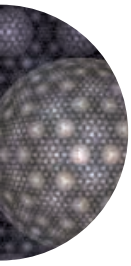
nanoscience and nanotechnology: small is different



institute
iMdea
nanoscience

2017

annual report

EXCELENCIA
SEVERO
OCHOA
2017-2021

AGENCIA ESTATAL DE INVESTIGACIÓN

foreword

2017
annual report

The consolidation of IMDEA Nano as an international reference in the field of nanotechnology has had significant advances in 2017.

We have installed several new facilities: a liquefier plant to produce liquid Helium from the recovered gas, a new STEM microscope, a roll to roll nanoimprint pilot plant for the production of nanostructured functional surfaces and a new Joule-Thompson STM which can go down to a temperature of 800 mK with 3 Teslas applied magnetic field.

The scientific production of the Institute has reached 200 papers/ year with an accumulated number of citations of the order of 18000 and a healthy parabolic increase with time. The institutional h index at the end of 2017 was 74.

In terms of financial support we have reached the point of getting 2/3 of our budget from external, competitive sources, with only 1/3 coming directly from the administration. This figure, unprecedented for Spanish institutions, demonstrate that we are very competitive, but at the same time, places us in a somewhat fragile situation, since we are too dependent on continuing this extraordinary success rate in external projects. That is why we should prepare ourselves to try and secure stable funding in the next future through programs such as the Severo Ochoa call for Centers of Excellence.

We have also reorganized our governance structure by appointing three Deputy Directors for Scientific Strategy (Dr. Julio Camarero), Outreach (Dr. Emilio Pérez) and Infrastructure (Dr. Daniel Granados). Together with the Executive Manager, Vicedirector and Director they form the Executive Commission.

In summary, I am confident that we are on the right track to establish IMDEA Nano as a wellrecognized Center of Excellence, thanks to the talent and commitment of all people involved in its activities. It is a privilege for me to be part of this adventure.

Rodolfo Miranda
Director, IMDEA Nanociencia Institute
June 2018

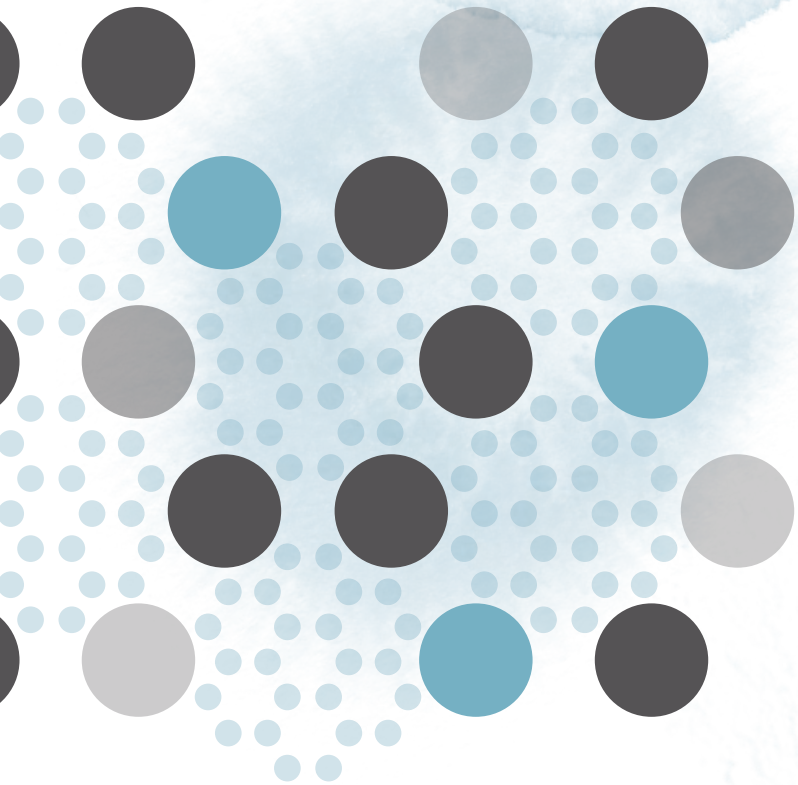


table of contents

2017
annual report

1

overview

2017
annual report

1. Legal Status

IMDEA-Nanociencia is a private non profit Foundation created by initiative of the Madrid Regional Government in November 2006, in order to shorten the distance between the research and society in the Madrid region and provide new capacity for research, technological development and innovation in the field of Nanoscience, Nanotechnology and Molecular Design. In 2007 the former Ministry of Education and Science of the Government of Spain decided to also fund part of the creation and equipment of an institute of Nanoscience in the Madrid autonomous region.

The Foundation is governed by a Board of Trustees, which has representatives of the national and regional administration, the Academic Institutions (Complutense, Autónoma and Politécnica Universities, Consejo Superior de Investigaciones Cientificas), industries, members of the Scientific Advisory Council, and experts in societal implications of nanoscience and technology transfer.

The Foundation governs the IMDEA-Nanociencia Institute, a new interdisciplinary research centre dedicated to the exploration of basic nanoscience and the development of applications of nanotechnology in connection with innovative industries. The IMDEANanociencia Institute is part of one of the strategic lines of the Campus of International Excellence (CEI) UAM+CSIC.

2. Strategic Goals

In the Madrid region there is a large community of physicists, chemists and biologists working actively on diverse aspects of Nanoscience. Many of these groups have a recognized international prestige in their respective fields.

In spite of this, a new step forward is needed for the future international competitiveness of R+D in Nanoscience and Nanotechnology. A suitable organizational and working environment needs to be created with the aim to promote the continuous interdisciplinary interaction between specialists in physics, chemistry, molecular biology, computer sciences, etc., that the very nature of this new discipline demands.

Most importantly, it is essential to be able to recruit and retain new talent and to repatriate young scientists working abroad, to train a new generation of technicians and scientists in a genuine interdisciplinary field, and to create and maintain new experimental equipment and advanced infrastructures.

All this must be done by coordinating efforts with the groups and institutions that already exist, thanks to a flexible structure based on research programs, which will have to undergo periodic evaluations. IMDEA Nanociencia aims at becoming an internationally recognized research centre, whilst maintaining a clear support from the existing scientific community in Madrid.

3. Location

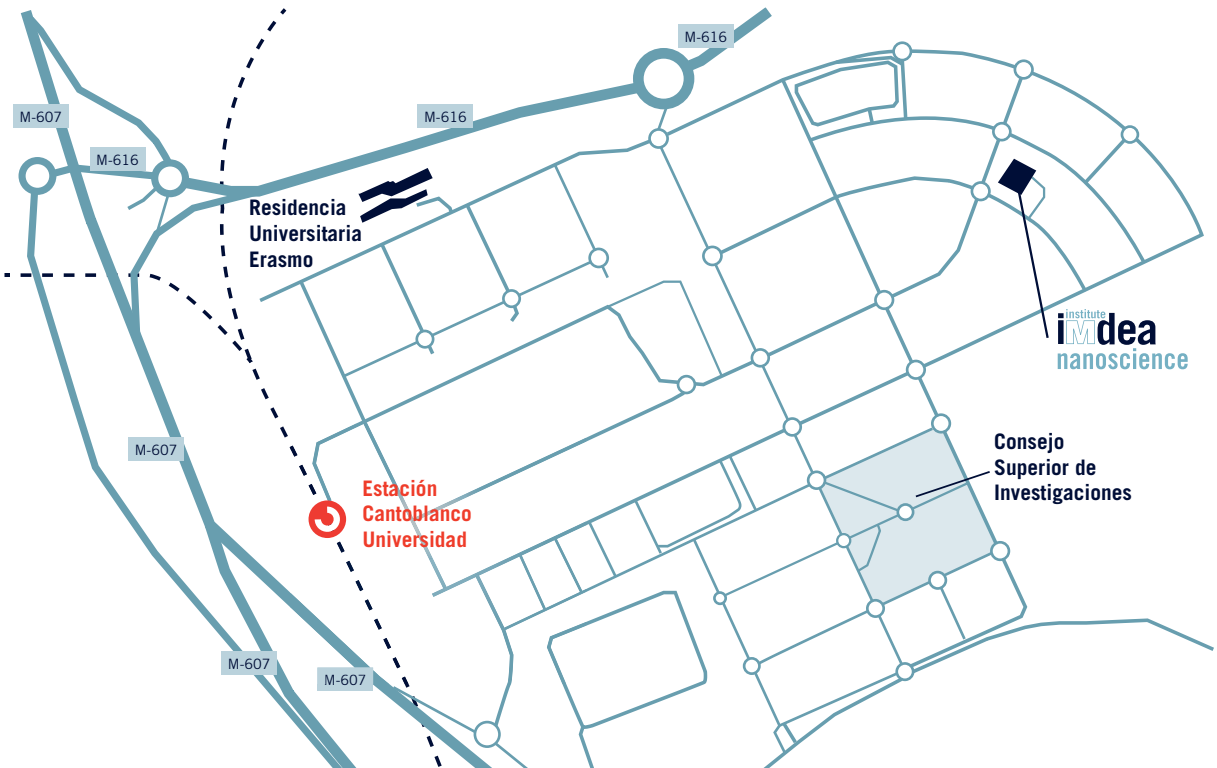
Initially, the Foundation started up its activities in spaces loaned by other academic research institutions such as the UAM School of Sciences and the UCM School of Chemistry. The new building of IMDEA is located on the Cantoblanco Campus of UAM, near Madrid. The foundation stone was laid in a public ceremony on 13th January 2010. The building was completed by December 2011 and has been fully operational since June 2012. Its 10,000 m^2 host 44 specific laboratories, as well as the Centre for NanoFabrication with state of the art facilities and world-class equipment.

Given the interdisciplinary nature of research in Nanoscience, the location of the Institute in a campus characterized by its excellence in related research areas provides the perfect environment.

4. Recruitment Procedure

The scientific research staff is selected worldwide strictly on the basis of research merit. The recruitment is carried out by means of International Open Calls, with pre-screening by the Scientific Advisory Committee (SAC) to provide a short list of potential candidates. The candidates then go through a process of interviews and discussion on the specific conditions for joining the Institute. After the interview process, the selected candidates are presented to the Board of Trustees and the corresponding offers are presented. The scientists are provided with laboratory space and start-up funds to facilitate their incorporation to the Institute and in the case of junior researchers, help them to boost their careers. Researchers from universities and other Spanish research institutions may also apply to the same selection procedure, to be incorporated to the Institute as associated members for periods of five years to develop specific research projects.

IMDEA Nanociencia. Universidad Autónoma de Madrid. Cantoblanco Campus.

