external funding: 14,548 €

Dr. Michael Epstein

Program: Contract FPU

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: 81,300 €

Ms. Lucía Arribas

7.2.2. Mobility actions

Stay at Max Planck Institute, Potsdam, Germany

Period: 3 months, 2015

Funding Institution: European Union (RENAISSANCE project)

Mr. Girum Ayalneh Tiruye

Stay at Institute for Energy Technology (IFE), Oslo, Norway

Period: 3 months, 2015

Funding Institution: European Economic Area (EEA)

Mr. Mario Martín

Stay at Pontificia Universidad Católica de Chile, Santiago de Chile

Period: 3 months, 2015

Funding Institution: IMDEA Energy Institute

Ms. Cleis Santos Santos

Stay at Technical University of Denmark, Denmark

Period: 3 months, 2015

Funding Institution: IMDEA Energy Institute/INSPIRA-1 project

Mr. Ahmed Mahdy

Stay at Institute for Energy Technology (IFE), Oslo, Norway

Period: 1 week, 2015

Funding Institution: European Economic Area (EEA)

Dr. Diego García



Visiting researchers

Ms. Isabel Plana, PhD Student

Origin Institution: Massachusetts Institute of Technology, USA

Host Unit: Thermochemical Processes Unit

Period: 1 month, 2015

Activity: Hydrodeoxygenation assays of mixtures of chemicals representative of the composition of pyrolysis bio-oils

Ms. Laura Francia, ERASMUS+ Student

Origin institution: University of Genoa, Italy

Host Unit: High Temperature Processes Unit

Period: 3 months, 2015

Activity: Literature survey on CSP and thermal storage energy

Ms. Alice Cordiviola, ERASMUS+ Student

Origin institution: University of Genoa, Italy

Host Unit: High Temperature Processes Unit

Period: 3 months, 2015

Activity: Literature survey on CSP and thermal storage Energy and basics of PCM based thermal energy storage system

Mr. Johannes Neuwirth

Origin Institution: BE Aerospace, Germany

Host Unit: Electrochemical Processes Unit

Period: 2 days, 2015

Activity: Definition of the manufacturing process of structural supercapacitors

Mr. Fabrizio Alberti, PhD Student

Origin Institution: Fondazione Bruno Kessler, Trento, Italy

Host Unit: High Temperature Processes Unit

Period: 2 weeks, 2015

Activity: Collaboration in the STAGE-STE project. Characterization of volumetric absorbers

Mr. Manuel Mundo, PhD Student

Origin Institution: Massachusetts Institute of Technology, USA

Host Unit: Electrochemical Processes Unit

Period: 2 months, 2015

Activity: Flow Batteries

Ms. Melissa Kreider, PhD Student

Origin Institution: Massachusetts Institute of Technology, USA

Host Unit: Thermochemical Processes Unit

Period: 2 months, 2015

Activity: Hydrodeoxygenation of bio-oils

Ms. Elena Alonso, PhD Student

Origin Institution: University of Lille, France

Host Unit: Thermochemical Processes Unit

Period: 2,5 months, 2015

Activity: Characterization of hybrid materials for CO₂ photoreduction

Ms. Martina Ambrogi, PhD Student

Origin Institution: Max Plank Potsdam, Germany

Host Unit: Electrochemical Processes Unit

Period: 4 months, 2015

Activity: Electrochemical characterization of different coals synthesized from cotton and polymeric ionic liquids within of RENAISSANCE project

Ms. Guiomar Hernández, PhD Student

Origin Institution: POLYMAT, University of the Basque Country (UPV/EHU), Spain

Host Unit: Electrochemical Processes Unit

Period: 1 month, 2015

Activity: Redox polymer electrolytes within of RENAISSANCE project

Mr. Yong Zhu, PhD Student

Origin Institution: North China Electric Power University, China

Host Unit: High Temperature Processes Unit

Period: 1 year, 2015-2016

Activity: Integration for concentrating solar technologies in advance thermal power plants

c o o p e r a t i o n f r a m e w o r k



- 8.1. Cooperation with research institutions and universities [75]
- 8.2. Cooperation with other Imdea Institutes [77]
- 8.3. Cooperation with industry [77]
- 8.4. Cooperation with networks and associations [81]

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8.1. Cooperation with research institutions and universities

The following table lists cooperation activities established with different research institutions and universities that have been active during 2015.

Institution	Cooperation
University of Warwick (United Kingdom)	Cooperation within the framework of CSP2 project for solar concentrating systems. Period: 2011-2015
Centre National de la Recherche Scientifique (CNRS) (France)	Cooperation in projects related to solar concentrating systems (Project CSP2). Period: 2011-2015
Paul Scherrer Institute (PSI) (Switzerland)	Cooperation within the framework of TCSPower project related to solar concentrating systems Period: 2011-2015
Institute of Energy Technology (ETH-Zurich) (Switzerland)	Cooperation in the CSP2 project for solar concentrating systems and CASCATBEL project for the production of second-generation biofuels. Period: 2011-2017
National Autonoma University of Mexico (UNAM) (Mexico)	Cooperation in research projects on concentrating solar power. Period: 2011-present
Sapienza University of Rome (Italy)	Coordinator of SmartHG project for smart grid intelligent automation. Period: 2012-2015
University of the Basque Country (Spain)	Coordinator of RENAISSANCE project for training network in innovative polyelectrolytes for energy and environment. Period: 2012-2016
Rey Juan Carlos University (URJC) (Spain)	Cooperation in projects to the production of sustainable fuels, energy storage, smart grids and applications of the spirulina (Projects: RESTOENE2, ALCCONES, PRICAM and INSPIRA1). Period: 2012-2018
Max Planck Institut fuer Kohlenforschung (Germany)	Cooperation within the framework of CASCATBEL project for the production of second-generation biofuels. Period: 2013-2017
CERTH/CPERI (Greece)	Cooperation within the framework of CASCATBEL project for the production of second-generation biofuels. Period: 2013-2017
Hamburg University of Technology (Germany)	Cooperation within the framework of CASCATBEL project for the production of second-generation biofuels. Period: 2013-2017



Institution	Cooperation
Fundación madrimasd para el conocimiento (Spain)	Cooperation within the framework of OPE MADRIMASD-IMDEA project for the creation of an office of European projects. Period: 2014-2017
Centre of Energy, Environmental and Technological Research (CIEMAT) (Spain)	Cooperation in projects to the production of sustainable fuels and energy storage (Projects: RESTOENE2, ALCCONES and STAGE-STE). Period: 2014-2018
Autonoma University of Madrid (UAM) (Spain)	Cooperation in projects to the production of sustainable fuels and applications of the spirulina (Projects: RESTOENE2 and INSPIRA1). Period: 2014-2018
Higher Council for Scientific Research (CSIC) (Spain)	Cooperation in projects to the production of sustainable fuels, applications of graphene and spirulina (Projects: RESTOENE2, MAD2D and INSPIRA1). Period: 2014-2018
University of Alcalá (Spain)	Coordinator of the PRICAM project to smart grids. Period: 2014-2018
Carlos III University (Spain)	Cooperation within the framework of RESmart project for the integration of renewable energy in smart grids and LPT project for the manageability of photovoltaic plants. Period: 2014-2019
Fundación Iberdrola España (Spain)	Cooperation in projects to the production of sustainable fuels, thermochemical storage and control of power grids. Period: 2015-2016
Fundación Ramón Areces (Spain)	Cooperation in projects for the efficient production of solar fuels (Project: SOLARKITE). Period: 2015-2018
CEBAS-CSIC (Spain)	Cooperation in projects for the integration of microalgae-bacteria in sewage plants (Project: MICROALBAC). Period: 2015-2018

8.2. Cooperation with other IMDEA Institutes

The following table lists cooperation agreements established with other IMDEA Institutes, which have been active during 2015.

Institution	Cooperation
IMDEA Software, IMDEA Materials; IMDEA Networks; IMDEA Water; IMDEA Food; IMDEA Nanoscience	Cooperation within the framework of AMAROUT II Program Period: 2013-2016
IMDEA Software; IMDEA Networks; IMDEA Nanoscience; IMDEA Food; IMDEA Materials	Cooperation within the framework of AMAROUT-Sp project of COFUND2014 program Period: 2014-2015
IMDEA Water; IMDEA Food; IMDEA Materials; IMDEA Nanoscience; IMDEA Networks; IMDEA Software	Cooperation within the framework of OPE MADRIMASD-IMDEA project Period: 2014-2017
IMDEA Nanoscience	Cooperation within the framework of MAD2D project Period: 2014-2018 Contract for a report on the state of the art in the field of nanotechnology Period: 2014-2015
IMDEA Materials	Cooperation within the framework of MAD2D project Period: 2014-2018 Contract for the development of materials for energy storage Period: 2014-2017

8.3. Cooperation with industry

Cooperation in R&D&i with companies is one of the main objectives of 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. In 2015, IMDEA Energy promoted a wide number of meetings with companies and was actively involved in the organization and participation in different business events. In 2015 more than 240 companies were contacted and 17 new joint R&D proposals have been launched. In the following table, it is shown the efforts made by the Institute in 2015 in order to promote relationships with industry:

Number of events designed for attracting companies organized by IMDEA Energy	7
Number of corporate events hosted by IMDEA Energy	2
Number of meetings with companies	93



The following table lists the companies that have been developing projects and contracts with the IMDEA Energy Institute along 2015.

Company	Cooperation
IMV Corporation (Japan)	Cooperation on energy efficient processes. Period: 2010-2016
Bühler (Switzerland)	Cooperation within the framework of TCSPower project related to solar concentrating systems. Period: 2011-2015
COMESSA (France)	Cooperation in projects related to solar concentrating systems (Project CSP2). Period: 2011-2015
Eramet et Comilog Chemicals (Belgium)	Cooperation within the framework of TCSPower project related to solar concentrating systems. Period: 2011-2015
European Powder & Process Technology (Belgium)	Cooperation in projects related to solar concentrating systems (Project CSP2). Period: 2011-2015
Siemens Concentrated Solar Power (Israel)	Cooperation within the framework of TCSPower project related to solar concentrating systems. Period: 2011-2015
Torresol Energy Investments (Spain)	Cooperation in projects related to solar concentrating systems (Project CSP2). Period: 2011-2015
Abengoa Hidrógeno (Spain)	Cooperation in projects and activities related to thermochemical energy storage (Project: MULTISTOR). Period: 2011-2016
Camelina Company España (Spain)	Cooperation in projects for the production of second generation biofuels. Period: 2012-2015
Abengoa Bioenergía (Spain)	Cooperation in projects for the production of second generation biofuels and production of lignocellulosic bioethanol (Projects: RESTOENE2 and LignoYeast). Period: 2012-2018
Repsol (Spain)	Cooperation in projects for the production of second generation biofuels and energy storage (Projects: SUPERLION, MULTISTOR, RESTOENE2 and MAD2D). Period: 2012-2018

Company	Cooperation
Abengoa Research (Spain)	Cooperation in projects for the production of second generation biofuels and energy storage (Projects: INNFACTO'12, CASCATBEL and ALCCONES) Period: 2012-2018
Iberdrola (Spain)	Cooperation in projects for solar thermochemical processes based on manganese oxides and smart grids (Projects: SOLAR02 and PRICAM) Period: 2012-2018
Solvionic (France)	Cooperation within the framework of SUPERLION project for development of supercapacitors. Period: 2013-2016
MAST Carbon International Ltd. (United Kingdom)	Cooperation within the framework of CASCATBEL project for the production of biofuels. Period: 2013-2017
Silkem (Slovenia)	Cooperation within the framework of CASCATBEL project for the production of biofuels. Period: 2013-2017
Nanologica (Sweden)	Cooperation within the framework of CASCATBEL project for the production of biofuels. Period: 2013-2017
Outotec (Germany)	Cooperation within the framework of CASCATBEL project for the production of biofuels. Period: 2013-2017
Albufera Energy Storage (Spain)	Cooperation in projects for the development of a rechargeable metal-air battery and cooperation within the framework MAD2D project for applications of graphene Period: 2013-2018
Inabensa (Spain)	Cooperation within the framework of RHueCa project for carbon footprint register. Period: 2014-2015
Unión Fenosa Distribución (Spain)	Cooperation within the framework of RESmart project for the integration of renewable energies into smart grids. Period: 2014-2016
Aqualia (Spain)	Cooperation within the framework of WWWAL-GAS project for biogas production from microalgae. Period: 2014-2017
MATGAS (Spain)	Cooperation within the framework of FOTOFUEL project for the production of solar fuels. Period: 2014-2015