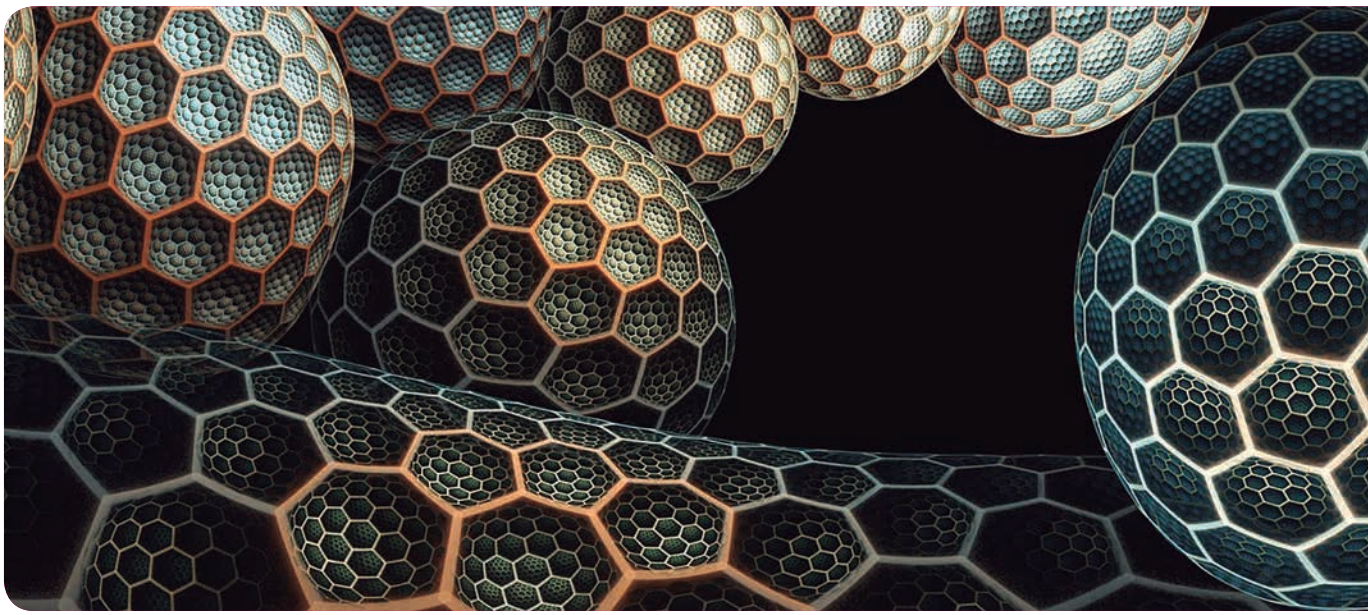


5. Gender Balance

IMDEA Nanociencia has a strong commitment towards gender equality, and since its inception has implemented measures that have been successfully adopted regarding flexibility in the working hours schedules and teleworking.

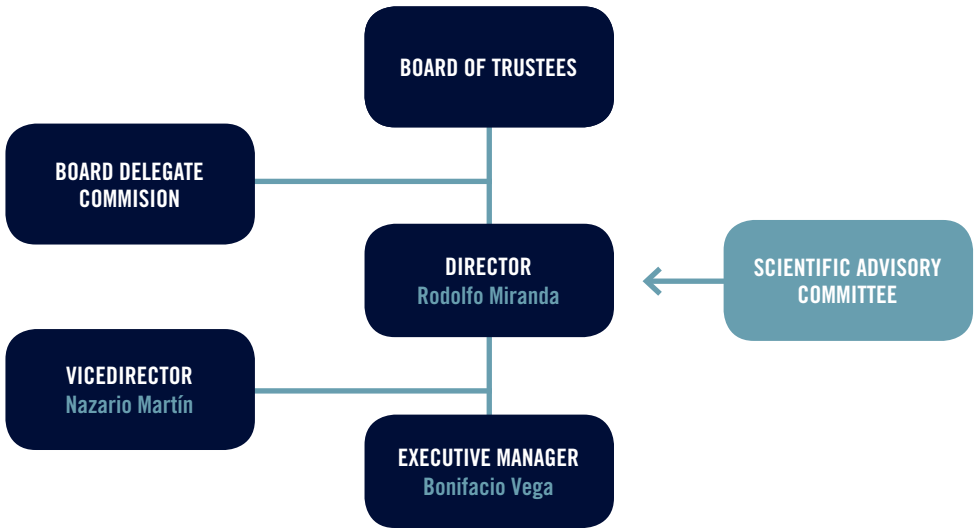
The number of female researchers at IMDEA Nanociencia is 35%, (57 of 163) which is higher than the percentage of female researchers in the EU-28.[1] Although there is still work to do to reach gender equality, IMDEA Nanociencia has a strong commitment to comply with gender equality in the workplace. IMDEA is actively promoting the appointment of outstanding female researchers with a strong emphasis on research excellence.

1. SHE Figures 2015, EU Commission.

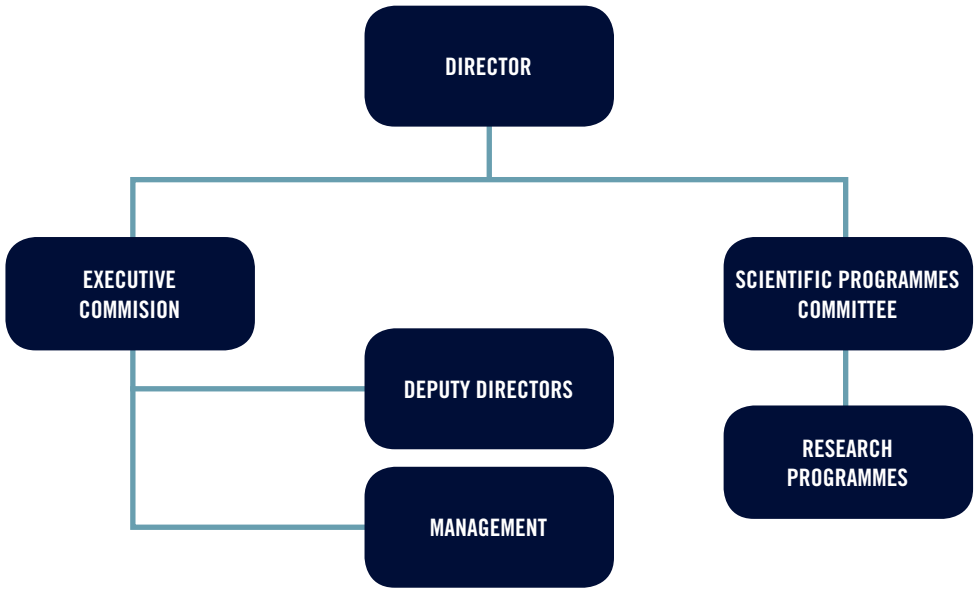


6. Management Structure

Legally Binding Governing Structure



Internal Governing Structure



Research Programs Committee

Prof. Rodolfo Miranda

Prof.
Julio Camarero

Prof.
J.L. Carrascosa

Prof.
José Luis Vicent

Prof.
J. Gierschner

Prof.
Isabel Rodríguez

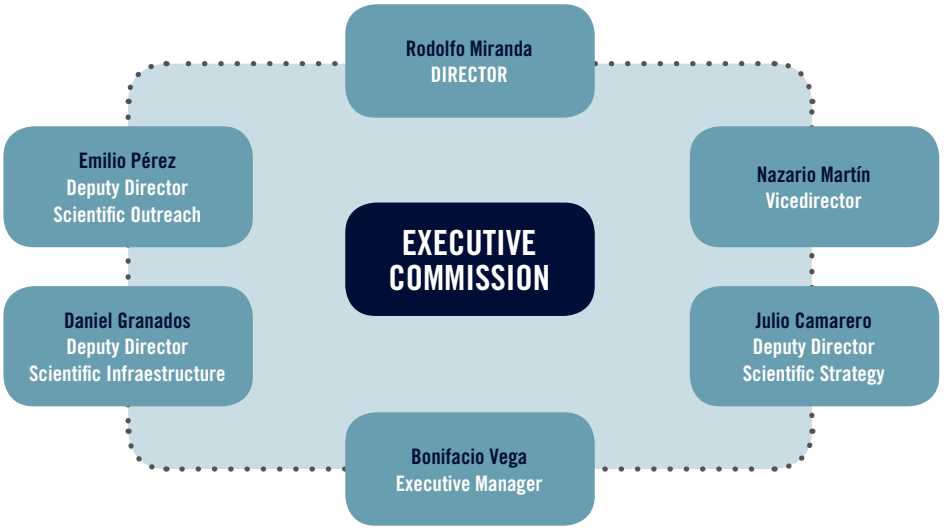
Prof.
Daniel Granados

Prof.
Nazario Martín

Prof.
Alberto Bollero

Prof.
Cristina Flors

Prof.
Emilio Pérez



7. Board of Trustees

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Physics Department and California Institute of Telecommunication and Information Technology (Calit2) University of California-San Diego. USA

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Counselor for Education Madrid Regional Government. Spain

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(until September 2017)
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Mr. Alejandro Arranz Calvo
(since September 2017)
General Director of Research and Innovation, Madrid Regional Government, Spain

Mr. Rafael García Muñoz
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Prof. Miquel Salmerón
University of California, Berkeley, USA

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Consultant-advisor and expert in Technology Transfer in Nanoscience. State of California and the National Nanotechnology Initiative. USA

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Ramen, S.A
Mrs. Silvia Cristina López y Mr. Emilio Ramiro

GMV Aerospace and Defense
Mr. Manuel Pérez

TECNOVAC
Mr. Antonio Martínez

8. Scientific Advisory Committee

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Cornell University, USA

Prof. Johannes Barth
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Prof. Harald Brune
Director of the Institute of Nanostructures at Surfaces. Ecole Polytechnique Fédérale de Lausanne (EPFL). Switzerland

Prof. Yvan Bruynserade
Laboratory of Solid-State Physics and Magnetism. Department of Physics and Astronomy, Katholieke Universiteit Leuven, Belgium

Prof. Luis Echegoyen
Chair of Chemistry, University of Texas at El Paso, USA

Prof. Christoph Gerber
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Prof. Cayetano López
Director of CIEMAT, Spain

Prof. Maurizio Prato
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Director of Surface Science Research Centre. University of Liverpool, United Kingdom

Prof. Miquel Salmerón
University of California, Berkeley, USA

2

research programmes and scientists

2017
annual report

programme

Molecular Nanoscience and Chemical Synthesis

Programme Manager: **Prof. Nazario Martín**

Research lines

Nanocarbons and Organic Photovoltaics
Prof. Nazario Martín

Chemistry of Low-Dimensional Materials
Prof. Emilio M. Pérez

Functional Organic Materials Hybrid Nanomaterials
Dr. Beatriz H. Juárez

Covalent Organic Frameworks
Prof. Félix Zamora

Functional Organic Materials
Prof. Tomás Torres

Electrochemical Biosensors
Prof. Encarnación Lorenzo

Switchable Nanomaterials
Dr. José Sánchez-Costa

Biosensors
Prof. José Manuel Pingarrón

About the programme

This programme deals with the design and synthesis of molecular nanostructures and nanomaterials, their spectroscopic characterization, in particular, their time-resolved optical response, and their self-assembly at surfaces. The expertise required includes the functionalization of different nanoforms of carbon, namely fullerenes, carbon nanotubes and graphene, metal-organic frameworks, spin-cross over architectures, organometallic compounds and semiconducting quantum dots to be self-organized on surfaces by means of covalent or supramolecular approaches and the implementation of various spectroscopic techniques, including spectroscopy of single molecules. Among the objectives of the Programme in basic science one may cite the characterization (and understanding) of the interaction light-organic molecules at the time scale of femtoseconds (both theoretically and experimentally at IMDEA) and the exploration of the time scale of the few femtoseconds into the attosecond (at least theoretically). The properties of prototype solar cells at very long time scales (ms) will be also explored experimentally. The practical objective is the use of this information, if possible, for the corresponding optimization of functional organic devices, such as organic solar cells, as well as the preparation of a variety of materials for hole and electron transport, respectively, in perovskite- based solar cells.