Company	Cooperation
Empresarios Agrupados (Spain)	Cooperation within the framework of ALCCONES project for solar energy storage. Period: 2014-2018
SENER Ingeniería y Sistemas (Spain)	Cooperation within the framework of ALCCONES project for solar energy storage. Period: 2014-2018
Exide Technologies (Spain)	Cooperation within the framework of RESTOENE2 for the production of second generation biofuels. Period: 2014-2018
Soluciones catalíticas Ibercat (Spain)	Cooperation within the framework of RESTOENE2 for the production of second generation biofuels. Period: 2014-2018
Airbus Operations (Spain)	Cooperation within the framework of MAD2D project for applications of graphene. Period: 2014-2018
Nanoinnova Technologies (Spain)	Cooperation within the framework of MAD2D project for applications of graphene. Period: 2014-2018
Bruker (Spain)	Cooperation within the framework of MAD2D project for applications of graphene. Period: 2014-2018
Indra (Spain)	Cooperation within the framework of PRICAM projet for smart grids. Period: 2014-2018
Isolux Ingeniería (Spain)	Cooperation within the framework of INSPIRA1 for applications of the spirulina. Period: 2014-2018
Neol Biosolution (Spain)	Cooperation within the framework of LignoYeast project. Period: 2015-2017
Biopolis (Spain)	Cooperation within the framework of LignoYeast project. Period: 2015-2017
GS-INIMA (Spain)	Coordinator of the DC-SOIAS project for capacitive deionization. Period: 2015-2018
PROINGESA (Spain)	Cooperation within the framework of DC-SOIAS project. Period: 2015-2018
Ingenia Solar Energy (Spain)	Coordinator of LPT project about photovoltaic plants. Period: 2015-2018

Company	Cooperation
FACSA (Spain)	Coordinator of MICROALBAC project for the integration of microalgae-bacteria treatment plants wastewater consortia. Period: 2015-2018
Green Future Consulting (Spain)	Cooperation in the production of lipids in microalgae. Period: 2015
IMECAL (Spain)	Cooperation within the framework of PERSEO process simulation. Period: 2015-2016
Cegasa Portable Energy (Spain)	Cooperation in the development of materials for primary zinc-air batteries. Period: 2015-2016

8.4. Cooperation with networks and associations

IMDEA Energy Institute, since its creation, has considered as a relevant activity its participation in associations, technology platforms, expert groups and alliances of the energy sector. This is also a means of increasing the external visibility of IMDEA Energy Institute, establishing new links with companies and research institutions and to gain updated information on the initiatives being planned and launched related to the different energy topics. The following lists gives the main associations in which IMDEA Energy Institute is participating as a member in 2015:

- Joint Programme on Energy Storage in the EERA (European Energy Research Alliance).
- Joint Programme on Bioenergy in the EERA (European Energy Research Alliance).
- Joint Programme on Concentrating Solar Power in the EERA (European Energy Research Alliance).
- Joint Programme on Economic, Environmental and Social Impacts of Energy Policies and Technologies in the EERA (European Energy Research Alliance).
- Research Grouping of the Joint Undertaking on Fuel Cells and Hydrogen of the VII Framework Programme of the EC (N.ERGHY).
- European Industrial Initiative in Bioenergy (BBI).
- Alliance of Energy Research and Innovation (ALINNE).
- Cluster on Sustainability and Renewable Energies of Madrid Network.
- Aerospace Cluster of Madrid Network.
- Spanish Technological Platform on Hydrogen and Fuel Cells (PTE – HPC).
- Spanish Technological Platform on CSP technologies Solar Concentration (PTE – SOLAR CONCENTRA).
- Spanish Technological Platform for Biomass (BIOPLAT).
- Spanish Technological Platform for Energy Efficiency (PTE-EE).



- Spanish Electrical Grid Platform (FutuRed).
- Spanish Technological Platform on CO₂ (PTECO2).
- Spanish Technological Platform for Automotive and Mobility (Move2future).
- Spanish Network of Life Cycle Assessment (esLCA).
- Thematic Network LIGNOCEL on Biotechnology of lignocellulosic materials.
- International Solar Energy Society (ISES).
- Club Español de la Energía.
- Spanish Association for Quality (AEC).
- HIA30 of the International Energy Agency.
- European Solar Thermal Electricity Association (ESTELA).



scientific results



9.1. Publications [84]

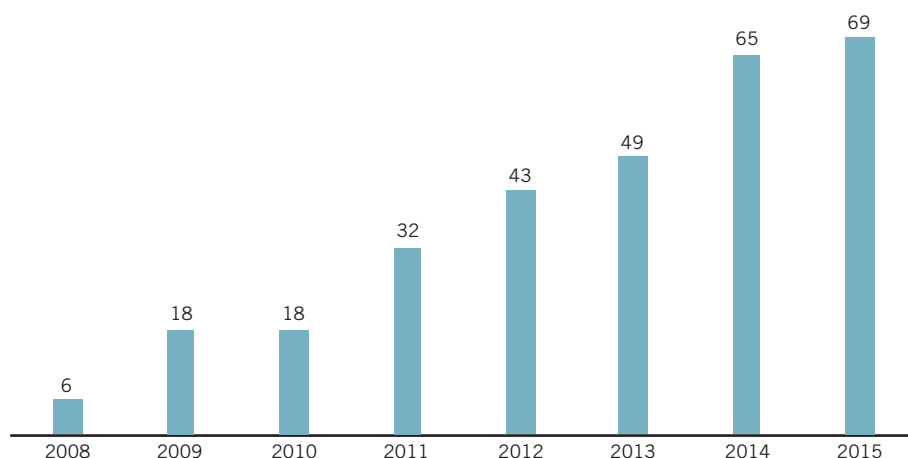
9.2. Congress communications [92]

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During 2015 IMDEA Energy has contributed with 69 publications in indexed scientific journals. Regarding patents, the Institute has applied for two patents. As for participation in conferences, during 2015 there have been 6 invited papers, 47 oral presentations and 23 poster communications. It is also noticeable that during 2015 seven doctoral theses were defended.

The following figure shows the evolution of the number of scientific publications in the period 2008 - 2015:



9.1. Publications

Scientific publications

1. Aichmayer, L.; Spelling, J.; Laumert, B.
"Thermoeconomic analysis of a solar dish micro gas-turbine combined-cycle power plant".
Energy Procedia, 2015, 69, 1089-1099.

2. Alonso, E.; Romero, M.
"Review of experimental investigation on directly irradiated particles solar reactors".
Renewable and Sustainable Energy Reviews, 2015, 41, 53-67.

3. Alonso, E.; Romero, M.
"A directly irradiated solar reactor for kinetic analysis of non-volatile metal oxides reductions".
International Journal of Energy Research, 2015, 39 (9), 1217-1228.

4. Bellan, S.; Gonzalez-Aguilar, J.; Romero, M.; Rahman, M.M.; Goswami, D.Y.; Stefanakos, E.K.
"Numerical investigation of PCM-based thermal energy storage system".
Energy Procedia, 2015, 69, 758-768.

5. Bellan, S.; Alam, T.E.; González-Aguilar, J.; Romero, M.; Rahman, M.M.; Goswami, D.Y.; Stefanakis, E.K.
“Numerical and experimental studies on heat transfer characteristics of thermal energy storage system packed with molten salt PCM capsules”. *Applied Thermal Engineering*, 2015, *90*, 970-979.
6. Beltrán, L.O.; Boland, J.; González-Aguilar, J.; Middleton, P.; Rincón-Mejía, E.A.
“Renewables working together for all”. Editorial to the Special Issue ISES Solar World Congress 2013 (SWC 2013) *Solar Energy*, 2015, *121*, 1.
7. Carrillo, A.J.; Serrano, D.P.; Pizarro, P.; Coronado, J.M.
“Improving the thermochemical energy storage performance of the Mn_2O_3/Mn_3O_4 redox couple by the incorporation of iron”. *ChemSusChem*, 2015, *8* (11), 1947-1954.
8. Carrillo, A.J.; Serrano, D.P.; Pizarro, P.; Coronado, J.M.
“Thermochemical heat storage at high temperatures using Mn_2O_3/Mn_3O_4 system: narrowing the redox hysteresis by metal co doping”. *Energy Procedia*, 2015, *73*, 263-271.
9. Chandrasekaran, R.; Palma, J.; Anderson, M.
“Carbide derived carbon electrode with natural graphite addition in magnesium electrolyte based cell for supercapacitor enhancements”. *Journal of Energy Chemistry*, 2015, *24* (3), 264-270.
10. Collado, L.; Reynal, A.; Coronado, J.M.; Serrano, D.P.; Durrant, J.R.; de la Peña-O’Shea, V.A.
“Effect of Au surface plasmon nanoparticles on the selective CO_2 photoreduction to CH_4 ”. *Applied Catalysis B Environmental*, 2015, *178*, 177-185.
11. Darabizad, G.; Rahmanifar, M.S.; Mousavi, M.F.; Pendashteh, A.
“Electrodeposition of morphology- and size-tuned PbO_2 nanostructures in the presence of PVP and their electrochemical studies”. *Materials Chemistry and Physics*, 2015, *156*, 121-128.
12. Demuez, M.; González-Fernández, C.; Ballesteros, M.
“Algicidal microorganisms and secreted algicides: New tools to induce microalgal cell disruption”. *Biotechnology Advances*, 2015, *33* (8), 1615-1625.
13. Demuez, M.; Mahdy, A.; Tomás-Pejó, E.; González-Fernández, C.; Ballesteros, M.
“Enzymatic cell disruption of microalgae biomass in biorefinery processes”. *Biotechnology Bioengineering*, 2015, *112* (10), 1955-1966.
14. Escola, J.M.; Serrano, D.P.; Aguado, J.; Briones, L.
“Hydroreforming of the LDPE thermal cracking oil over hierarchical Ni/Beta catalysts with different Ni particle size distributions”. *Industrial and Engineering Chemistry Research*, 2015, *54* (26), 6660-6668.
15. Gafurov, T.; Usaola, J.; Prodanovic, M.
“Incorporating spatial correlation into stochastic generation of solar radiation data”. *Solar Energy*, 2015, *115*, 74-84.
16. Gafurov, T.; Usaola, J.; Prodanovic, M.
“Modelling of concentrating solar power plant for power system reliability studies”. *IET Renewable Power Generation*, 2015, *9* (2), 120-130.
17. Gallo, A.; Spelling, J.; Romero, M.; González-Aguilar, J.
“Preliminary design and performance analysis of a multi-megawatt scale dense particle suspension receiver”. *Energy Procedia*, 2015, *69*, 388-397.

18. García-Muñoz, R.A.; Serrano, D.P.; Vicente, G.; Linares, M.; Vitvarova, D.; Cejka, J. "Remarkable catalytic properties of hierarchical zeolite-Beta in epoxide rearrangement reactions". *Catalysis Today*, 2015, *243*, 141-152.
19. Gil, M.V.; Fermoso, J.; Rubiera, F.; Chen, D. "H₂ production by sorption enhanced steam reforming of biomass-derived bio-oil in a fluidized bed reactor: An assessment of the effect of operation variables using response surface methodology". *Catalysis Today*, **2015**, *242*, 19-34.
20. Gómez-García, F.; González-Aguilar, J.; Tamayo-Pacheco, S.; Olalde, G.; Romero, M. "Numerical analysis of radiation propagation in a multi-layer volumetric solar absorber composed of a stack of square grids". *Solar Energy*, 2015, *121*, 94-102.
21. González-Fernández, C.; Sialve, B.; Moli-nuevo-Salces, B. "Anaerobic digestion of microalgal biomass: Challenges, opportunities and research needs". *Bioresource Technology*, 2015, *198*, 896-906.
22. González-Pardo, A.; González-Aguilar, J.; Romero, M. "Analysis of glint and glare produced by the receiver of small heliostat fields integrated in building façades. Methodology applicable to conventional central receiver systems". *Solar Energy*, 2015, *121*, 68-77.
23. González-Aguilar, J.; Romero, M.; Vidal, A. "Current status of solar thermochemistry in Spain". *Journal of the Japan Institute of Energy*, 2015, *94* (3), 194-200.
24. Gruber, J.K.; Huerta, F.; Matatagui, P.; Prodanovic, M. "Advanced building energy management based on a two-stage receding horizon optimization". *Applied Energy*, 2015, *160*, 194-205.
25. Gruber, J.K.; Prodanovic, M.; Alonso, R. "Estimation and analysis of building energy demand and supply costs". *Energy Procedia*, 2015, *83*, 216-225.
26. Gruber, J.K.; Ramirez, D.R.; Limon, D.; Alamo, T. "A convex approach for NMPC based on second order Volterra series models". *International Journal of Robust and Nonlinear Control*, 2015, *25* (18), 3546-3571.
27. Hayes, B.P.; Gruber, J.K.; Prodanovic, M. "A closed-loop state estimation tool for MV network monitoring and operation". *IEEE Transactions on Smart Grid*, 2015, *6* (4), 2116-2125.
28. Iribarren, D.; Marvuglia, A.; Hild, P.; Guiton, M.; Popovici, E.; Benetto, E. "Life cycle assessment and data envelopment analysis approach for the selection of building components according to their environmental impact efficiency: A case study for external walls". *Journal of Cleaner Production*, 2015, *87*, 707-716.
29. Isik, M.; Lonjaret, T.; Sardon, H.; Marcilla, R.; Herve, T.; Malliaras, G.G.; Ismailova, E.; Mecerreyes, D. "Cholinium-based ion gels as solid electrolytes for long-term cutaneous electrophysiology". *Journal of Materials Chemistry C*, 2015, *3*, 8942-8948.
30. Jana, P.; De La Peña O'Shea, V.A.; Montero, C.M.; Gálvez, P.; Pizarro, P.; Coronado, J.M.; Serrano, D.P. "Mixed NaNbTa_{1-x}O₃ perovskites as photocatalysts for H₂ production". *Green Chemistry*, 2015, *17* (3), 1735-1743.

31. Lado, J.J.; Pérez-Roa, R.E.; Waters, J.J.; Tejedor-Tejedor, M.I.; Federspill, C.; Anderson, M.A. "Continuous cycling of an asymmetric capacitive deionization system: An evaluation of the electrode performance and stability". *Journal of Environmental Chemical Engineering*, 2015, 3 (4), 2358-2367.
32. Leung, P.K.; Mohamed, M.R.; Shah, A.A.; Xu, Q.; Conde-Duran, M.B. "A mixed acid based vanadiumcerium redox flow battery with a zero-gap serpentine architecture". *Journal of Power Sources*, 2015, 274, 651-658.
33. Li, J.; González-Aguilar, J.; Romero, M. "Line-concentrating flux analysis of 42kWe high-flux solar simulator". *Energy Procedia*, 2015, 69, 132-137.
34. Mahdy, A.; Mendez, L.; Ballesteros, M.; González-Fernández, C. "Algaculture integration in conventional wastewater treatment plants: Anaerobic digestion comparison of primary and secondary sludge with microalgae biomass". *Bioresource Technology*, 2015, 184, 236-244.
35. Mahdy, A.; Mendez, L.; Ballesteros, M.; González-Fernández, C. "Protease pretreated *Chlorella vulgaris* biomass bioconversion to methane via semi-continuous anaerobic digestion". *Fuel*, 2015, 158, 35-41.
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5. Tiruye, G.A.; Marcilla, R. **2015.** Chapter: “Ionic Liquids and Polymers in Energy. Book: Applications of Ionic Liquids in Polymer Science and Technology”. Ed.: Springer-Verlag Berlin Heidelberg. DOI: 10.1007. Hardcover ISBN: 978-3-662-44902-8.

patents
 chapters of books



Articles in general journals

1. Dufour, J. "Tranvía chino de hidrógeno. Sin catenaria y propulsado por pilas". Suplemento "A tu salud" de La Razón, nº 564, pp 20-21, June 2015.
2. González-Pardo, A.; González-Aguilar, J.; Romero, M. "Comparación del comportamiento óptico. Campos verticales y campos horizontales de heliostatos". Journal Era Solar. Fototérmica & Fotovoltaica, nº 184, January-February 2015, pp 30-35.
3. Migliorini-Soterio, G.K.; González-Aguilar, J.; Romero, M.; Monge, J. "Diseño óptico y análisis de producción. Planta eléctrica termosolar". Journal Era Solar. Fototérmica & Fotovoltaica, March-April 2015, pp 46-51.
4. Spelling, J.; Aichmayer, L.; Laumert, B. "Thermoeconomic evaluation of a novel utility-scale hybrid solar dish micro gas-turbine power plant". Journal: ASME Turbo Expo 2015: Turbine Technical Conference and Exposition. Proceedings of ASME Turbo Expo 2015. June 15-19, 2015, Montreal, Canada. Paper No. GT2015-42368, pp. V003T06A007. ISBN: 978-0-7918-5667-3.
5. Tiruye, G.A.; Muñoz-Torrero, D.; Marcilla, R. "Desarrollo de supercondensadores sólidos mediante el uso de electrolitos poliméricos basados en líquidos iónicos". Revista de plásticos modernos, vol. 109, nº 702, pp 12-17, June 2015.

Ph.D. Thesis

1. **Title:** Analyse du potentiel de nouvelles structures d'absorbeur volumétrique pour les récepteurs des centrales solaires à tour
Author: Fabrisio Gómez García
Director: Dr. José González and Dr. Gabriel Olalde
Venue: University of Perpiñán, France
Date: 16 January 2015
2. **Title:** Diseño y caracterización de supercondensadores de alta energía basados en materiales carbonosos
Author: Susana Vaquero Morata
Director: Dr. Rebeca Marcilla and Dr. Jesús Palma
Tutor: Dr. Pilar Ocón (UAM)
Venue: Autonomia University of Madrid, Madrid, Spain
Date: 16 February 2015
3. **Title:** Pyrolysis for biofuels or biochar? A thermodynamic, environmental and economic assessment
Author: Jens Peters
Director: Dr. Javier Dufour
Venue: Rey Juan Carlos University, Móstoles, Madrid, Spain
Date: 20 March 2015
4. **Title:** Desarrollo de catalizadores bifuncionales selectivos para la producción de diésel renovable mediante el proceso de hidrodesoxigenación de ésteres metílicos
Author: Cristina Ochoa Hernández
Director: Dr. David Serrano and Dr. Juan M. Coronado
Venue: Rey Juan Carlos University, Móstoles, Madrid, Spain
Date: 26 March 2015



5. Title: Adequacy of generation system with large-scale deployment of solar power and energy storage

Author: Tokhir Gafurov

Director: Dr. Julio Usaola (UC3M) and Dr. Milan Prodanovic

Venue: Carlos III University, Leganés, Madrid, Spain

Date: 8 April 2015

6. Title: Fotosíntesis artificial: Influencia de la química superficial y los procesos optoelectrónicos en la fotorreducción de CO₂

Author: Laura Collado Brunete

Director: Dr. Victor de la Peña-O'Shea and Dr. David Serrano

Venue: Rey Juan Carlos University, Móstoles, Madrid, Spain

Date: 27 July 2015

7. Title: Optimal integration of a solid-oxide electrolyser cell into a direct steam generation solar tower plant for zero-emission hydrogen production

Author: Javier Sanz Bermejo

Director: Dr. Manuel Romero

Co-director: Dr. Javier Muñoz (UPM)

Tutor: Dr. Raúl Sanz

Venue: Rey Juan Carlos University, Móstoles, Madrid, Spain

Date: 3 September 2015

9.2. Congress communications

Invited lectures

1. Title: *New services for energy demand management*

Speaker: Prodanovic, M. (Keynote)

Congress: SustainIT 2015

Venue: Madrid, Spain

Date: 14-15 April 2015

Organizer: IMDEA Networks

2. Title: *High flux/high temperature solar thermal conversion: technology development and advanced applications*

Speaker: Romero, M. (Plenary)

Congress: World Renewable Energy Congress XIV

Venue: Bucharest, Romania

Date: 8-12 June 2015

Organizer: University "POLITEHNICA" of Bucharest; Technical University of Civil Engineering Bucharest; The Romanian Academy; World Renewable Energy Congress / Network

3. Title: *Pyrolysis for fuel or carbon storage? A life cycle study*

Speaker: Dufour, J. (Plenary)

Congress: 1st International Workshop on Biorefinery of Lignocellulosic Materials (IWBLCM)

Venue: Córdoba, Spain

Date: 9-12 June 2015

Organizer: University of Córdoba

4. Title: Application of ionic liquids and their polymer electrolytes in electrochemical energy storage

Speaker: Marcilla, R. (Keynote)

Congress: Iberoamerican Meeting on Ionic Liquids (IMIL 2015)

Venue: Madrid, Spain

Date: 2-3 July 2015

Organizer: UAM, UCM, UPM

5. Title: *Recent progress in the thermocatalytic processing of biomass into advanced fuels*

Speaker: Serrano, D.P. (Keynote)

Congress: International Congress and Expo on Biofuels & Bioenergy

Venue: Valencia, Spain

Date: 25-27 August 2015

Organizer: OMICS International

6. Title: *Catalyst design for the production of fuels and/or chemicals from waste plastics*

Speaker: Serrano, D.P. (Keynote)

Congress: 8th International Symposium on Feedstock Recycling of Polymeric Materials (ISFR 2015)

Venue: Leoben, Austria

Date: 7-10 September 2015

Organizer: Austrian Universities of Technologies

invited lectures

Oral communications

1. Title: *Boosting the performance of supercapacitors by using Redox Ionic Liquid Electrolytes*

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

Congress: The energy and materials research conference (EMR2015)

Venue: Madrid, Spain

Date: 25-27 February 2015

Organizer: Formatex research center

2. Title: *Testing methods for electrochemical energy storage systems under unconventional standards*

Authors: García-Quismondo, E.; Almonacid, I.; Palma, J.; Anderson, M.

Congress: The energy and materials research conference (EMR2015)

Venue: Madrid, Spain

Date: 25-27 February 2015

Organizer: Formatex research center

3. Title: *Development of a solarized rotary kiln for high-temperature chemical processes*

Authors: Arribas, L.

Congress: 11th SOLLAB Doctoral Colloquium

Venue: Melchsee-Frutt, Switzerland

Date: 2-4 March 2015

Organizer: ETH Zurich

4. Title: *Thermochemical heat storage at high temperatures using Mn_2O_3/Mn_3O_4 system: narrowing the redox hysteresis by metal co doping*

Authors: Carrillo, A.J.; Serrano, D.P.; Pizarro, P.; Coronado, J.M.

Congress: 9th International Renewable Energy Storage Conference 2015 (IRES 2015)

Venue: Düsseldorf, Germany

Date: 9-11 March 2015

Organizer: IRES

5. Title: *Use of metal-oxide nanostructures as catalyst and their application for air electrodes*

Authors: García-Quismondo, E.; Leung, P.; Marcilla, R.; Palma, J.; Anderson, M.

Congress: Metal Air Batteries International Congress (MaBIC '15)

Venue: La Coruña, Spain

Date: 14-16 April 2015

Organizer: A Coruña City Council

6. Title: *Porous $FeCo_2O_4$ nanostructures for supercapacitor application*

Authors: Pendashteh, A.; Palma, J.; Anderson, A.; Marcilla, R.

Congress: E-MRS 2015 Spring Meeting

Venue: Lille, France

Date: 11-15 May 2015

Organizer: E-MRS

7. Title: *Understanding capacitive deionization performance by comparing its electrical response with an electrochemical supercapacitor*

Authors: Garcia-Quismondo, E.; Santos, C.; Palma, J.; Anderson, M.A.

Congress: 227th ECS Meeting.

Venue: Chicago, USA

Date: 24-28 May 2015

Organizer: ECS





8. Title: *All-solid state supercapacitors based on poly(ionic liquid) matrix embedded with different ionic liquids*

Authors: Tiruye, G.A.; Palma, J.; Anderson, M.; Marcilla, R.

Congress: 4th International Symposium on Enhanced Electrochemical Capacitors

Venue: Montpellier, France

Date: 8-12 June 2015

Organizer: ISE

9. Title: *Numerical analysis of latent heat storage system with encapsulated phase change material in spherical capsules*

Authors: Bellan, S.; Cordiviola, A.; Barberis, S.; Traverso, A.; González-Aguilar, J.; Romero, M.

Congress: World Renewable Energy Congress XIV

Venue: Bucharest, Romania

Date: 8-12 June 2015

Organizer: University "POLITEHNICA" of Bucharest; Technical University of Civil Engineering Bucharest; The Romanian Academy; World Renewable Energy Congress / Network

10. Title: *Is the growth stage of microalgae ruling their anaerobic digestion?*

Authors: Méndez, L.; Mahdy, A.; Ballesteros, M.; González-Fernández, C.

Congress: 7th European Meeting on Chemical Industry and Environment (EmChie 2015)

Venue: Universitat Rovira i Virgili, Tarragona, Spain

Date: 10-12 June 2015

Organizer: Universitat Rovira i Virgili

11. Title: *Phenols and lignin: Key players in inhibition of enzymatic hydrolysis of cellulose by laccase*

Authors: Oliva-Taravilla, A.; Tomás-Pejó, E.; Demuez, M.; González-Fernández, C.; Ballesteros, M.

Congress: 1st International Workshop on Biorefinery of Lignocellulosic Materials (IWB LCM)

Venue: Córdoba, Spain

Date: 10-12 June 2015

Organizer: University of Córdoba

12. Title: *Evaluation of electrode materials towards extended cycle-life of the all-copper redox flow battery*

Authors: Leung, P.; Garcia-Quismondo, E.; Sanz, L.; Palma, J.; Anderson, M.