Nanocarbons and Organic Photovoltaics

GROUP LEADER

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Valentina Sacchetti
Rafael Sandoval

Research Lines

1. **Fullerenes as a singular curved scenario: Discovering new reactions on Fullerenes!**

   A most significant recent contribution from Martín's group has been the first synthesis of chiral fullerenes in a catalytic enantioselective manner, thus allowing the preparation of "chiral fullerenes a la carte" at will, under extremely mild conditions. This far-reaching achievement was published in Nature Chemistry, 2009, 1, 578and it was followed by other seminal papers, namely Angew. Chem. Int. Ed. 2011 (cover) and J. Am. Chem. Soc., 2011; J. Am. Chem. Soc., 2014, 136, 2897-2904; J. Am. Chem. Soc., 2014, 136, 705–712; Acc. Chem. Res. 2014, 47, 2660–2670; J. Am. Chem. Soc, 2015, 137, 1190-1197 and Angew. Chem. Int. Ed., 2017, 56, 2136 –2139.

2. **Supramolecular Chemistry of Fullerenes. Concave-convex Supramolecular Interactions**

   Macrocylic receptors based in previous molecular tweezer have allowed to obtain amazing organic receptors for fullerenes (Angew. Chem. Int. Ed., 2013, 52, 5115-5119; Angew. Chem. Int. Ed., 2014, 53, 5629-5633. See also: J. Am. Chem. Soc., 2016, 138, 15359 (First dynamic cover issue, see: Cover JACS * November 30,2016 * Number 47 * pubs.acs.org/JACS).

Group webpage:
http://www.nazariomartingroup.com

3. On-Surface Chemistry. Exploring the 2D World Wonders

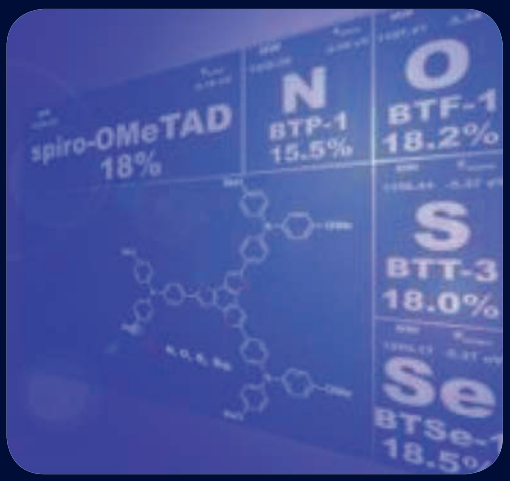
Finding new concepts and unprecedented reaction pathways for organic molecules is been enabled by ultra-high vacuum deposition on top of 2D substrates. This relatively new chemistry field allows an a la carte bottom-up design and synthesis of graphene nanoribbons and other carbon nanoforms. This line of work is carried out in collaboration with our colleagues at IMDEA Dr. David Écija and Dr. Roberto Otero. Currently, two drafts are under preparation.

4. Hole and Electron Transport Materials for Photovoltaic Applications

Martin's group is also engaged in the preparation of a variety of Hole Transporting Materials (HTMs) as well as Electron Transporting Materials (ETMs) for perovskite solar cells. These materials have been able to reach values as high as 20%. This work has been carried out with Prof. Nazeerudin in the EPFL (Switzerland). For recent results, see: Angew. Chem. Int. Ed. 2016, 55, 6270; Adv. Energy Mater. 2017, 7, 1601674; Adv. Energy Mater. 2017, 1601102; J. Mater. Chem. A, **2018**, 6, 5944–5951; Adv. Funct. Mater., 2018 **-DOI: 10.1002/adfm.201801734**. An EU patent (Application No. PCT/IB2016/057475) was obtained.

I. García-Benito, I. Zimmermann, J. Urieta-Mora, J. Aragó, J. Calbo, J. Perles, A. Serrano, A. Molina-Ontoria, E. Ortí, N. Martín, M. K. Nazeeruddin."Heteroatom Effect on Star-shaped Hole-Transporting Materials for Perovskite Solar Cells" *Adv. Funct. Mater.*, **2018**, -DOI: 10.1002/adfm.201801734.

A systematic study of the effect that heteroatom-containing central scaffold (N, O, or Se) wields on the photovoltaic efficiency is investigated and compared with their sulfur analogue. The new star-shaped derivatives endowed with three-armed triphenylamine moieties show C3 symmetry and a remarkable performance. This work highlights that chalcogenide-based derivatives are promising hole-transporting material candidates to compete efficiently with spiro-OMeTAD.



highlight

Chemistry of Low-Dimensional Materials

GROUP LEADER

Prof. Emilio M. Pérez
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Teresa Naranjo
Sofia Mena
Julia Villalva
Mariano Vera

Group webpage:
http://nanociencia.imdea.org/chemistry-of-low-dimensional-materials/home

Research Lines

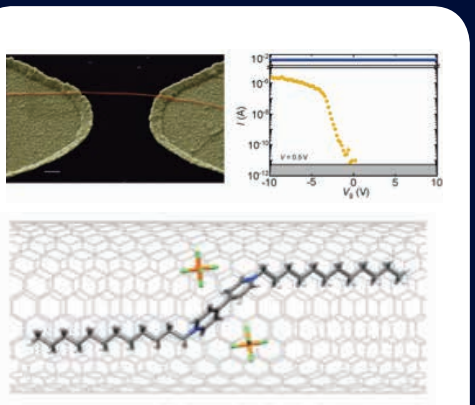
Our group has interests in three main research lines:

1. Novel methods for the chemical modification of carbon nanotubes: We have developed methods for the synthesis of rotaxane-type derivatives of SWNTs, the first example of mechanically interlocked derivatives of SWNTs (MINTs, see *Chem. Eur. J.* **2017**, *23*, 12681 for a review). MINTs show fundamentally different properties from other types of SWNT derivatives, which might have implications in the reinforcement of polymers (*ACS Nano* **2016**, *10*, 8012), catalysis, and sensing.

2. Chemistry of 2D materials: We are developing improved methods for production of ultrathin 2D materials and van der Waals heterostructures through liquid phase exfoliation from their bulk sources (*Nat. Commun.* **2017**, *8*, 14409). From these suspensions, we build functioning (opto)electronic devices using dielecrophoresis (*Nanoscale* **2018**, DOI: 10.1039/C8NR01045E). Finally, we are interested in fundamental problems in the chemistry of 2D materials, such as chemoselectivity (*Nano Lett.* **2016**, *16*, 355).

3. Fundamental principles of supramolecular chemistry: Lastly, we are very interested in measuring and understanding noncovalent forces, which underlie all the results of the previous two lines. For example, we have developed a method for the determination of association constants of small molecules towards SWNTs and unveiled the different contributions to the stability of the complexes (*Chem. Eur. J.* **2017**, *23*, 12909).

Single-walled carbon nanotubes (SWNTs) are typically produced as a mixture of semiconducting and metallic SWNTs. This hampers their application in semiconducting technologies because metallic SWNTs would short-circuit devices. Here, we developed a simple non-covalent approach to turn metallic SWNTs into high-quality semiconductors, by filling their interior with viologen salts. See: *Angew. Chem. Int. Ed.* **2017**, *56*, 12240.



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Functional Organic Materials Hybrid Nanomaterials

GROUP LEADER

Dr. Beatriz H. Juárez
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Researcher ID:
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María Acebrón

Héctor Rodríguez
(co-supervised with Dr. Ricardo-Arias)

TECHNICIAN

Diego Ruiz

Group webpage:
http://nanociencia.imdea.org/semiconductor-nanoparticles-group/group-home

Research Lines

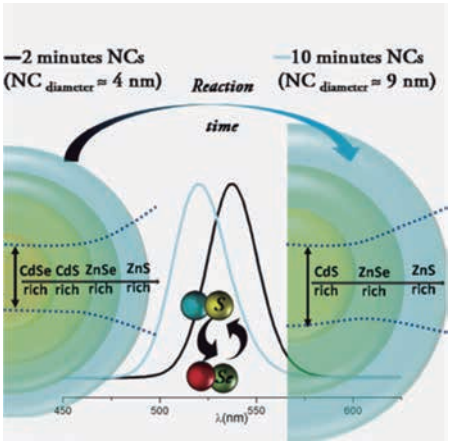
1. The main research line includes the synthesis of colloidal nanocrystal (mainly semiconductor nanocrystals or quantum dots in 0, 1, and 2D as well as hybrid systems) with the aim to design rules for optimal nanocrystals performance.

   Special emphasis is given to surface chemistry studies by X-ray Photoelectron Spectroscopy and X-ray absorption Spectroscopy and characterization by advanced optical and microscopical techniques. *(Nano letters 17 (7), 4165-4171, 2017; Physical Chemistry Chemical Physics 19 (3), 1999-2007)*

2. Functional materials for nanothermometry based on semiconductor nanocrystals. Among the fabricated systems for nanoscale thermal monitoring we focus on the synthesis of nanocrystals with adequate size and surface treatment for luminescence nanothermometry in the NIR range, where light attenuation in tissues is minimized and higher sensitivity can be achieved. *(Advanced Functional Materials 27 (6), 2017, Nanoscale 9 (7), 2505-2513, 2017)*

3. A third research line includes our interest in optical trapping. We are interested in the elucidation of the luminescence dynamics of colloidal quantum dots during optical trapping in different biocompatible media. *(The Journal of Physical Chemistry C 121 (18), 10124-10130, 2017)*

Compositional changes taking place during the synthesis of alloyed CdSeZnS nanocrystals (NCs) allow shifting the optical features to higher energy as the NCs grow. Under certain synthetic conditions, the effect of those changes on the surface/interface chemistry competes with and dominates over the conventional quantum confinement effect in growing NCs. These changes, identified by means of complementary advanced spectroscopic techniques such as XPS (X-ray Photoelectron Spectroscopy) and XAS (X-ray absorption Spectroscopy), are understood in the frame of an ion migration and exchange mechanism taking place during the synthesis. Control over the synthetic routes, during the NCs growth, represents an alternative tool to tune the optical properties of colloidal quantum dots, broadening the versatility of the wet-chemical methods. *(Journal of Physical Chemistry Letters, 10.1021/acs.jpclett.8b00741)*



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Covalent Organic Frameworks

GROUP LEADER

Prof. Félix Zamora
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Jesús A. Martín
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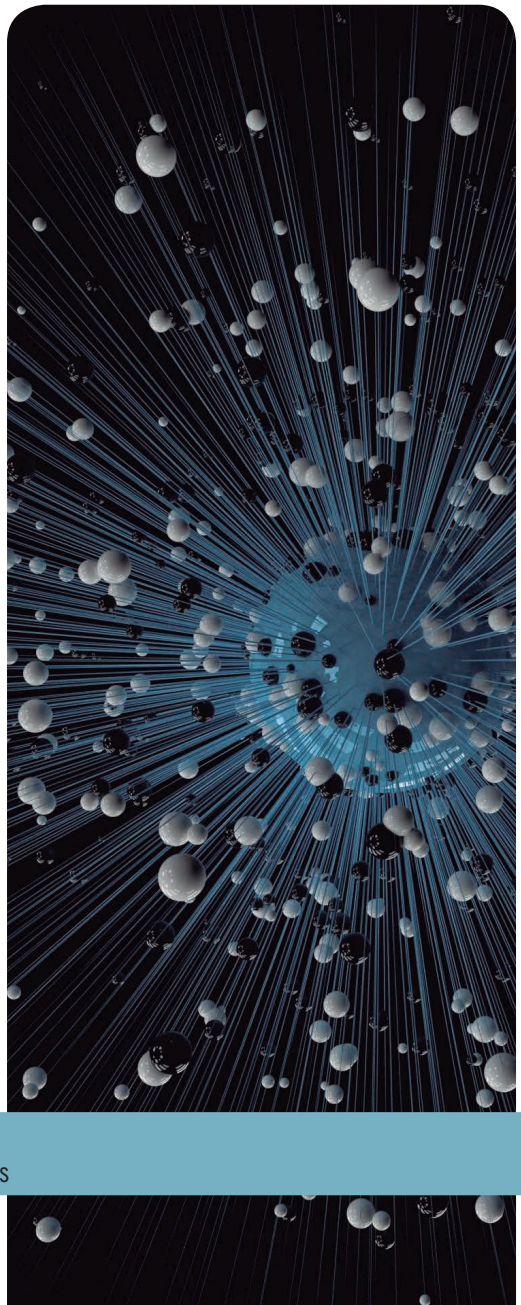


Group webpage:
https://www.nanomater.es

Research Lines

Our research group is developing the chemistry of low dimensional materials. The research activity deals with the preparation and characterization of nanomaterials with multifunctional properties:

- One-dimensional coordination polymers with electrical properties, and their potential use as "molecular wires", and the use of coordination polymers of lamellar structure to produce nanometric films and monomolecular thickness *[Nature Nano 5 (2010) 110-115; Nature Commun. 4, 1709 (2013); Chem. Soc. Rev. 2010, 39, 4220–4233; Angew. Chem. Int. Ed. 56, 987 –991 (2017)]*.

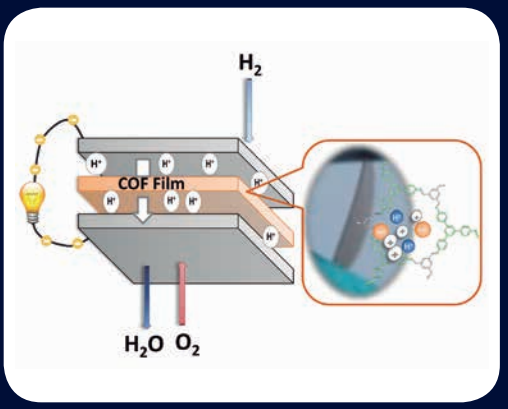
- Two-dimensional materials with a rational chemical design using Covalent Organic Frameworks and Metal-Organic Frameworks: It aims to provide alternative two-dimensional materials using chemical synthesis for a rational design of structures and properties *[Adv. Matter. 25, 2141–2146 (2013); Chem Sci. 6, 2553–2558 (2015); Chem Commun 52, 4113-4127 (2016)]*.

- Two-dimensional materials based on inorganic crystals such as graphene, boron nitride and antimonene: Our aim is to provide novel synthetic routes for the production of suspensions and the characterization of these materials on surfaces *[Adv. Matter. 28, 6332–6336 (2016); Angew. Chem. Int. Ed. 55, 14345-14349 (2016)]*.

- Design and synthesis of porous Materials with potential applications in water and energy based on Covalent Organic Frameworks *[J. Mater. Chem. A., 5, 17973-17981 (2017); J. Am Chem. Soc. 139, 10079–10086 (2017); ACS Catal. 7, 1015–1024 (2017).]*.

h i g h l i g h t

Imine-based covalent organic frameworks (COFs) are polymeric, crystalline and porous materials formed by the direct Schiff reaction between amine and aldehyde molecules. They are obtained as powders hampering several potential applications. Here we develop a simple method to produce quasi-transparent and flexible COF-films which are useful for the construction of proton exchange membrane fuel cells. See *J. Am. Chem. Soc.* **2017**, *139*, 10079.



Functional Organic Materials

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Group webpage:
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Research Lines

Our research focuses on the preparation and study of molecular materials based on porphyrinoids (phthalocyanines (Pcs), subphthalocyanines (SubPcs), porphyrins, etc.).

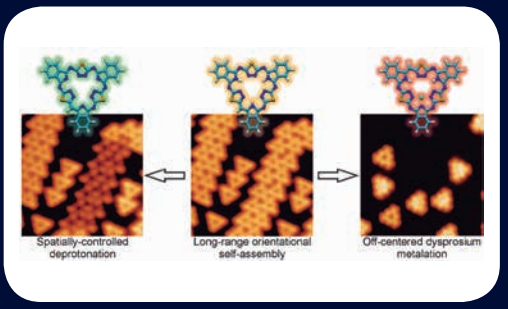
1. One research line deals with the incorporation of Pcs as active components in solar cells (*Chem. Commun.*, **2010**, *46*, 7090). We have also made significant progresses in the use of SubPcs as electron acceptors in vacuum-evaporated planar (*Adv. Energy Mater.*, **2014**, *4*, 1301413; *J. Am. Chem. Soc.*, **2015**, *137*, 8991) or bulk heterojunction solar cells (*Angew. Chem. Int. Ed.*, **2017**, *56*, 148). Similarly, we have described the use of Pcs as hole-transporting materials in perovskite-sensitized solar cells (*Adv. Energy Mater.*, **2017**, *7*, 1601733).

2. Our group is also active in the area of photodynamic therapy (PDT), in which Pcs are used as photosensitizers for singlet oxygen generation (two international patents issued – PCT/EP 16168476.6, 2016 and PCT/ EP16177001.1, 2016). We have also successfully used SubPcs in PDT of cancer (*Adv. Funct. Mater.*, **2018**, DOI:10.1002/adfm.201705938).

3. Finally, our group is investigating the use of porphyrinoids in nanotechnological spaces, such as the development of novel photovoltaic materials. In this context, we have prepared self-assembled ferroelectric molecular materials based on SubPcs, which also present conductivity properties (*Sci. Adv.*, **2017**, *3*, e1701017), or expanded porphyrinoids able to self-organize on metal surfaces (*J. Am. Chem. Soc.*, **2017**, *139*, 14129).

h i g h l i g h t

Expanded porphyrins are large-cavity macrocycles with enormous potential in coordination chemistry, anion sensing, and optoelectronics. Here, we showed the self-organization capability of an "expanded hemiporphyrazine" on Au(111) through a unique growth mechanism based on long-range orientational self-assembly. Furthermore, a spatially controlled "writing" protocol on such self-assembled architecture was presented based on the STM tip-induced deprotonation of the inner protons of individual macrocycles. Finally, the capability of these surface-confined macrocycles to host lanthanide elements was assessed, introducing a novel off-centered coordination motif. See *J. Am. Chem. Soc.* **2017**, *139*, 14129.