Congress: International Flow Battery Forum (IFBF)

Venue: Glasgow, Scotland

Date: 16-17 June 2015

Organizer: Flow Battery Forum

13. Title: *Modified lamellar and pillared ZSM-5 with MgO and ZnO for an improved catalytic fast-pyrolysis of eucalyptus woodchips*

Authors: Feroso, J.; Hernando, H.; Jana, P.; Moreno, I.; Pizarro, P.; Coronado, J.M.; Serrano, D.P.; Přeč, J.; Ochoa-Hernández, C.; Čejka, J.

Congress: 6th Czech-Italian-Spanish Conference on Molecular Sieves and Catalysis (CIS-6)

Venue: Amantea, Italy

Date: 14-17 June 2015

Organizer: Italian Zeolites Association and Interdivisional Catalysis Group

14. Title: *Hydrogen production by methane decomposition over pure silica sba-15 materials*

Authors: Serrano, D.P.; Botas, J.A.; Pizarro, P.; Gómez, G.

Congress: 6th Czech-Italian-Spanish Conference on Molecular Sieves and Catalysis (CIS-6)

Venue: Amantea, Italy

Date: 14-17 June 2015

Organizer: Italian Zeolites Association and Interdivisional Catalysis Group

15. Title: *Modelling of wind energy resources and wind farm power outputs using nested Markov chain approach*

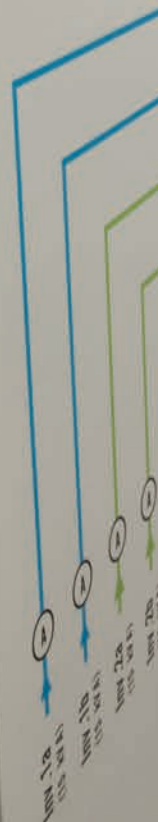
Authors: Djokic, S.Z.; Hayes, B.P.; Langella, R.; Testa, A.

Congress: IEEE International Conference on Clean Electrical Power

Venue: Taormina, Italy

Date: 16-18 June 2015

Organizer: IEEE





16. Title: *Insights in the CO₂ photo-activation over titania-based photocatalysts for artificial photosynthesis*

Authors: de la Peña O'Shea, V.A.; Collado, L.; Reñones, P.; Perez-Dieste, V.; Escudero, C.; Fresno, F.; Coronado, J.M.; Serrano, D.P.; Álvarez, C.
Congress: VII AUSE congress and II ALBA user's meeting

Venue: Barcelona, Spain

Date: 16-19 June 2015

Organizer: ALBA

17. Title: *Modelling of wind energy resources and wind farm power outputs using nested markov chain approach*

Authors: Djokic, S.; Hayes, B.P.; Langella, R.; Testa, A.

Congress: IEEE International Conference on Clean Electrical Power

Venue: Taormina, Italy

Date: 16-18 June 2015

Organizer: IEEE

18. Title: *Short-term load forecasting at the local level using smart meter data*

Authors: Hayes, B.P.; Gruber, J.K.; Prodanovic, M.

Congress: 2015 IEEE PowerTech Eindhoven

Venue: Eindhoven, Netherlands

Date: 29 June-2 July 2015

Organizer: IEEE

19. Title: *Estimation and analysis of building energy demand and supply costs*

Authors: Gruber, J.K.; Prodanovic, M.; Alonso, R.

Congress: 7th International Conference on Sustainability in Energy and Buildings (SEB15)

Venue: Lisboa, Portugal

Date: 1-3 July 2015

Organizer: KES International

20. Title: *Estimation and analysis of building energy demand and supply costs*

Authors: Gruber, J.K.; Prodanovic, M.; Alonso, R.

Congress: 7th International Conference on Sustainability in Energy and Buildings (SEB15)

Venue: Lisboa, Portugal

Date: 1-3 July 2015

Organizer: KES International

21. Title: *Exploring the mechanism of CO₂ photoreduction on titania surfaces and related plasmonic phenomena*

Authors: Collado, L.; Coronado, J.M.; Serrano, D.P.; De la Peña-O'Shea, V.A.

Congress: International Conference on Carbon Dioxide Utilization (ICCDU2015)

Venue: Singapore, Malaysia

Date: 5-9 July 2015

Organizer: National University of Singapore; Institute of Chemical and Engineering Sciences

22. Title: *Avances y retos de I&D en energía solar de concentración*

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

Congress: XXXV Biental de la RSEF y 25º Encuentro Ibérico de la Enseñanza de la Física

Venue: Gijón, Spain

Date: 13-17 July 2015

Organizer: RSEF

23. Title: *Hidroxidación catalítica (HDO) de fenol y guayacol sobre fosforos metálicos soportados*

Authors: Berenguer, A.; Moreno, I.; Coronado, J.M.; Pizarro, P.; Serrano, D.P.

Congress: Catálisis, confluencia interdisciplinar: modelos, catalizadores y reactores (SECAT'15)

Venue: Barcelona, Spain

Date: 13-15 July 2015

Organizer: SECAT; University of Barcelona

24. Title: *Pirólisis catalítica de astillas de eucalipto con MgO y ZnO soportados sobre zsm-5 bidimensionales*

Authors: Hernando, H.; Feroso, J.; Jana, P.; Moreno, I.; Pizarro, P.; Coronado, J.M.; Serrano, D.P.; Píech, J.; Ochoa-Hernández, C.; Čejka, J.

Congress: Catálisis, confluencia interdisciplinar: modelos, catalizadores y reactores (SECAT'15)

Venue: Barcelona, Spain

Date: 13-15 July 2015

Organizer: SECAT; University of Barcelona

25. Title: *Nuevos avances en la producción de combustibles solares mediante fotosíntesis artificial*

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

Congress: XXXV Reunión Bienal de la RSEQ

Venue: A Coruña, Spain

Date: 19-23 July 2015

Organizer: RSEQ; University of A Coruña

26. Title: *Impacts of distribution-connected variable generation on short-term load forecasting and operational planning*

Authors: Hayes, B.

Congress: 2015 IEEE Power & Energy Society General Meeting

Venue: Denver, CO, USA

Date: 26-30 July 2015

Organizer: IEEE

27. Title: *Upgrading bio-oils by sequential catalytic processing*

Author: Serrano, D.P.

Congress: International Congress and Expo on Biofuels & Bioenergy

Venue: Valencia, Spain

Date: 25-27 August 2015

Organizer: OMICS International

28. Title: *In-situ upgrading of eucalyptus wood-chips fast-pyrolysis bio-oil using metal oxide/h-ZSM-5 catalysts*

Author: Pizarro, P.

Congress: International Congress and Expo on Biofuels & Bioenergy

Venue: Valencia, Spain

Date: 25-27 August 2015

Organizer: OMICS International

29. Title: *Hydrodeoxygenation of bio-oil model compounds over supported nickel*

Author: Thangaraju-Murugan, S.

Congress: International Congress and Expo on Biofuels & Bioenergy

Venue: Valencia, Spain

Date: 25-27 August 2015

Organizer: OMICS International

30. Title: *A glimpse of SmartHG project test-bed and communication infrastructure*

Authors: Alimguzhin, V.; Mari, F.; Melatti, I.; Tronci, E.; Ebeid, E.; Mikkelsen, S.A.; Jacobsen, R.H.; Gruber, J.K.; Hayes, B.; Huerta, F.; Prodanovic, M.

Congress: 18th Euromicro Conference on Digital Systems Design (DSD/SEAA2015)

Venue: Funchal, Portugal

Date: 26-28 August 2015

Organizer: Universidade do Porto; Universidade da Madeira

31. Title: *User flexibility aware price policy synthesis for smart grids*

Authors: Mancini, T.; Mari, F.; Melatti, I.; Salvo, I.; Tronci, E.; Gruber, J.K.; Hayes, B.; Prodanovic, M.; Elmegaard, L.

Congress: 18th Euromicro Conference on Digital Systems Design (DSD/SEAA2015)

Venue: Funchal, Portugal

Date: 26-28 August 2015

Organizer: Universidade do Porto; Universidade da Madeira

32. Title: *Hydrogen production via methane decomposition using MnOx/YSZ catalysts*

Authors: Carrillo, A.J.; Zazo, L.; Serrano, D.P.; Pizarro, P.; Coronado, J.M.

Congress: HYdrogen POWer Theoretical and Engineering Solutions International Symposium 2015 (Hypothesis XI)

Venue: Toledo, Spain

Date: 06-09 September 2015

Organizer: IMDEA Energy Institute; URJC

33. Title: *Photocatalytic hydrogen production from water/methanol solutions over NaNO.5TaO.5O3 perovskite*

Authors: Jana, P.; de la Peña O'Shea, V.A.; Mata Montero, C.; Pizarro, P.; Coronado, J.M.; Serrano, D.P.

Congress: HYdrogen POWer Theoretical and Engineering Solutions International Symposium 2015 (Hypothesis XI)

Venue: Toledo, Spain

Date: 06-09 September 2015

Organizer: IMDEA Energy Institute; URJC

34. Title: *Exergy analysis of hydrogen production via methane decomposition. Comparison with methane steam reforming*

Authors: Sanz, A.; Cruz, P.; Montero, E.; Dufour, J.

Congress: HYdrogen POWer Theoretical and Engineering Solutions International Symposium 2015 (Hypothesis XI)

Venue: Toledo, Spain

Date: 06-09 September 2015

Organizer: IMDEA Energy Institute; URJC

35. Title: *Life-cycle performance of hydrogen production via indirect biomass gasification with CO₂ capture*

Authors: Susmozas, A.; Iribarren, D.; Zapp, P.; LinBen, J.; Dufour, J.

Congress: HYdrogen POWer Theoretical and Engineering Solutions International Symposium 2015 (Hypothesis XI)

Venue: Toledo, Spain

Date: 06-09 September 2015

Organizer: IMDEA Energy Institute; URJC

36. Title: *Life-cycle performance of novel bio-fuel systems based on microalgae*

Authors: Iribarren, D.; Martín-Gamboa, M.; Gijón-Bastante, R.

Congress: HYdrogen POWer Theoretical and Engineering Solutions International Symposium 2015 (Hypothesis XI)

Venue: Toledo, Spain

Date: 06-09 September 2015

Organizer: IMDEA Energy Institute; URJC

37. Title: *Numerical optimization of hydrogen production in a solar-driven packed-bed tubular reactor*

Authors: Peña Rodríguez, M.; Gonzalez-Aguilar, J.; Romero, M.

Congress: HYdrogen POWer Theoretical and Engineering Solutions International Symposium 2015 (Hypothesis XI)

Venue: Toledo, Spain

Date: 06-09 September 2015

Organizer: IMDEA Energy Institute; URJC

38. Title: *Photocatalytic H₂ production by methanol reforming using Pt metal nanoparticles supported over S-modified ZnO nanostructures*

Authors: Nuñez, J.; Coronado, J.M.; Serrano, D.P.; de la Peña O'Shea, V.A.

Congress: HYdrogen POWer Theoretical and Engineering Solutions International Symposium 2015 (Hypothesis XI)

Venue: Toledo, Spain

Date: 06-09 September 2015

Organizer: IMDEA Energy Institute; URJC

39. Title: Macroscopic fibres of CNTs as electrodes for multifunctional supercapacitors

Authors: Senokos, E.; Marcilla, R.; Vilatela, J.J.; Reguero, V.; Palma, J.

Congress: E-MRS Fall Meeting

Venue: Warsaw, Poland

Date: 15-18 September 2015

Organizer: MRS

40. Title: *Destoxificación con lacasas: papel de los compuestos fenólicos y lignina en la inhibición de la hidrólisis enzimática*

Authors: Oliva-Taravilla, A.; Tomás-Pejó, E.; Demuez, E.; González-Fernández, C.; Ballesteros, M.

Congress: XVII Reunión de la Red Temática Lignocel. "Retos enzimáticos, químicos y de ingeniería para la utilización de recursos agroforestales no alimentarios (lignocelulosa) en una economía más sostenible y menos contaminante".

Venue: CIB, Madrid, Spain

Date: 1-2 October 2015

Organizer: Red Lignocel

41. Title: *Solar heat capture and storage in circulating (CFB) or dense upflow fluidized beds (UBFB)*

Authors: Flamant, G.; Degreuve, J.; Baeyens, J.; Marti, J.; Aldo, S.; Gauthier, D.; Romero, M.; González-Aguilar, J.; Benoit, H.; Zhang, H.

Congress: SolarPACES 2015

Venue: Cape Town, South Africa

Date: 13-16 October 2015

Organizer: SolarPACES



42. Title: *Design of efficient Mn-based redox materials for thermochemical heat storage at high temperatures*

Authors: Carrillo, A.; Serrano, D.P.; Pizarro, P.; Coronado, J.M.

Congress: SolarPACES 2015

Venue: Cape Town, South Africa

Date: 13-16 October 2015

Organizer: SolarPACES

43. Title: *Development and Application of Capacitive Deionization in Wastewater Treatment Plants*

Authors: Garcia-Quismondo, E.; Santos, C.; Palma, J.; Anderson, M.

Congress: 2nd Conference on Capacitive Deionization and Electrosorption (CDI&E 2015)

Venue: Saarbrücken, Germany

Date: 26-29 October 2015

Organizer: INM – Leibniz Institute for New Materials

44. Title: *Are second chances good? Life cycle assessment of hydrogen production from grape pruning*

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

Congress: 6th Word Hydrogen Technologies Convention (WHTC2015)

Venue: Sydney, Australia

Date: 11-14 October 2015

Organizer: IAH2; AAHE

45. Title: *Energy and exergy analysis of hydrogen production through different gasification layouts*

Authors: Sanz, A.; Susmozas, A.; Cruz, P.; Montero, E.; Dufour, J.

Congress: 6th Word Hydrogen Technologies Convention (WHTC2015)

Venue: Sydney, Australia

Date: 11-14 October 2015

Organizer: IAH2; AAHE

46. Title: *Development of a solarized rotary kiln for high-temperature chemical processes*

Authors: Arribas, L.; Miroslavov, V.; Bellan, S.; Romero, M.; González-Aguilar, J.

Congress: Solar World Congress 2015 (SWC2015)

Venue: Daegu, Korea

Date: 8-12 November 2015

Organizer: ISES

47. Title: *CO₂ photoreduction mechanis*

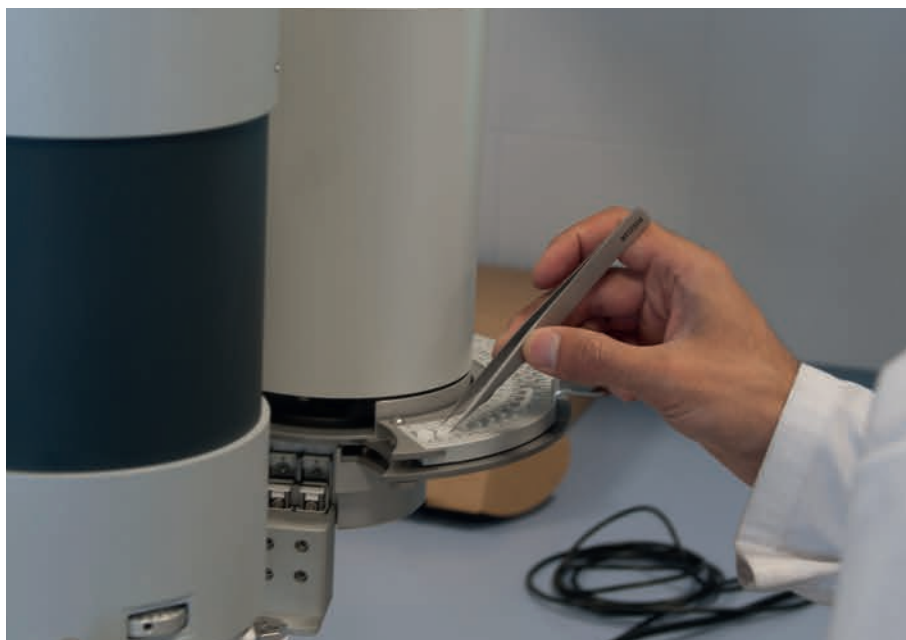
Authors: De la Peña-O'Shea, V.A.

Congress: First workshop on nanostructured materials for light harvesting technologies

Venue: IMDEA Materials Institute, Getafe, Madrid, Spain

Date: 25-26 November 2015

Organizer: IMDEA Energy and IMDEA Materials



Poster communications

1. Title: *Análisis de sistemas energéticos con captura de CO₂*

Authors: Iribarren, D.; Dufour, J.

Congress: Jornada "Aportando valor al CO₂"

Venue: IMDEA Energy Institute, Móstoles, Madrid

Date: 17-18 February 2015

Organizer: IMDEA Energía, PTECO₂ and SusChemSpain

2. Title: *On the mechanism of CO₂ photoreduction on titania based catalysts*

Authors: Collado, L.; Coronado, J.M.; Serrano, D.P.; de la Peña-O'Shea, V.A.

Congress: 1st International Solar Fuels Conference (ISF-1)

Venue: Uppsala, Sweden

Date: 26 April-1 May 2015

Organizer: Swedish Consortium for Artificial Photosynthesis

3. Title: *Effect of plasmonic metal nanoparticles on the activity of TiO₂-based photocatalysts for artificial photosynthesis*

Authors: Collado, L.; Fresno, F.; Reynal, A.; Durrant, J.R.; Coronado, J.M.; Serrano, D.P.; de la Peña-O'Shea, V.A.

Congress: 1st International Solar Fuels Conference (ISF-1)

Venue: Uppsala, Sweden

Date: 26 April-1 May 2015

Organizer: Swedish Consortium for Artificial Photosynthesis

4. Title: *FOTOFUEL: An excellence network facing the new challenges in solar fuels production*

Authors: de la Peña-O'Shea, V.A.; Fierro, J.L.G.; Llobet, A.; García, H.; Vilatela, J.J.; García-Aranda, M.A.; Illas, F.; Giménez, S.; Malato, S.; Vega, L.

Congress: 1st International Solar Fuels Conference (ISF-1)

Venue: Uppsala, Sweden

Date: 26 April-1 May 2015

Organizer: Swedish Consortium for Artificial Photosynthesis

5. Title: *Ecocentric implementation of the economic dimension into LC + DEA studies*

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

Congress: SETAC Europe 25th Annual Meeting

Venue: Barcelona, Spain

Date: 3-7 May 2015

Organizer: SETAC

6. Title: Screening of sustainability indicators for bioenergy systems: Are they suitable for single-score aggregation?

Authors: Martín, M.; Iribarren, D.; Fuss, M.; Garraín, D.; Lechón, Y.; Poganietz, W.R.; Dufour, J.

Congress: SETAC Europe 25th Annual Meeting

Venue: Barcelona, Spain

Date: 3-7 May 2015

Organizer: SETAC

7. Title: *Nanostructured iron cobaltite micro-rods as electrode materials for aqueous supercapacitors*

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

Congress: 4th International Symposium on Enhanced Electrochemical Capacitors

Venue: Montpellier, France

Date: 8-12 June 2015

Organizer: SETAC

8. Title: *High performance of quinoid-ionic liquid redox electrolyte in supercapacitors*

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

Congress: 4th International Symposium on Enhanced Electrochemical Capacitors

Venue: Montpellier, France

Date: 8-12 June 2015

Organizer: SETAC

9. Title: *Life-cycle performance of ethyl levulinate as a biofuel*

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

Congress: 1st International Workshop of Lignocellulosic Materials (IWB LCM)

Venue: Córdoba, Spain

Date: 9-12 June 2015

Organizer: University of Córdoba



10. Title: *Influencia del co-catalizador en la selectividad de la reducción fotocatalítica de CO₂*

Authors: Fresno, F.; Collado, L.; Coronado, J.M.; Serrano, D.P.; de la Peña-O'Shea, V.A.

Congress: Catálisis, confluencia interdisciplinar: modelos, catalizadores y reactores (SECAT'15)

Venue: Barcelona, Spain

Date: 13-15 July 2015

Organizer: SECAT; University of Barcelona

11. Title: *FOTOFUEL: Red de Excelencia para abordar los nuevos desafíos en la producción de combustibles solares*

Authors: de la Peña-O'Shea, V.A.; Fierro, J.L.G.; Llobet, A.; García, H.; Vilatela, J.J.; García-Aranda, M.A.; Illas, F.; Giménez, S.; Malato, S.; Vega, L.

Congress: Catálisis, confluencia interdisciplinar: modelos, catalizadores y reactores (SECAT'15)

Venue: Barcelona, Spain

Date: 13-15 July 2015

Organizer: SECAT; University of Barcelona

12. Title: *Efecto de la estructura y morfología de catalizadores basados en nano-fibras de TiO₂ en la reducción fotocatalítica de CO₂*

Authors: Reñones, P.; Soto, M.; Moya, A.; Vilatela, J.J.; Fresno, F.; de la Peña-O'Shea, V.A.

Congress: Catálisis, confluencia interdisciplinar: modelos, catalizadores y reactores (SECAT'15)

Venue: Barcelona, Spain

Date: 13-15 July 2015

Organizer: SECAT; University of Barcelona

13. Title: *A comparison of MV distribution system state estimation methods using field data*

Authors: Hayes, B.; Prodanovic, M.

Congress: 2015 IEEE Power & Energy Society General Meeting

Venue: Denver, CO, USA

Date: 26-30 July 2015

Organizer: IEEE

14. Title: *Estudio de la mejora de la eficiencia energética mediante un sistema de domótica*

Authors: Picatoste, A.; Gruber, J.K.; Matatagui, P.; Prodanovic, M.

Congress: XXXVI Jornadas de Automática 2015

Venue: Bilbao, Spain

Date: 2-4 September 2015

Organizer: University of the Basque Country

15. Title: *Solar-driven pyrolysis and gasification of low-grade carbonaceous materials*

Authors: Romero, M.; Löhr, C.; González-Aguilar, J.; González-Fernández, C.; Kaltschmitt, M.

Congress: HYdrogen POWer Theoretical and Engineering Solutions International Symposium 2015 (Hypothesis XI)

Venue: Toledo, Spain

Date: 06-09 September 2015

Organizer: IMDEA Energy Institute; URJC

16. Title: *Towards a harmonized life cycle sustainability assessment framework for hydrogen energy*

Authors: Dufour, J.; Iribarren, D.; Zapp, P.; Ishimoto, Y.; Espegren, K.A.; Masoni, P.

Congress: HYdrogen POWer Theoretical and Engineering Solutions International Symposium 2015 (Hypothesis XI)

Venue: Toledo, Spain

Date: 06-09 September 2015

Organizer: IMDEA Energy Institute; URJC



17. Title: *Numerical modelling of a 100-Wh lab-scale thermochemical heat storage system for concentrating solar power plants*

Authors: Álvarez de Miguel, S.; Bellan, S.; García de María, J.M.; González-Aguilar, J.; Romero, M.

Congress: SolarPACES 2015

Venue: Cape Town, South Africa

Date: 13-16 October 2015

Organizer: SolarPACES

18. Title: *Numerical analysis of radiation propagation in innovative volumetric receivers based on selective laser melting techniques*

Authors: Alberti, F.; Santiago, S.; Roccabruna, M.; Luque, S.; Gonzalez-Aguilar, J.; Crema L.; Romero, M.

Congress: SolarPACES 2015

Venue: Cape Town, South Africa

Date: 13-16 October 2015

Organizer: SolarPACES

19. Title: *A new laboratory-scale experimental facility for detailed aerothermal characterizations of volumetric absorbers*

Authors: Gómez-García, F.; Santiago, S.; Luque, S.; Romero, M.; González-Aguilar, J.

Congress: SolarPACES 2015

Venue: Cape Town, South Africa

Date: 13-16 October 2015

Organizer: SolarPACES

20. Title: *Analysis of fluid flow and heat transfer inside a spherical container encapsulated by molten salt*

Authors: Belinchón, A.; Bellan, S.; González-Aguilar, J.; Romero, M.

Congress: Solar World Congress 2015 (SWC2015)

Venue: Daegu, Korea

Date: 8-12 November 2015

Organizer: ISES

21. Title: *Dynamic simulation and experimental research of open air receiver system with ceramic foam absorber*

Authors: Li, Q.; Bai, F.; Gonzalez-Aguilar, J.; Liu, S.

Congress: Solar World Congress 2015 (SWC2015)

Venue: Daegu, Korea

Date: 8-12 November 2015

Organizer: ISES

22. Title: *Effect of plasmonic metal nanoparticles on the activity of TiO₂-based photocatalysts for artificial photosynthesis*

Authors: Collado, L.; Fresno, F.; Reynal, A.; Durrant, J.R.; Coronado, J.M.; Serrano, D.P.; de la Peña O'Shea, V.A.

Congress: First workshop on nanostructured materials for light harvesting technologies

Venue: IMDEA Materials Institute, Getafe, Madrid, Spain

Date: 25-26 November 2015

Organizer: IMDEA Energy and IMDEA Materials

23. Title: *Effect of thermal treatment on sugar cane bagasse fly ash electrodes for capacitive deionization*

Authors: Lado, J.; Zornitta, R.; Calvi, F.; Ruotolo, L.; Tejedor-Tejedor, I.; Anderson, M.A.