Electrochemical Nanobiosensors

GROUP LEADER

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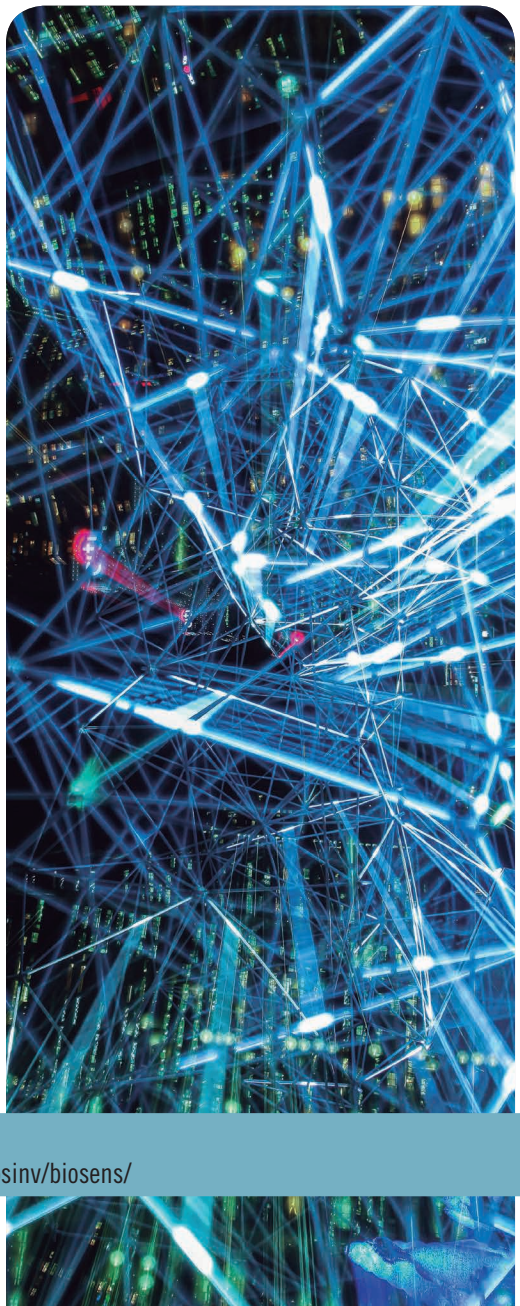


Group webpage:
http://www.uam.es/gruposinv/biosens/

Research Lines

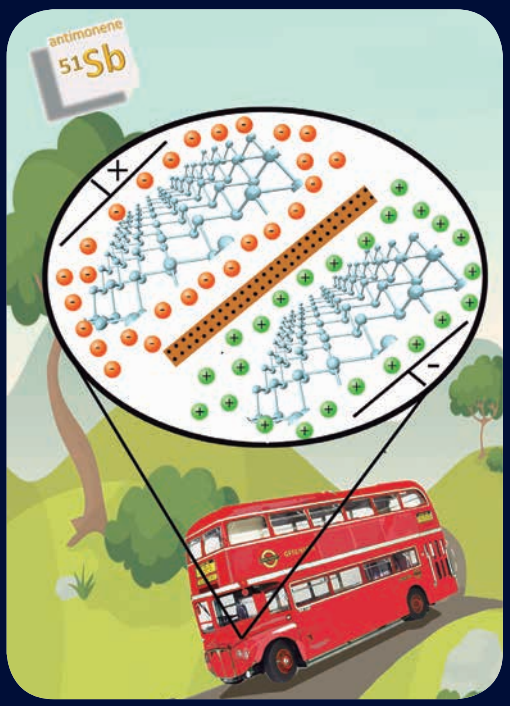
The group has interest in the following research lines:

1. Nanomaterials for Biosensor development: We have developed amperometric (bio)sensors with improved performance by the inclusion of nanomaterials, such as nanodiamonds *(Bioelectrochemistry. 2016, 111, 99)*, graphene, carbon nanotubes *(Sensors and Actuators B. 2016, 222, 331and 2016, 236, 773)* and gold nanoparticles. These nanomaterials have also been chemically modified o included in sol-gel systems *(Analytica Chimica Acta. 2016, 908 141)*.

2. Electrochemical indicators for DNA biosensors: the group has pioneering works in Spain concerning the development of redox indicators of hybridization event. These indicators have been successfully applied in the development of very selective DNA biosensor and of biosensor for the detection of gene mutations associated to important human diseases, such as CF. In particular we have recently employed successfully metallacarboranes *(Chemical Science. 2016, 7, 5786)* and dyes *(Bioelectrochemistry.2016, 111, 115)* as redox indicators in DNA biosensor for the detection of different gene mutations.

3. Nanomaterials for the development of supercapacitors: Lastly, we are very interested in the application of 2D nanomaterials for the fabrication of energy storage devices. For example, graphene decorated SiC nanomaterial (graphene@SiC) (fabricated via an adiabatic process), has been physicochemically characterised then applied as a supercapacitor material and as an anode within a Li-ion battery (LIB) *(Journal of Carbon Research. 2017, 3, 20)*.

Antimonene, for the first time, is characterised as a material for applications in energy storage, being applied as an electrode material as the basis of a supercapacitor. Antimonene significantly improve the energy storage capabilities of a carbon electrode with a capacitance of 1578 F g-1, and a high charging current density of 14 A g^{-1}. See: *Adv. Energy Mater. 2017, 1702606*.



highlight

Switchable nanomaterials

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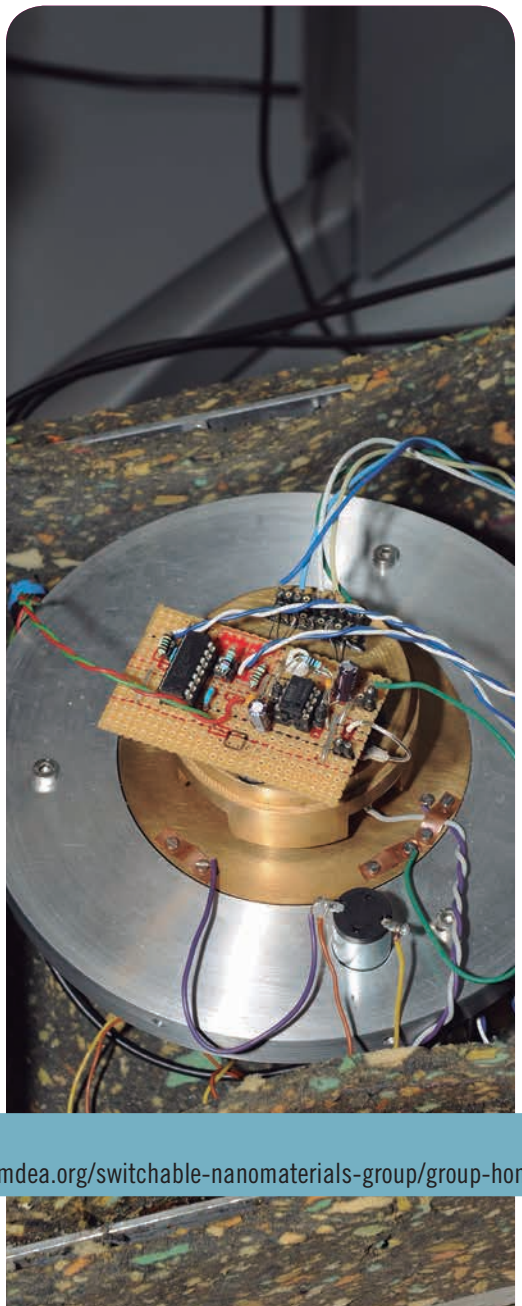


Group webpage:
http://www.nanociencia.imdea.org/switchable-nanomaterials-group/group-home

Research Lines

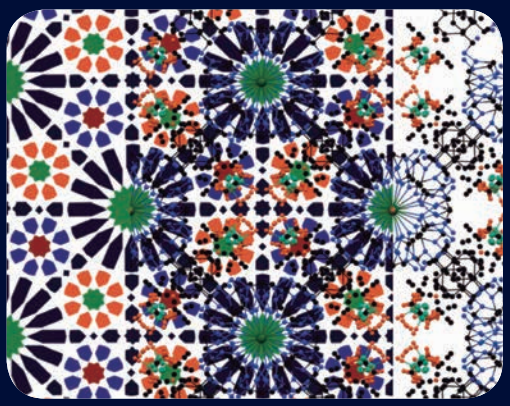
At the Switchable NanoMaterials group (SNM) we are focused on the development of metal-based coordination complexes at the macro- and nanoscopic scale for their technological application in the fields of quantum computing, energy storage, spintronic and sensing devices. Our multidisciplinary approach is based on three major themes:

1. **Iron-based Spin Crossover (SCO) Switchable coordination complexes:** The SCO phenomena remain one of the most spectacular forms of a switchable material (*https://doi.org/10.1016/j.crci.2018.04.004*). At the SNM we are using these materials as pillars for the synthesis of smart gasses and small volatile organic compounds (VOCs) sensors.

2. **Functional Metal-Organic Frameworks, MOFs:** MOFs are extended molecular materials formed by metal ions bridged by ligands, thus creating voids to absorb guest molecules. We are interested on increasing the selectivity of the MOF through tuning the shape and size of the pores and/or through the inclusion of specific receptors (Chem. Commun., 2018, Advance Article, *10.1039/C8CC01561A*).

3. **Non-porous architectures acting as porous compounds**: In contrast to MOFs, while 1D and 0D discrete compounds are non-porous by nature, in some cases they can behave as porous materials and absorb guest molecules. Recently some of us have demonstrated the potential use of low dimension materials constructed using SCO as metal centres (*JACS, 2014, 10.1039/C8CC01561A*). This remarkable result led us to consider the great potential that these structures have for the development of advanced sensors.

A novel extended triazole-based ligand (PM-Tria) has been synthesized and an unprecedented MOF 3D architecture has serendipitously been formed by assembling iron(II), PM-tria ligand and fluoride anions. This MOF contains a perfectly linear one-dimensional $\{Fe(II)\text{-}F\}_n$ bridging chain that shows an antiferromagnetic behaviour. Furthermore, the structure is compared with a 14th century mosaic found in the Alhambra Palace in Granada showing a surprising symmetry resemblance *(Chem. Commun., 2018, Advance Article, 10.1039/C8CC01561A)*