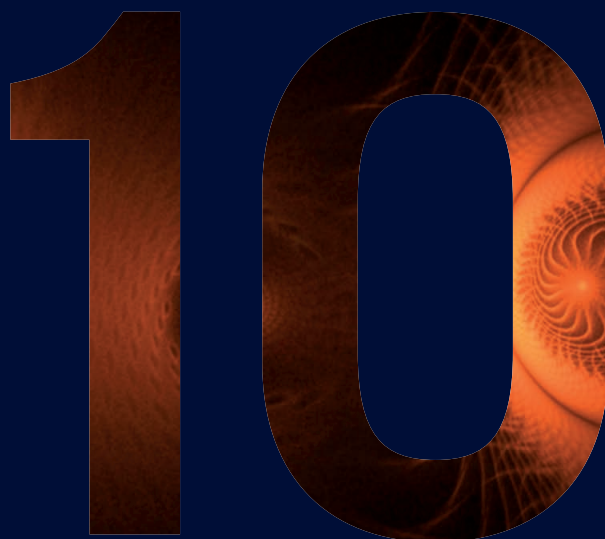
Congress: 2nd Conference on Capacitive Deionization and Electrosorption (CDI&E 2015)

Venue: Saarbrücken, Germany

Date: 26-29 October 2015

Organizer: INM-Leibniz Institute for New Materials

training and dissemination activities

A large, stylized number '10' in a dark brown color. The interior of the '0' is filled with a golden, textured, and fractal-like pattern, resembling a cross-section of a shell or a complex biological structure.

- 10.1. **Organization of lectures and seminars [103]**
- 10.2. **Organization of internal training activities [104]**
- 10.3. **Participation in conferences, courses and seminars [105]**
- 10.4. **Participation in science dissemination activities [111]**
- 10.5. **Training activities [112]**

annual report
2015

10.1. Organization of lectures and seminars

The IMDEA Energy Institute has been involved in the organization of the following conferences and congresses:

1. Workshop: Technological surveillance and prospective

Venue: IMDEA Energy Institute, Móstoles, Madrid

Date: 27 January 2015

Organizer: IMDEA Energy Institute

2. Seminar “Aportando valor al CO₂”

Venue: IMDEA Energy Institute, Móstoles, Madrid

Date: 17-18 Febrero 2015

Organizer: IMDEA Energy Institute, PTECO2 and SusChemEspaña

3. Meeting IMDEA Energy – IMDEA Materials on materials and energy research

Venue: IMDEA Energy Institute, Móstoles, Madrid

Date: 19 February 2015

Organizer: IMDEA Energy Institute

4. Workshop: Instrumento PYME en H2020: Proyectos de innovación en el área de energía

Venue: IMDEA Energy Institute, Móstoles, Madrid

Date: 23 April 2015

Organizer: IMDEA Energy Institute; Innova Consulting

5. I Workshop Smart Grids 2015

Topic: “Integración de energías renovables y almacenamiento energético en las Smart Grids”

Venue: IMDEA Energy Institute, Móstoles, Spain

Date: 7 July 2015

Organizer: Grupo TECMARED and IMDEA Energy Institute

6. Congress: HYdrogen POWer Theoretical and Engineering Solutions International Symposium 2015 (Hypothesis XI)

Member of the Scientific Committee: Serrano, D.P. (Chairman); Dufour, J. (Co-Chairman); Palma, J.; Coronado, J.M.; González, J.; de la Peña, V.A.; Jana, P.; Iribarren, D.; Sanz, A.

Venue: Toledo, Spain

Date: 06-09 September 2015

Organizer: IMDEA Energy Institute; URJC

7. International Workshop: Demand aware services for smartgrids

Venue: IMDEA Energy Institute, Móstoles, Spain

Date: 29 September 2015

Organizer: IMDEA Energy Institute

8. Technical Workshop 2015

Speakers: Palma, J.; Romero, M.; González-Aguilar, J.; Prodanovic, M.;

Venue: IMDEA Energy Institute, Móstoles, Spain

Date: 30 September 2015

Organizer: ETRERA2020; Madrid Network; IMDEA Energy Institute

9. Technical Workshop: Analysis tools and experiences production of advanced solar thermal systems

Venue: IMDEA Energy Institute, Móstoles, Spain

Date: 23 October 2015

Organizer: IMDEA Energy Institute

10. I IMDEA Conference. Science, Company and Society

Venue: IMDEA Materials Institute, Getafe, Madrid, Spain

Date: 6 November 2015

Organizer: IMDEA's Institutes

11. First workshop on nanostructured materials for light harvesting technologies

Venue: IMDEA Materials Institute, Getafe, Madrid, Spain

Date: 25-26 November 2015

Organizer: IMDEA Energy and IMDEA Materials

12. 4th Annual Workshop of Young Researchers of IMDEA Energía
Venue: IMDEA Energy Institute, Móstoles, Madrid
Date: 11 December 2015
Organizer: IMDEA Energy Institute

10.2. Organization of internal training activities

The IMDEA Energy Institute has organized the following lectures and technical seminars and training activities:

1. Oral presentation: ExPE: a new software tool for combining simulation and exergy analysis. An application to energy systems for the coproduction of synthetic biofuels and electricity
Speaker: Pedro Cruz (IMDEA Energy Institute)
Date: 16 January 2015

2. Oral presentation: A new concept of redox ionic liquid electrolytes in supercapacitors
Speaker: Paula Navalpotro (IMDEA Energy Institute)
Date: 20 February 2015

3. Oral presentation: Development of a solarized rotary kiln for high-temperature chemical processes
Speaker: Lucía Arribas (IMDEA Energy Institute)
Date: 10 April 2015

4. Oral presentation: Catalytic fast pyrolysis of lignocellulose biomass: The first step to reach the viable advanced biofuel production
Speaker: Héctor Hernando (IMDEA Energy Institute)
Date: 22 May 2015

5. Lecture: Multi agent system application in SmartGrids
Speaker: Dr. Jignesh Solanki (University of West Virginia, USA)
Date: 22 May 2015

6. Lecture: Present and future of CSP
Speaker: Dr. Cyril Caliot (PROMES-CNRS, France)
Date: 19 June 2015

7. Oral presentation: Doped and coupled photocatalysts for a better use of solar light to drive chemical reactions
Speaker: Dr. Fernando Fresno (IMDEA Energy Institute)
Date: 10 July 2015

8. Lecture: Giving A US Style Scientific Presentation
Speaker: Prof. Marc Anderson (IMDEA Energy Institute)
Date: 4 September 2015

9. Oral presentation: Development of multifunctional supercapacitor based on carbon nanotube fibers
Speaker: Evgeny Senokos (IMDEA Energy Institute)
Date: 25 September 2015

10. Lecture: Energy management: environment and technology
Speaker: Javier Orellana (Industrial Engineer ICAI - LEED GA - CEM®)
Date: 20 November 2015

internal training activities

10.3. Participation in conferences, courses and seminars

The following list includes invited lectures and conferences in courses, masters, technical seminars and workshops given by researchers of the IMDEA Energy Institute:

1. Master in Renewable Energies and Environment (ERMA)

Module: Solar thermal power plants

Speaker: Romero, M. (Coordinator); González-Aguilar, J.

Venue: UPM, Madrid, Spain

Date: January-June 2015 and October-December 2015

Organizer: Polytechnic University of Madrid

2. Master in Renewable Energies and Energy Market

Module: Solar Thermoelectricity

Speakers: Romero, M. (Coordinator); González-Aguilar, J.

Venue: EOI, Madrid, Spain

Date: January-June 2015 and October-December 2015

Organizer: EOI

3. Master in Renewable Energies

Module: Solar thermal power plants

Speaker: Romero, M. (Coordinator)

Venue: León, Spain

Date: January-June 2015 and October-December 2015

Organizer: University of León

4. Master on Renewable Energies, Hydrogen and Fuel Cells

Module: Solar energy

Speakers: Romero, M.; González-Aguilar, J.

Venue: Madrid, Spain

Date: January-June 2015 and October-December 2015

Organizer: UIMP-CSIC

5. XV Workshop of materials: "Materials for Energy and Environmental Sustainability"

Conference: Materials for flow batteries

Speaker: Palma, J.

Venue: Leganés, Madrid, Spain

Date: 6 February 2015

Organizer: Carlos III University; Álvaro Alonso Barba Institute

6. Seminar on Environmental Management: electricity storage

Conference: Electrochemical storage: flow batteries

Speaker: García-Quismondo, E.

Venue: Madrid, Spain

Date: 17 February 2015

Organizer: Gas Fenosa Foundation

7. Invited conference at Madrid Network

Conference: RHueCa project: "Register your carbon footprint"

Speakers: Iribarren, D; Martín, M.

Venue: Madrid Network, Madrid, Spain

Date: 17 February 2015

Organizer: Madrid Network



**8. Lecture series 2015. New aspects in Inorganic Chemistry**

Conference: Materials and processes for the chemical storage of solar energy

Speaker: Coronado, J.

Venue: Madrid, Spain

Date: 25 February 2015

Organizer: Complutense University of Madrid

9. VIII lecture series “Los jueves de la Ciencia”

Conference: From light bulbs to smart grids: The past, present and future of the electricity system

Speaker: Hayes, B.

Venue: UNED Guadalajara, Spain

Date: 26 February 2015

Organizer: UNED Guadalajara

10. SFERA-II Winter School 2015 on Thermal Storage

Conference: Latent heat thermal storage-from materials to components and thermal storage system integration

Speaker: González-Aguilar, J.

Venue: ETH Zurich, Switzerland

Date: 5-6 March 2015

Organizer: ETH Zurich

11. Workshop “Efficiency: Transportation, Water & Energy”

Panel Discussion on Challenges & Innovation in Sustainability

Speaker: Prodanovic, M.

Venue: Madrid, Spain

Date: 9-10 March 2015

Organizer: Madrid Network-University of California Davis

12. Meeting Red Innpulso

Venue: Móstoles, Madrid, Spain

Date: 25 March 2015

Organizer: Red Innpulso

13. I Conference on Clean Energy Technologies. Towards a sustainable energy future

Conference: Design and scale of electrochemical reactors for energy and environmental applications

Speaker: Palma, J.

Venue: Móstoles, Madrid, Spain

Date: 25 March 2015

Organizer: Rey Juan Carlos University

14. I Conference on Clean Energy Technologies. Towards a sustainable energy future

Conference: Energy management in Mostoles Campus Energy Management Commission

Speaker: Dufour, J.

Venue: Móstoles, Madrid, Spain

Date: 25 March 2015

Organizer: Rey Juan Carlos University

15. I Conference on Clean Energy Technologies. Towards a sustainable energy future

Conference: Energy supply in buildings: optimal sizing and management

Speaker: Gruber, J.K.

Venue: Móstoles, Madrid, Spain

Date: 25 March 2015

Organizer: Rey Juan Carlos University

16. I Conference on Clean Energy Technologies. Towards a sustainable energy future

Conference: Production of bioethanol from agricultural waste. Small microorganisms for large solutions

Speaker: Tomás-Pejo, E.

Venue: Móstoles, Madrid, Spain

Date: 25 March 2015

Organizer: Rey Juan Carlos University

17. I Conference on Clean Energy Technologies. Towards a sustainable energy future

Conference: R & D in Energy and Environment

Speaker: Serrano, D.P.

Venue: Móstoles, Madrid, Spain

Date: 25 March 2015

Organizer: Rey Juan Carlos University

18. Technical seminar: RHueCa project: "Register your carbon footprint"

Conference: Presentation of RHueCa project

Speakers: Iribarren, D.; Martín, M.

Venue: Valladolid, Spain

Date: 25 March 2015

Organizer: Madrid Network

19. Technical seminar: RHueCa project: "Register your carbon footprint"

Conference: Presentation of RHueCa project

Speakers: Iribarren, D.; Martín, M.

Venue: Móstoles, Madrid, Spain

Date: 26 March 2015

Organizer: Madrid Network

20. Congress: Metal Air Batteries International Congress (MaBIC '15)

Member of the Scientific Committee: Anderson, M.

Venue: La Coruña, Spain

Date 14-16 April 2015

Organizer: A Coruña City Council

21. Invited conference at Escuela Superior de Ingeniería de Caminos Canales y Puertos (UPM)

Conference: Solar fuels production via artificial photosynthesis: Searching the holy grail

Speaker: De la Peña-O'Shea, V.A.

Venue: Madrid, Spain

Date: 15 April 2015

Organizer: Escuela Superior de Ingeniería de Caminos Canales y Puertos (UPM)

22. Invited conference at SustainIT conference

Conference: New Services for Energy Demand Management

Speaker: Prodanovic, M.

Venue: Carlos III University, Madrid, Spain

Date: 15 April 2015

Organizer: IEEE Computer Society

23. ISES webinar: Solar driven thermochemical production of sustainable fuels

Speaker: Romero, M. (Moderator)

Date: 17 April 2015

Organizer: ISES

24. Workshop about the CleanTechStart program

Conference: Trends and opportunities of clean energy technologies

Speaker: Dufour, J.

Venue: Madrid, Spain

Date: 17 April 2015

Organizer: KIC innoenergy & Fundación Madri+d

25. Workshop "with CIENCIA.te// Biofuels and Sustainability"

Conference: Industrial challenges in the production of bioethanol

Speaker: Tomás, E.

Venue: Trujillo, Cáceres, Spain

Date: 17 April 2015

Organizer: I.E.S Francisco de Orellana

26. Invited conference at NIDays 2015 - Foro Tecnológico sobre el Diseño Gráfico de Sistemas

Conference: Smart Energy Integration Lab

Speaker: Huerta, F.

Venue: IFEMA, Madrid, Spain

Date: 21 April 2015

Organizer: National Instruments

27. Course: New trends and challenges of the chemical processes in the XXI century (Second Edition)

Conference: Photocatalysis: achievements and future prospects

Speaker: Coronado, J.M.

Venue: UNED, Madrid, Spain

Date: 22-24 April 2015

Organizer: UNED





28. Invited conference at Max Planck Institute
Conference: Application of ionic liquids and their polymer electrolytes in electrochemical energy storage

Speaker: Marcilla, R.

Venue: Postdam- Berlín, Germany

Date: 28 April 2015

Organizer: Max Planck Institute

29. Course: Spamex university training program in the energy sector

Conference: Carbon. Harnessing Technologies

Speaker: Pizarro, P.

Venue: Vicálvaro, Madrid, Spain

Date: 4 May 2015

Organizer: Spamex university training program

30. Course: Spamex university training program in the energy sector

Conference: Electrochemical storage

Speaker: Marcilla, R.

Venue: Vicálvaro, Madrid, Spain

Date: 7 May 2015

Organizer: Spamex university training program

31. 16th Edition of the European PhD School

Conference: Active energy management strategies for smart buildings

Speaker: Prodanovic, M.

Venue: Gaeta, Italy

Date: 28 May 2015

Organizer: University of Cassino and South Lazio;
Institut National Polytechnique de Toulouse;
Laboratoire Plasma et Conversion d'Energie

32. Seminar: Biorefinery and possibilities

Conference: Bioproducts from microalgae grown in wastewater

Speaker: González, C.

Venue: Madrid, Spain

Date: 8 June 2015

Organizer: INIA

33. Course: Battery University

Conference: New battery technologies

Speaker: Palma, J.

Venue: Madrid, Spain

Date: 11-12 June 2015

Organizer: Albufera Energy Storage

34. Congress: 6th Czech-Italyn-Spanish Conference on Molecular Sieves and Catalysis (CIS-6)

Member of the Scientific Committee: Serrano, D.P.

Venue: Amantea, Italy

Date: 14-17 June 2015

Organizer: Italyn Zeolites Association and Inter-divisional Catalysis Group

35. Invited conference at Festhalle Messe

Conference: Wastewater bioremediation using microalgae biomass for the production of bio-fuels and biochemical

Speaker: González, C.

Venue: Frankfurt am Main, Germany

Date: 17 June 2015

Organizer: AICHEMA



36. Workshop on decontamination and cleaning in our cities

Conference: Solar fuels: energy applications of photocatalysis

Speaker: Fresno, F.

Venue: Bilbao, Spain

Date: 18 June 2015

Organizer: Asociación Ibérica de la Fotocatálisis (AIF)

37. Workshop inter-platform. Technology production of clean fuels: power from gas to solar fuels

Panel discussion 2: Synergies CO₂-H₂: New Challenges

Speaker: De la Peña-O'Shea, V.A.

Venue: CIEMAT, Madrid, Spain

Date: 19 June 2015

Organizer: PTECO2 and PTE-HPC

38. Workshop: Hydrogen as a strategy of specialization in new energy technologies

Panel discussion: Public institutions as an engine of change in new energy technologies

Speaker: Serrano, D.P.

Venue: Puertollano, Ciudad Real, Spain

Date: 23 June 2015

Organizer: CYTEMA; CNH2

39. Workshop on targeting the European advanced biofuel industry needs through EERA-Bioenergy collaborative research in Europe

Speaker: Tomás-Pejó, E.

Venue: Brussels, Belgium

Date: 26 June 2015

Organizer: EERA Bioenergy

40. Course: Catalysis for energy production and environmental protection

Conference: Catalytic routes for the production of hydrogen as a clean energy vector

Speaker: Serrano, D.P.

Venue: San Sebastián, Spain

Date: 6-8 July 2015

Organizer: University of the Basque Country

41. Summer School: Smart energy for a sustainable future

Member of the Organizer Committee: Dufour J.

Venue: Vicálvaro, Madrid, Spain

Date: 6-10 July 2015

Organizer: Rey Juan Carlos University

42. Summer School: Smart energy for a sustainable future

Conference: Role of renewable energies in sustainability

Speaker: González-Aguilar, J.

Venue: Vicálvaro, Madrid, Spain

Date: 7 July 2015

Organizer: Rey Juan Carlos University

43. Summer School: Smart energy for a sustainable future

Panel discussion on Smart cities: the sustainability of cities and intelligent energy

Speaker: Prodanovic, M.

Venue: Vicálvaro, Madrid, Spain

Date: 9 July 2015

Organizer: Rey Juan Carlos University

44. Summer School: Environmental management

Conference: Life-cycle assessment

Speaker: Dufour, J.

Venue: Vicálvaro, Madrid, Spain

Date: 9 July 2015

Organizer: Rey Juan Carlos University

45. Congress: 2015 IEEE Power & Energy Society General Meeting

Panel discussion: Impacts of distribution-connected variable generation on short-term load forecasting and operational planning

Speaker: Hayes, B.

Venue: Denver, CO, USA

Date: 26-30 July 2015

Organizer: IEEE

**46. Congress: International Congress and Expo on Biofuels & Bioenergy**

Member of the Organizer Committee: Serrano, D.P.

Venue: Valencia, Spain

Date: 25-27 August 2015

Organizer: OMICS International

47. TCS Collaborative Workshop-DLR

Conference: Reactor for thermochemical storage with manganese oxide system

Speaker: Álvarez, S.

Venue: Cologne, Germany

Date: 9 September 2015

Organizer: ConsorcioTCS Power

48. Congress SolarPACES 2015

Members of Scientific Committee: Romero, M. and González-Aguilar, J.

Venue: Cape Town, South Africa

Date: 13-16 October 2015

Organizer: SolarPACES

49. Technical Workshop: Analysis tools and experiences production of advanced solar thermal systems

Conference: Life-cycle assessment of solar thermal power plants with Ebsilon

Speaker: Sanz, A.

Venue: IMDEA Energy Institute, Móstoles, Spain

Date: 23 October 2015

Organizer: IMDEA Energy Institute

50. I IMDEA Conference. Science, Company and Society

Conference: From Straw to Oil: Enabling Sustainable Biofuels by Catalysts Design

Speaker: Coronado, J.M.

Venue: IMDEA Materials Institute, Getafe, Madrid, Spain

Date: 6 November 2015

Organizer: IMDEA's Institutes

51. ISES Solar World Congress 2015

Member of the Scientific Committee: Romero, M.

Theme chair: "Renewable Electricity Technologies: CSP, Biomass, Geothermal, Wind, Hydro, Ocean & Other": Gonzalez-Aguilar, J.

Venue: Daegu, South Korea

Date: 8-12 November 2015

Organizer: ISES

52. I National Forum Energy Management (FOROGEN)

Conference: Implementation and benefits of a SGEN in the Rey Juan Carlos University

Speaker: Dufour, J.

Venue: Madrid, Spain

Date: 17 November 2015

Organizer: Asociación de Empresas de Eficiencia Energética

53. Course: Energy storage systems

Conference: Alkaline batteries

Speaker: García-Quismondo, E.

Venue: Madrid, Spain

Date: 17 November 2015

Organizer: CIEMAT-CEMEX

54. Invited conference at CIB-CSIC

Conference: Obtaining biogas from algae biomass for energy uses

Speaker: Molinuevo, B.

Venue: Madrid, Spain

Date: 26 November 2015

Organizer: CIB-CSIC



55. Smart City Expo World congress, Brokerage Event

Speaker: Marín, F. (18 meetings)

Venue: Barcelona, Spain

Date: 18 November 2015

Organizer: Fira Barcelona

56. European financing mechanisms for R&D within the energy and environment sector

Speaker: Marín, F. (10 meetings in brokerage event)

Venue: CDTI, Madrid, Spain

Date: 19 November 2015

Organizer: CDTI

57. UPM Innovatech Workshop

Speaker: Marín, F. (2 meetings in brokerage event)

Venue: Campus de Montegancedo UPM, Madrid, Spain

Date: 2 December 2015

Organizer: UPM

58. Business meeting Leganés Technology

Speaker: Marín, F. (7 meetings in brokerage event)

Venue: Leganés Technology, Madrid, Spain

Date: 3 December 2015

Organizer: Legatech, UC3M

59. Invited conference at Workshop CO₂ capture & utilization

Conference: Materials and processes for the thermochemical production of solar fuels

Speaker: Coronado, J.M.

Venue: Barcelona, Spain

Date: 17 December 2015

Organizer: IREC y XARMAE

10.4. Participation in science dissemination activities

1. GENERA 2015

a) Gallery innovation. Poster presentation: "Tecnología PHIL aplicada a la incorporación de renovables en las redes eléctricas". Prodanovic, M.; Huerta, F.

Date: 24-27 February 2015

b) Participation in "Brokerage event"

Date: 24-25 February 2015

c) Science and technology forums

Conference: New services for management of electricity distribution networks. SmartHG project. Speaker: Prodanovic, M.

Conference: Thermochemical energy storage in solar thermal power plants. TCS Power project. Speaker: Álvarez, S.

Conference: Development and benefits of a system of energy management at the Public University. Speaker: Dufour, J.

Date: 26 February 2015

Venue: IFEMA, Madrid, Spain

Organizer: Madri+d Foundation

2. Researchers' night 2015

Activity: Journey around the world of energy

Venue: Móstoles, Madrid, Spain

Date: 25 September 2015

Organizer: IMDEA Energy Institute

3. Science Week of Comunidad de Madrid (2015)

Activity: Towards zero emissions

Venue: Móstoles, Madrid, Spain

Date: 5, 10, 12 November 2015

Organizer: IMDEA Energy Institute



10.5. Training activities

1. 1. Andrés, Sara

B. Sc. in Chemical Engineering, Politecnica University of Madrid. Escuela Técnica Superior de Ingenieros Industriales

Internship work: Industrial research project for the development of a new type of rechargeable metal-air battery

Supervisor: Dr. Jesús Palma, ECPU

Period: February-April 2015

2. Castel, Álvaro

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

Internship work: Electrochemical assessment of fibers graphene and carbon nanotubes

Supervisor: Dr. Rebeca Marcilla, ECPU

Period: July-September 2015

3. Cayuela, Javier

B. Sc. in Energy Engineering, Politecnica University of Madrid. Escuela Técnica Superior de Ingenieros de Minas y Energía

Internship work: Developing models of energy systems based on the use of concentrated solar energy and geothermal energy

Supervisor: Dr. José González, HTPU

Period: January-May 2015

4. Cereceda, Guillermo

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

Internship work: Electrochemical evaluation of carbonaceous materials nanostructured fibers

Supervisor: Dr. Rebeca Marcilla, ECPU

Period: September-December 2015

5. De Diego, Carmen

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

Internship work: Simulation of hydrogen production processes

Supervisor: Dr. Javier Dufour, SAU

Period: January-July 2015

6. De Diego, Carmen

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

Project title: Estudio de una planta termosolar de colectores cilindro parabólicos, y el análisis de ciclo de vida de la misma

Supervisor: Dr. Javier Dufour, SAU

Date of defense: July 2015

7. Doblas, Alejandro

B. Sc. Energy Engineering, Rey Juan Carlos University

Project title: Diseño de una batería de Aluminio-aire

Supervisor: Dr. Rebeca Marcilla (ECPU) and Dr. Silvia González

Date of defense: July 2015

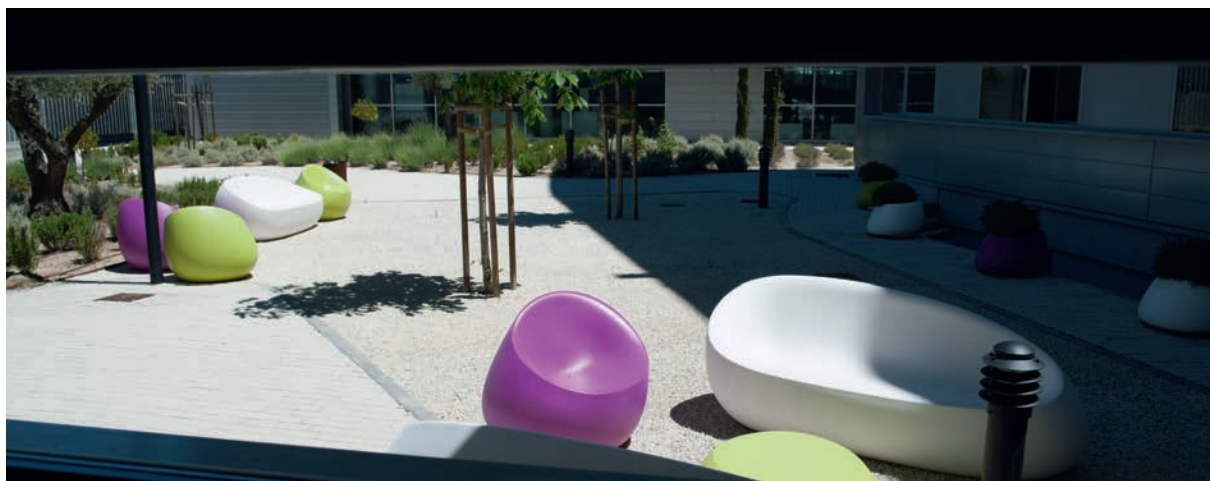
8. Escribano, Manuel

B. Sc. in Mining Engineering, Politécnica University of Madrid. Escuela Técnica Superior de Ingenieros de Minas

Internship work: Energy management and analysis using TRNSYS of an air conditioning system based on geothermal energy