highlight

Biosensors

GROUP LEADER

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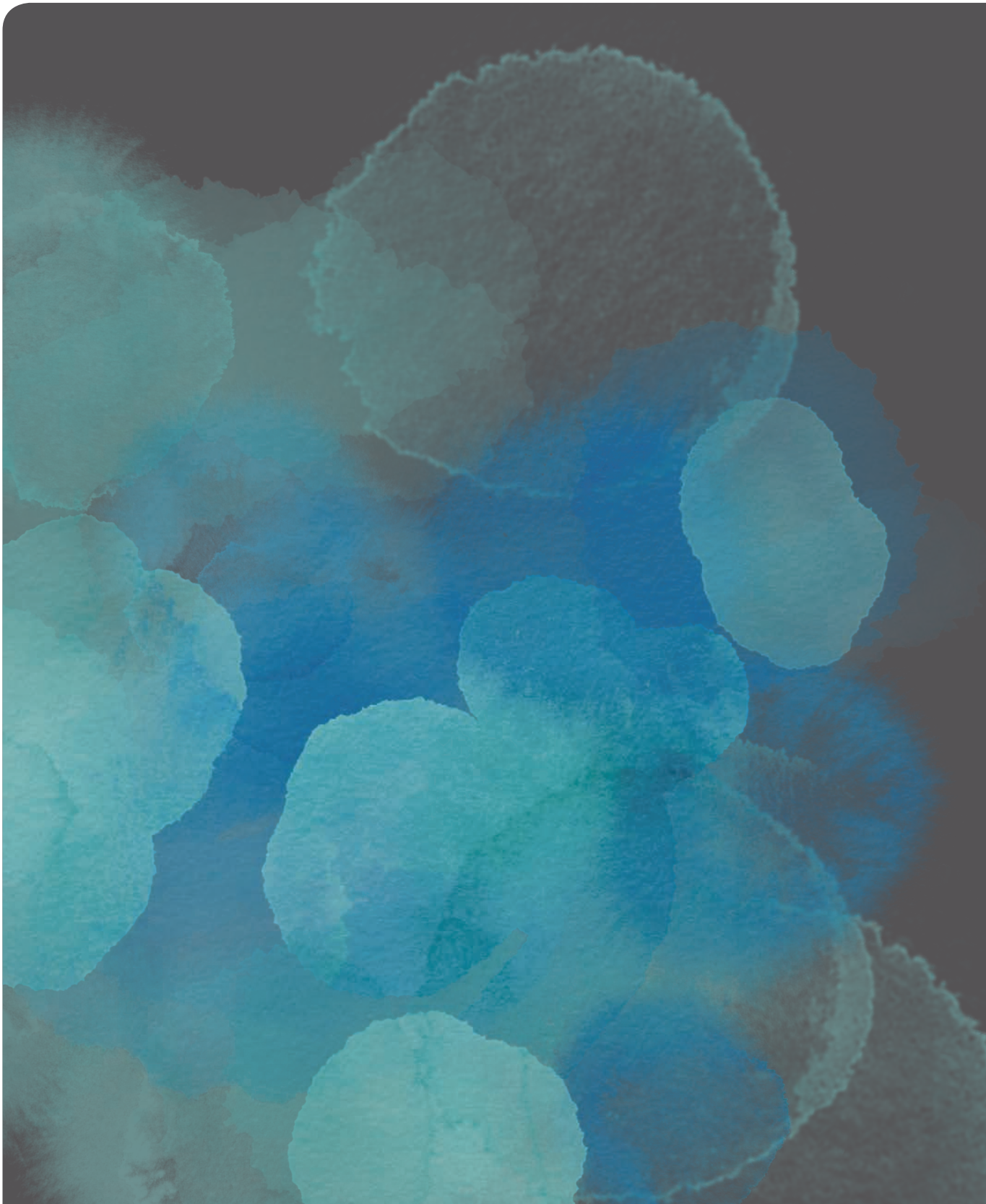
Research Lines

Fundamental Research:
Synthesis, characterization and application of latest generation nanomaterials, redox polymers/electronic conductors and modern electroanalytical techniques in electrochemical (bio)sensing.

Applied Research:
Development and application of advanced electrochemical (bio) sensors for the determination of relevant (bio)markers in the environmental, clinical and food fields in response to current demands of society.

Group webpage:
http://www.imdeananociencia.org/home-en/people/item/dr-jose-manuel-pingarron



programme

Time-resolved Optical Spectroscopy

Programme Manager: Prof. Johannes Gierschner

Research lines

Photophysics of Organic and Hybrid Supramolecular Nanosystems
Prof. Johannes Gierschner

Pump-probe Photoinduced Absorption Spectroscopy
Dr. Juan Cabanillas González

Femtosecond Spectroscopy on Molecular Systems
Prof. Larry Luer

Nanooptics and Nanoacoustics
Prof. Reinhold Wannemacher

About the programme

The programme deals with phenomena in which either the (acoustic or optical) radiation or the matter are confined at sub-micrometre dimensions. In nanoacoustics, phase-sensitive acoustic microscopy, imaging, and non-destructive testing are developed, while the field of nanophotonics is both a Nobel Prize-winning science and a multibillion-dollar industry, underpinning applications such as telecommunications, data storage, and materials processing. Nanostructures and nanostructured materials exhibit fascinating optical response, and nanoscale optics have already shown many surprises, such as extraordinary optical transmission, superlensing, giant field enhancement, optical trapping, and imaging with resolution far beyond the diffraction limit. Researchers in this Programme have also explored semiconductor materials as advantageous candidates to be the physical basis of storage and manipulation of quantum information. The growth and characterisation of semiconductor nanostructures, and photonic devices, such as LEDs, Lasers, pillars and photonic crystal cavities is also relevant for activities in Programme 1). The scientists in this Programme have also developed optical microscopy in the near and far field, optical spectroscopy with coherent and nonlinear techniques, Raman and FTIR spectroscopy and spectroscopic SNOM.

Photophysics of Organic & Hybrid Supramolecular Nanosystems

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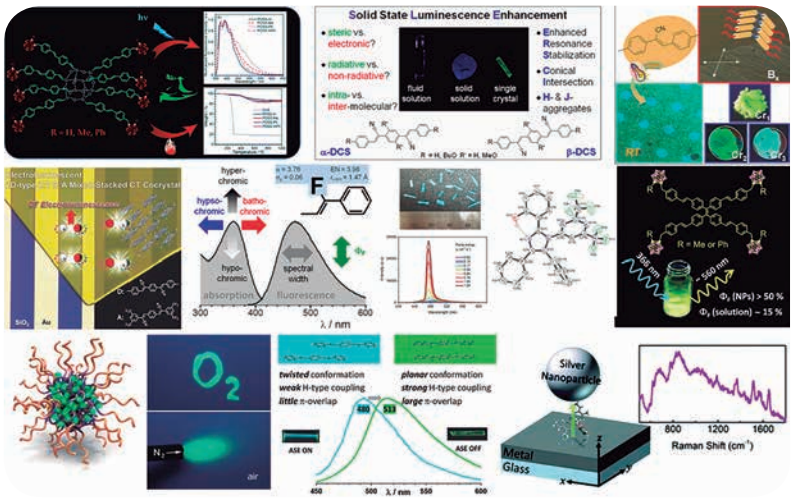


Group webpage:
http://www.nanociencia.imdea.org/photophysics-of-organic-and-hybrid-supramolecular-nanosystems/group-home

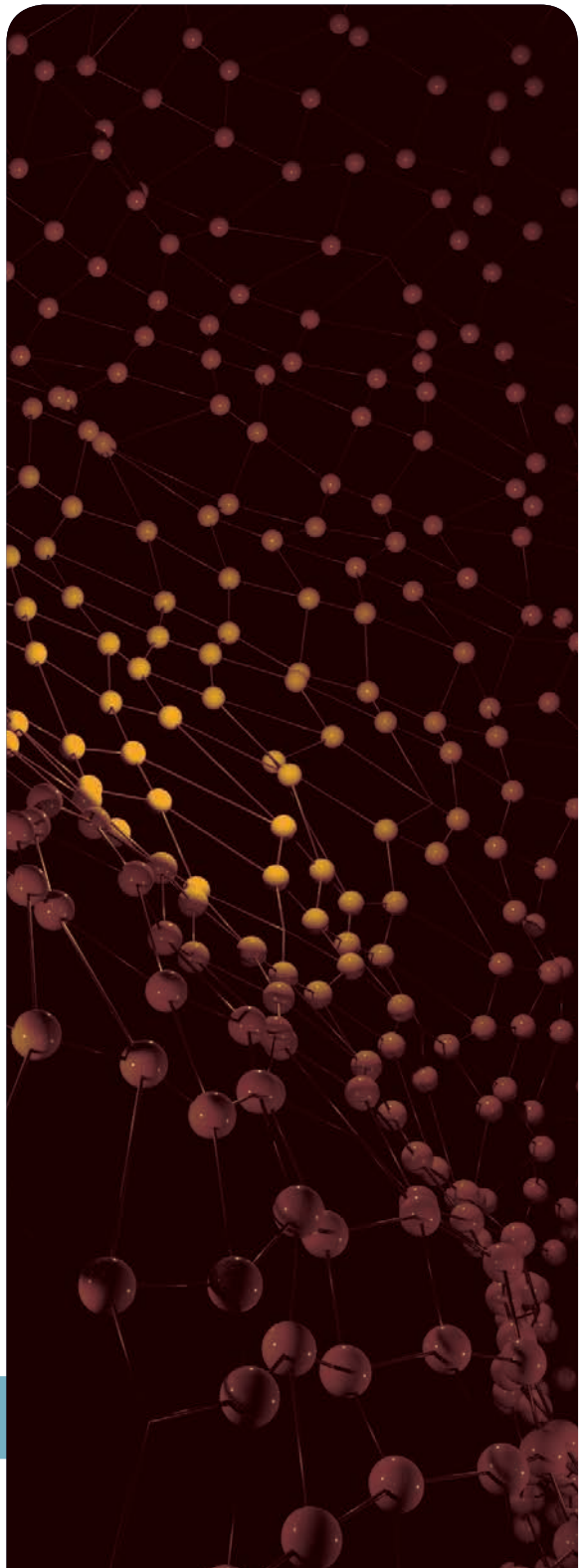
Research Lines

Our research is dedicated to the understanding of the photophysics of organic and hybrid supramolecular nanosystems. The ultimate goal, i.e. unbiased, targeted design of tailor-made systems for optoelectronics or fife science, can only be reached in an interdisciplinary manner, which we tackle in an integrative spectroscopic & computational approach, based on a strong background in chemistry & materials science.

Current Interests

1. Luminescent Organic Materials: The understanding or even prediction of non-/occurrence of luminescence in solution and in the crystalline state is of crucial importance for targeted molecular design, where we achieve a systematic understanding using libraries of well-defined materials; for a recent highlight see *J. Phys. Chem. C 2017, 121, 23166*. For reviews on the matter see *Adv. Opt. Mater. 2016, 4, 348*, *J. Mater. Chem. C 2013, 1, 5818*, *J. Phys. Chem. Lett. 2013, 4, 2686.*

2. MO and Exciton Localization in Donor-Acceptor Materials: Next generation organic optoelectronics based on multi-chromophoric systems enable new unprecedented (multi) functional properties; highlights include *Adv. Mater. 2017, 29, 1701346*, *Adv. Mater. 2016, 28, 9169*, *J. Am. Chem. Soc. 2013, 135, 4757*.



Pump-probe Photoinduced Absorption Spectroscopy

GROUP LEADER

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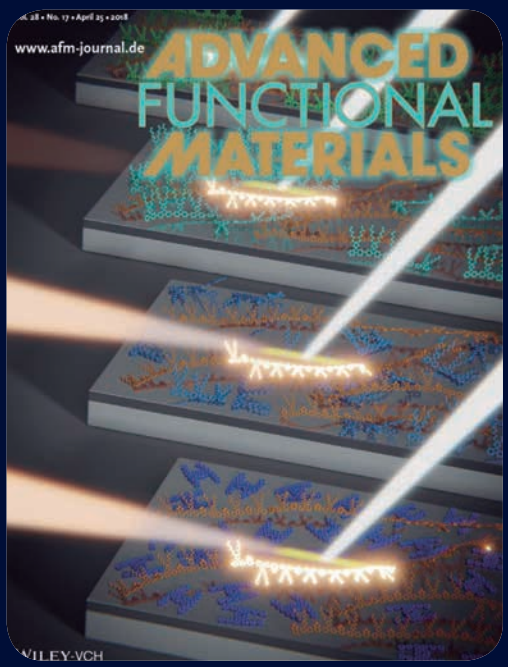
Research Lines

1. Conjugated polymers for photonics: relation between structure and light amplification properties. We study the optical gain and stimulated emission properties of conjugated polymers with femtosecond transient absorption spectroscopy. We focus on chemical structures designed to promote optical gain upon reducing interchain interactions. Suppression of loss mechanisms like exciton-exciton annihilation, (*J. Phys. Chem. C 2016, 120, 11350–11358*) or polaron absorption (*Adv. Funct. Mater. 2018, 28, 1705824*) and promotion of strong host:guest interactions on polymer mixtures (*Macromolecules 2015, 48, 8765–8772*) are crucial for outstanding light amplifying properties.