Supervisor: Dr. José González, HTPU

Period: February-July 2015



9. Esperanza, Paula

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

Internship work: Analytical characterization of catalytic pyrolysis products within the biofuel production line

Supervisor: Dr. Javier Feroso, TCPU

Period: December 2015

10. Favero, Mateo

M. Sc. Ingeniería dei sistemi edilizi

Project title: Feasibility study for installation of on-site energy resources in public buildings

Supervisor: Dr. Milan Prodanovic, ELSU

Date of defense: October 2015

11. Geraldín Mariana

B. Sc. in Chemical Engineering, Simón Bolívar Venezuela University

Internship work: Process simulation solar concentration for the production of chemicals products (hydrogen and oxygen)

Supervisor: Dr. José González, HTPU

Period: February-June 2015

12. Gijón, Raquel

M. Sc. in Chemical Engineering. Rey Juan Carlos University–Autonoma University of Madrid.

Project title: Análisis tecnoambiental de vías alternativas para la producción de biocombustibles a partir de microalgas

Supervisor: Dr. Diego Iribarren and Dr. Abel Sanz, SAU

Date of defense: July 2015

13. Gómez, Gabriel

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

Internship work: Support tasks in the biofuel pilot plant: preparation and realization of reactions, product analysis by gas chromatography, elemental analysis, etc.

Supervisor: Javier Marcos, TCPU

Period: November-December 2015

14. González, David

B. Sc. Energy Engineering, Rey Juan Carlos University

Project title: Estudio de viabilidad de la producción de syngas por coelectrolisis de vapor-CO₂

Supervisor: Dr. Javier Dufour, SAU

Date of defense: July 2015

15. Gutiérrez, Santiago

B. Sc. en Ciencias Ambientales, Rey Juan Carlos University

Internship work: Support tasks in the biofuel pilot plant

Supervisor: Dr. Patricia Pizarro, TCPU

Period: February-July 2015

16. Herrador, Eduardo

M. Sc. in Chemical Engineering. Rey Juan Carlos University

Project title: Producción de etanol a partir de paja pre-tratada con explosión por vapor. Uso de levaduras termotolerantes y fermentadoras

Supervisor: Dr. Elia Tomás, BTPU

Date of defense: July 2015

17. Humanes, Álvaro

B. Sc. in Environmental Sciences. Escuela Superior de Ciencias Experimentales y Tecnología, Rey Juan Carlos University

Project title: Demanda energética solar: Implementación metodológica y aplicación a biocombustibles derivados de pirólisis

Supervisor: Dr. Javier Dufour and Dr. Diego Iribarren, SAU

Date of defense: May 2015

18. Jiménez, Carlos

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

Internship work: Simulator development of energy consumption in smart buildings

Supervisor: Dr. Milan Prodanovic, ELSU

Period: January-March 2015

**19. Jiménez, Carlos**

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

Project title: Procedimiento para realizar rehabilitación energética de edificios

Supervisor: Dr. Milan Prodanovic, ELSU

Date of defense: June 2015

20. Jiménez, Sergio

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

Internship work: Support tasks in the biofuel pilot plant

Supervisor: Dr. Patricia Pizarro, TCPU

Period: January-April 2015

21. Jiménez, Sergio

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

Project title: Pirólisis catalítica de biomasa lignocelulósica para la producción de bio-aceite

Supervisor: Dr. Patricia Pizarro, TCPU

Date of defense: December 2015

22. Linacero, Rubén

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

Internship work: Simulation of energy production processes

Supervisor: Dr. Javier Dufour, SAU

Period: January-June 2015

23. Manzano, Francisco Javier

B. Sc. in Environmental Sciences, Rey Juan Carlos University

Internship work: Apoyo en las tareas de análisis de ciclo de vida de sistemas energéticos

Supervisor: Dr. Diego Iribarren, SAU

Period: March-June 2015

24. Martín, Laura

B. Sc. in Chemical Engineering, Rey Juan Carlos University-Autonomous University of Madrid

Internship work: Engineering work processes used to analyze thermo-electrochemical solar systems

Supervisor: Dr. José González, HTPU

Period: October-December 2015

25. Martín Muñoz Salcedo, José

M. Sc. in Renewable Energy in Power Systems, Carlos III University

Project title: Dimensionamiento del sistema de suministro energético para edificios.

Supervisor: Dr. Jörn Gruber, ELSU

Date of defense: September 2015

26. Martín, Tania

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

Internship work: Study of new chemical redox flow battery by analysis of physical properties such as solubility, density and viscosity

Supervisor: Dr. Jesús Palma, ECPU

Period: September-November 2015

27. Matarranz, Roberto

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

Internship work: Support tasks using fluidized bed reactors in high temperature applications using concentrated solar power

Supervisor: Dr. José González, HTPU

Period: February-July 2015

28. Megía, Pedro Julio

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

Internship work: Preparation of electrodes for capacitive deionization system (CDI) and testing of an electrochemical reactor CDI assembled with electrodes prepared

Supervisor: Dr. Jesús Palma, ECPU

Period: July August-November 2015

29. Mora, María del Carmen

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

Project title: Electroquímica de materiales tipo redox en líquidos iónicos

Supervisores: Dr. Rebeca Marcilla and Dr. Jesús Palma, ECPU

Date of defense: July 2015

30. Moreno, Diego

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

Project title: Desarrollo de supercondensadores híbridos de altas prestaciones basados en líquidos iónicos.

Supervisor: Dr. Rebeca Marcilla and Paula Navalpotro, ECPU

Date of defense: September 2015

31. Muñoz, Marcos

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

Internship work: Analysis and characterization of materials for the solar thermochemical storage

Supervisor: Sandra Alvarez, HTPU

Period: February-June 2015

32. Ortega, Carlos

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

Project title: Obtención de hidrógeno a partir de biogás

Supervisor: Dr. Javier Dufour, SAU

Date of defense: July 2015

33. Otero, Javier

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

Project title: Nuevos componentes para baterías de flujo redox de bajo coste

Supervisores: Dr. Jesús Palma and Dr. Enrique García-Quismondo, ECPU

Date of defense: January 2015

34. Páez, María Teresa

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

Project title: Diseño de una batería de flujo basada en quinonas

Supervisor: Dr. Jesús Palma and Dr. Adolfo Narros, ECPU

Date of defense: June 2015

35. Pérez, Víctor Manuel

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

Project title: Análisis termodinámico y cinético de óxidos redox comerciales para el almacenamiento termoquímico de energía.

Supervisor: Dr. Juan Manuel Coronado, TCPU

Date of defense: June 2015

36. Pineda, Andrea Catalina

M. Sc. in Renewable Energy in Power Systems, Carlos III University

Project title: Agregación de los edificios inteligentes para crear nuevos servicios de red

Supervisor: Dr. Barry Hayes, ELSU

Date of defense: September 2015



37. Prieto, Marina

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

Project title: Eficiencia energética en explotaciones agropecuarias

Supervisor: Dr. Javier Dufour, SAU

Date of defense: July 2015

38. Prieto, Marina

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

Project title: Huella de carbono en explotaciones agropecuarias

Supervisor: Dr. Javier Dufour, SAU

Date of defense: July 2015

39. Ramos, Carolina

B. Sc. in Environmental Sciences, Rey Juan Carlos University

Project title: Análisis del ciclo de vida de un módulo de pila de combustible para sustitución de baterías de plomo ácido en vehículos

Supervisores: Dr. Javier Dufour and Dr. Diego Iribarren, SAU

Date of defense: July 2015

40. Ramos, Carolina

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

Project title: Modificación de un vehículo eléctrico convencional en un vehículo de hidrógeno y pila de combustible

Supervisor: Dr. Javier Dufour, SAU

Date of defense: July 2015

41. Ramos, Carolina

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

Project title: Análisis del ciclo de vida de un módulo de pila de combustible para sustitución de baterías de plomo ácido en vehículos

Supervisor: Dr. Javier Dufour, SAU

Date of defense: July 2015

42. Reoyo, Víctor

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

Internship work: Cultivation of cyanobacterium (*Spirulina platensis*) in wastewater using different culture conditions

Supervisor: Dr. Cristina González, BTPU

Period: April-June 2015

43. Rodríguez, Eduardo

M. Sc. in Chemical Engineering Rey Juan Carlos University/Autónoma University of Madrid

Project title: Desarrollo de un modelo CFD para un sistema de almacenamiento energético orientado a centrales solares termoeléctricas

Supervisor: Dr. José González, HTPU

Date of defense: December 2015

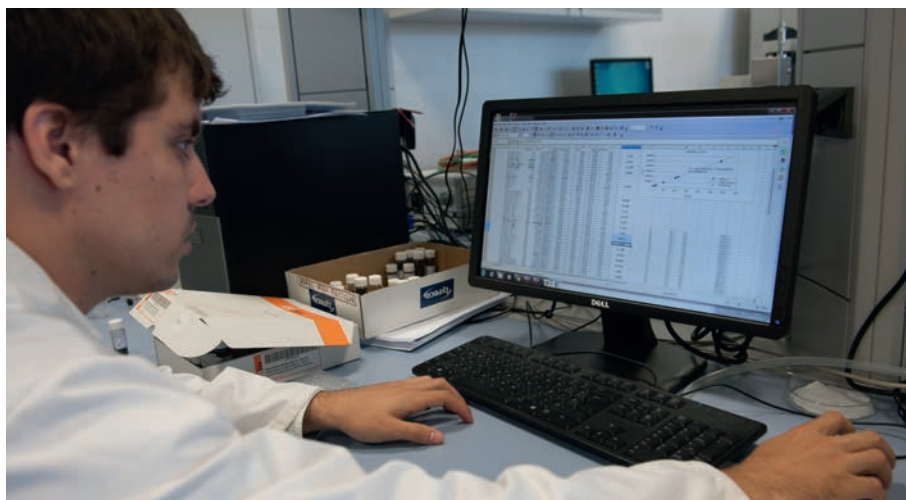
44. Sánchez, Carmen

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

Project title: Obtención de bioaceites mediante licuefacción con microondas de biomasa lignocelulósica

Supervisor: Dr. Patricia Pizarro, TCPU

Date of defense: January 2015



45. Santiago, Rubén

B. Sc. in Chemical Engineering, Autonomía University of Madrid

Internship work: Production of solar fuels through water splitting and catalytic photoreduction of CO₂

Supervisor: Dr. Víctor de la Peña, TCPU

Period: September-December 2015

46. Sebastián, Andrés

B. Sc. en Ingeniería en Tecnologías Industriales, Politécnica University of Madrid. Escuela Técnica Superior de Ingenieros Industriales

Internship work: Analysis of integration of technologies and production schemes advanced solar thermal power plants using MATLAB software

Supervisor: Dr. Manuel Romero, HTPU

Period: May-December 2015

47. Sierra, Noemí

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

Internship work: Electrochemical characterization of different type organic redox electrolyte pairs of different nature

Supervisor: Dr. Rebeca Marcilla, ECPU

Period: October-December 2015

48. Soto, María

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

Internship work: Design and development of a photoreactor for the production of solar fuels

Supervisor: Dr. Víctor de la Peña, TCPU

Period: February-May 2015

49. Subirá, Gaizka

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

Project title: Caracterización físico-química de sólidos

Supervisor: Dr. Patricia Pizarro, TCPU

Date of defense: July 2015

50. Swan, David

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

Internship work: Study of new carbonaceous materials as electrodes in capacitive deionization devices

Supervisor: Dr. Jesús Palma, ECPU

Period: July-August 2015

51. Valente, Antonio

M. Sc. in Environmental Engineering, Università degli Studi di Cassino e del Lazio Meridionale. Cassino.

Project title: Analisi del ciclo di vita dell'idrogeno come soluzione per la gestione di energia prodotta in surplus negli impianti idroelettrici

Supervisor: Dr. Giuseppe Spazzafumo, Dr. Javier Dufour (SAU) and Dr. Diego Iribarren (SAU)

Date of defense: March 2015

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