2. Conjugated polymer waveguides and laser resonators. We use soft nanoimprint lithography to transfer patterns onto flexible substrates subsequently coated with conjugated polymer. (*Sci. Rep. 2016, 6, 34565*). Upon choosing the appropriate pitch for the periodic pattern we can achieve confinement of the emission in the conjugated polymer film and amplification of the optical cavity modes. This research line is carried out in collaboration with the group of Nanostructured Functional Surfaces at IMDEA Nanociencia.

3. Fluorescent chemosensors. We investigate the use of fluorescence, amplified spontaneous emission and laser action in cavity resonators as transduction signal for sensing analytes with high sensitivity in the gas (*Sens. Actuators B: Chem. 2016, 236, 136–143*) or liquid phase (*Sci. Rep. 2017, 7, 46265*). For this purpose we exploit the luminescent properties of conjugated polymers, organic dyes and porous metal-organic frameworks processed in films and composites (*Materials 2017, 10, 992*).

Selecting suitable hosts for green laser emission guest polymers like F8BT remains challenging, with efficient Förster resonance energy transfer and high photoluminescence quantum efficiency being necessary, but not sufficient criteria. We demonstrate that hosts with short-time, charged-state absorption (upper panels) quench gain whereas hosts that delay charge generation (lower panels) allow lasing. (*See: Adv. Funct. Mater. 2018, 28, 1705824*).



highlight

Femtosecond Spectroscopy on Molecular Systemson Molecular Systems

GROUP LEADER

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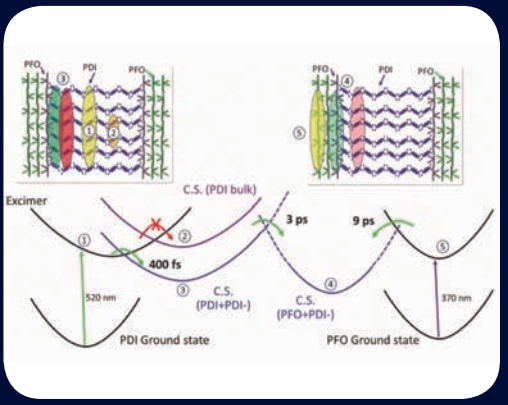
Research Lines

- **Transient absorption spectroscopy** across all relevant time scales in organic optoelectronic devices and their components.
- Advanced matrix based methods for spectral decomposition to quantify **complex photophysical pathways.**
- Main goal: Finding **dominant loss pathways** giving industrial and academic partners **design rules** to improve their devices.
- Main topics: **organic photovoltaics, photocatalysis.**

Suppressing photooxidation of conjugated polymers and their blends with fullerenes through nickel chelates. A collaboration with Z.A.E Bayern and the University of Erlangen. *(Energy Environ. Sci. 2017, 10(9), 2005-2016)*

Maximizing efficiency in novel all-small molecule solar cells. In a collaboration with Seoul National University and the University of Tubingen, we clarified the reason for the high efficiency of this novel class of devices: their high purity avoids parasitic quenching channels thus accommodating slow charge transfer rates *(Energy Environ. Sci. 2018, 11, 211)*

Efficient long-range electron transfer processes in polyfluorene–perylene diimide (PDI) blends. In a collaboration with KAUST (Saudi Arabia) and the University of Sheffield, we demonstrated that in the presence of a donor-acceptor interface, excitons in PDI can undergo an ultrafast symmetry breaking charge transfer, outperforming excimer formation, a well-known loss path in PDI. *(Nanoscale, 2018, DOI: 10.1039/C8NR01064A)*



highlight

Nanooptics and Nanoacoustics

GROUP LEADER

Prof. Reinhold Wannemacher

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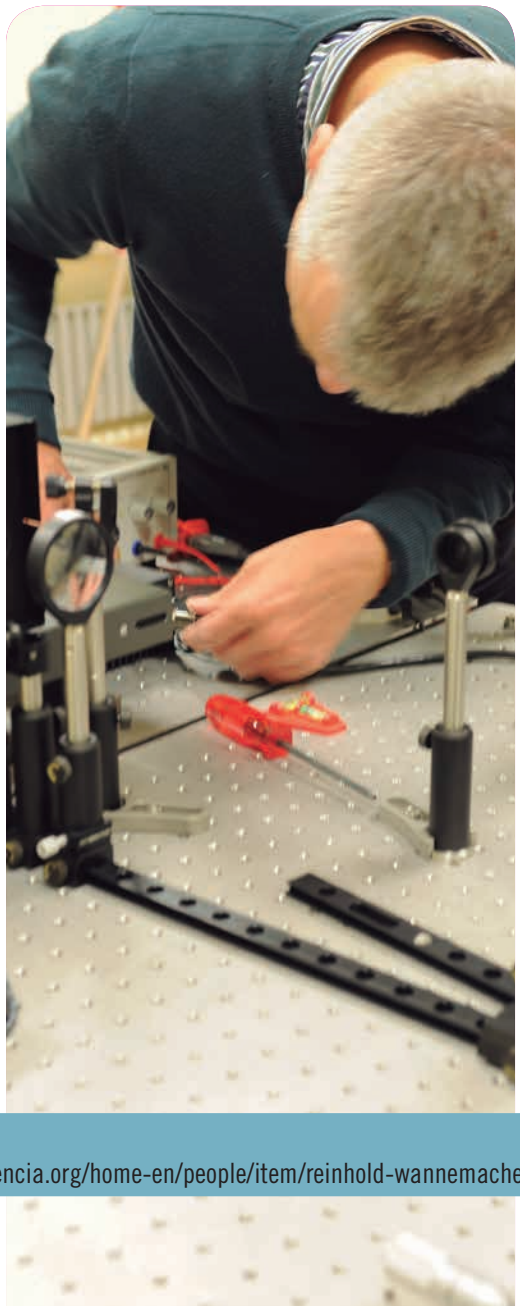


Group webpage:
http://www.imdeananociencia.org/home-en/people/item/reinhold-wannemacher

Research Lines

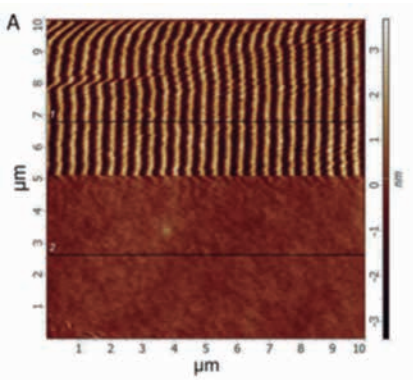
1. We are studying the photocatalytic, charge and energy transfer properties of carbon-based nanomaterials (carbon dots, graphene) in close collaboration with the groups of Isabel Rodriguez and Feng Luo, IMDEA Nanocienci.a

2. We study amplified spontaneous emission and lasing and perform low-temperature spectroscopy down to 1.5 K of crystalline and amorphous conjugated organic and hybrid materials in close collaboration with the groups of Juan Cabanillas and Johannes Gierschner, IMDEA Nanociencia. We also investigate the low-temperature homogeneous linewidth of carbon nanomaterials.

3. We investigate fluorescent and electrochemical sensors in close collaboration with the groups of Encarnación Lorenzo and Juan Cabanillas, IMDEA Nanociencia

4. We employ high-frequency ultrasonic waves (20-500MHz) for sensing using coaxial probes and combine ultrasonic vibrations (100 kHz-6 MHz) with force microscopy for imaging and manipulation of friction on the nanoscale.

Mechanical wear is often evidenced by the formation of ripples on surfaces of contacting bodies. Using an atomic force microscope (AFM) we have shown that, on the nanoscale, this wear process can be suppressed by the application of ultrasonic vibrations. At the same time the friction coefficient is strongly reduced compared to its value without applying any vibrations. See: *ACS Nano* **2015**, *9*, 8859-8868



highlight

programme

Scanning Probe Microscopies and Surfaces

Programme Manager: **Prof. Rodolfo Miranda**

Research lines

Scanning Probe Microscopies and Surfaces
Prof. Rodolfo Miranda

miliKelvin STM
Prof. Amadeo L. Vázquez de Parga

Nanoarchitectures at surfaces
Dr. David Écija

Spin-Polarized low T STM
Dr. Fabián Calleja

Surface Reactivity
Prof. Juan M. Rojo

Photonic STM
Dr. Roberto Otero

Modelling
Prof. Fernando Martín

Nanotribology

SNOM
Dr. Daniel Granados

Theoretical Study of Molecules on Surfaces
Prof. Manuel Alcamí

About the programme

The use of advanced microscopies and spectroscopies with atomic resolution is essential to characterize matter at the nanoscale. The scientists involved in this programme develop at IMDEA advanced Scanning Probe Microscopes, mostly STM, AFM and Photoelectron Microscopy to investigate problems such as the epitaxial growth of graphene, the chemical functionalization of graphene, the design of metal-intercalated graphene heterostructures, the characterization of topological insulators, the self-assembly of molecules at surfaces, the on-surface synthesis of nanomaterials from molecular precursors, the design of surface-confined metal-organic architectures, the in-situ fabrication and response of nano-catalysts, the realization of scanning tunnelling spectroscopy and inelastic scanning tunnelling spectroscopy at the level of single molecules, the investigation of tip-induced electroluminescence or the spin polarized imaging of magnetic nanostructures. Friction at the nanoscale and theoretical modelling are also involved. Activities of this programme have implications for aeronautics, electronic, magnetic, sensory, and energy applications.

Scanning Probe Microscopies and Surfaces

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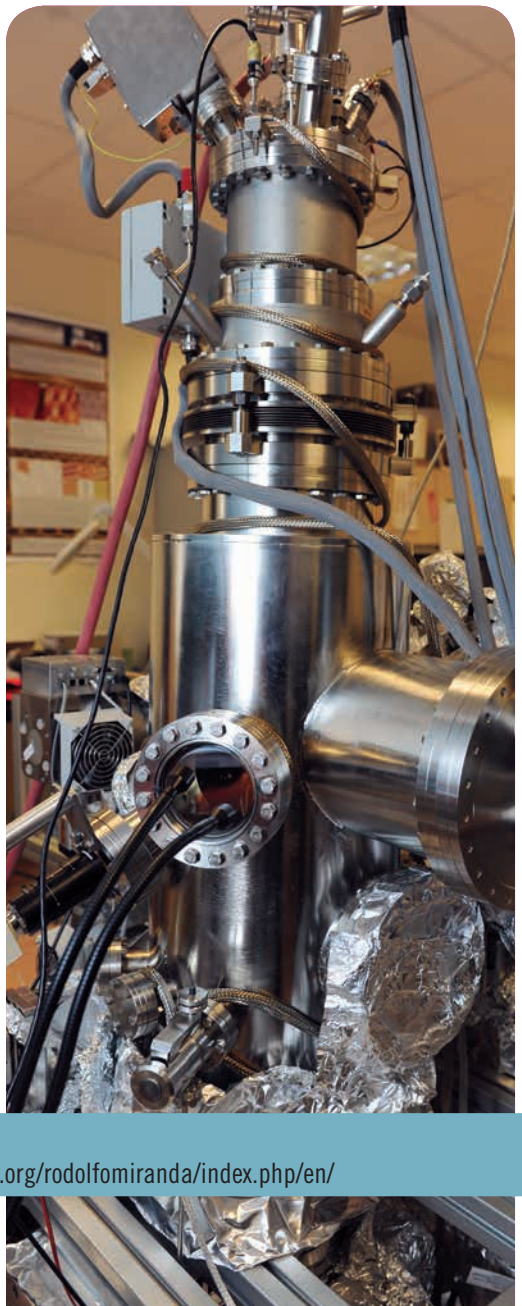

Group webpage:
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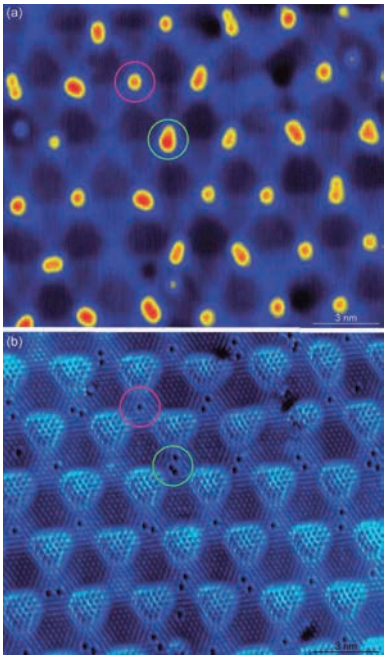
Research Lines

The use of advanced microscopies and spectroscopies with atomic resolution is essential to characterize matter at the nanoscale. Our main tool for studying nanostructures at the atomic scale is low temperature scanning probe microscopy. The microscopes enable us to image, manipulate, and detect the local properties of nanoscale objects with picometer resolution under extreme conditions, i.e. in ultra-high vacuum, at temperatures down to 700mK and in magnetic fields up to 3T. We measure electronic, vibrational and optical excitations, magnetic interactions and forces, manipulate single atoms and molecules to assemble functional nanostructures.

We investigate problems such as the epitaxial growth of graphene, its spatially-resolved electronic structure or its chemical functionalization, the investigation of tip-induced electroluminescence of molecules, its Kondo response or the spin polarized imaging of magnetic nanostructures.

- Atomic scale tunneling microscopy and spectroscopy
- Dynamics at surfaces
- Fundamental properties of low dimensional systems and quantum materials
- Magnetism of nanostructures
- Molecular nanoscience at surfaces

High yielding and extremely site-selective covalent functionalization of graphene. We describe a method to functionalize graphene covalently with 92% yield and 98% site-selectivity and strict spatial periodicity on the nanometer scale. This method could be extended to other functional molecules. Fig. 3



(a) STM image (17 _ 12 nm$_2$, V_b = +1.7 V, I_t = 10 pA) acquired after exposing the sample at 374 K to 1080 L of CH_3CN. (b) STM image of the same area at different tunnelling parameters (17 _ 12 nm$_2$, V_b = +2 mV,I_t = 800 pA). The magenta and green circles highlight single or triple functionalized HCP-Top areas.

highlight

Imaging of 2D Materials

GROUP LEADER

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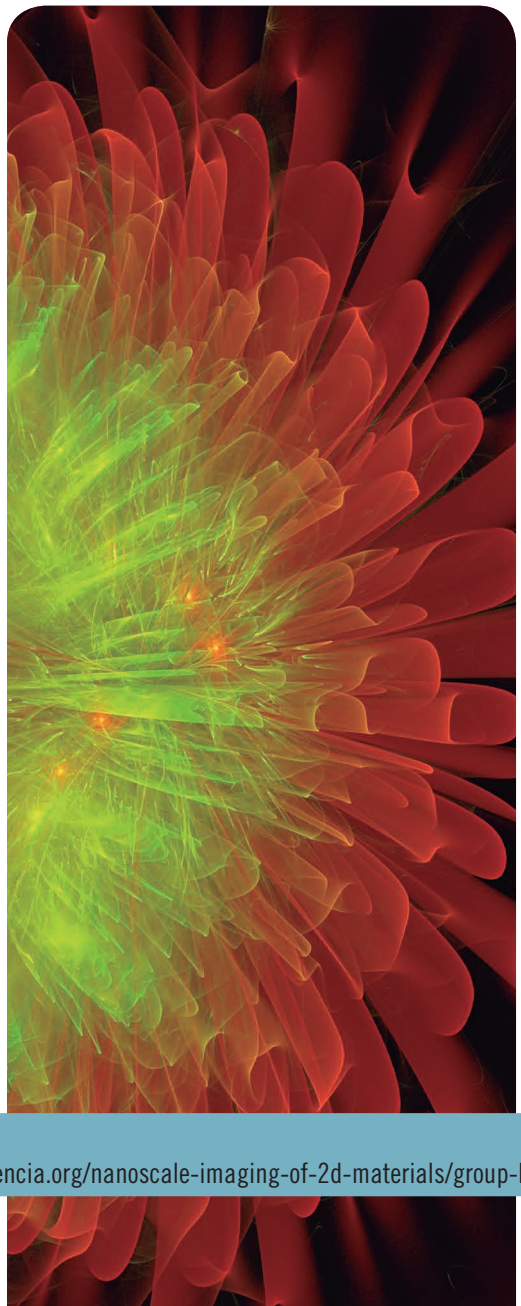

Group webpage:
http://www.imdeananociencia.org/nanoscale-imaging-of-2d-materials/group-home

Research Lines

The group is working on the characterization by means of low temperature scanning tunnelling microscopy and spectroscopy (LT-STM/STS) the surface of epitaxial 2D materials and topological insulators.

Chemistry on graphene

We are exploring the covalent bonding of chemical species to the epitaxial graphene in ultra-high vacuum conditions. Another research line is the use of epitaxial graphene as a playground to study the interaction between individual molecules deposited on the graphene films.

Tuning the electronic structure of graphene

We have been working on the growth of graphene on different transition metals and the resulting crystallographic and electronic properties. The intercalation of foreign atoms between graphene and the substrate opens the way for further tune the properties of the graphene overlayer.

Superconductivity

Exploring the superconductivity at the surface on thin films

Topological materials

The exploration of the properties of the surface of topological materials.

Switching the Kondo effect on TCNQ through a catalytic reaction in CH2CN functionalized graphene on Ru(0001). A reversible chemical reaction between TCNQ and CH2CN* was achieved on graphene/Ru(0001) under ultra-high vacuum conditions. The resulting molecule, CM-TCNQ, presents a different electronic configuration from TCNQ, preventing its Kondo resonance. Therefore, this reaction can be viewed as a controlled Kondo switch.

Topographic STM image of a TCNQ/TCNQ dimer and a TCNQ/TCNQ-CH2CN species on gr/Ru(0001) and corresponding Kondo intensity distribution map. Notice the missing Kondo signal from TCNQ-CH2CN. (ACS Nano 2018)

highlight

Spin-Polarized low T STM

GROUP LEADER

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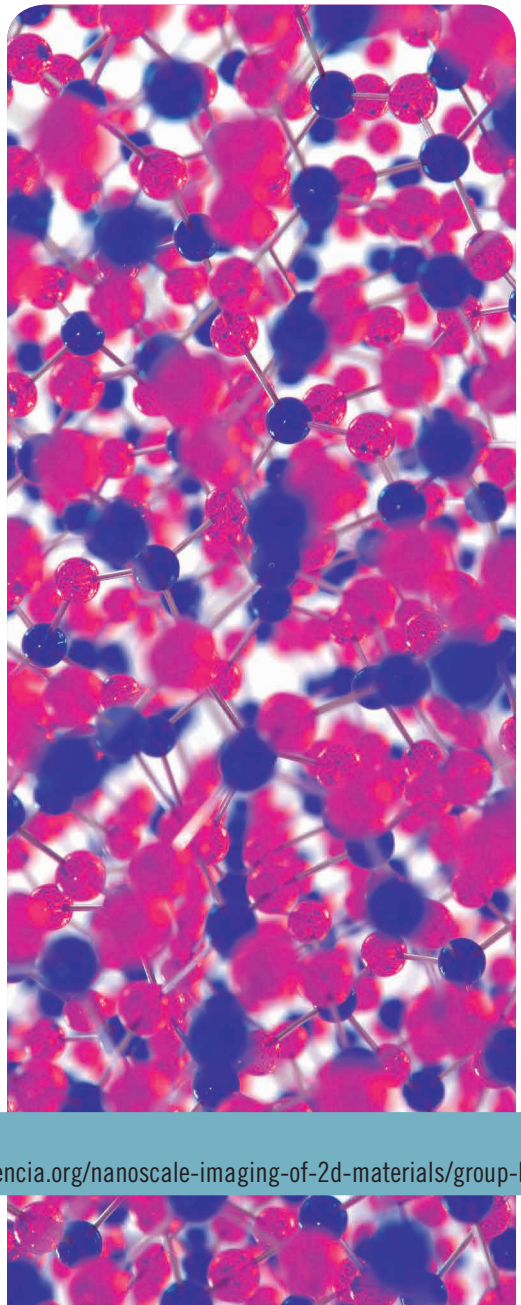
Cosme González



Group webpage:
http://www.imdeananociencia.org/nanoscale-imaging-of-2d-materials/group-home

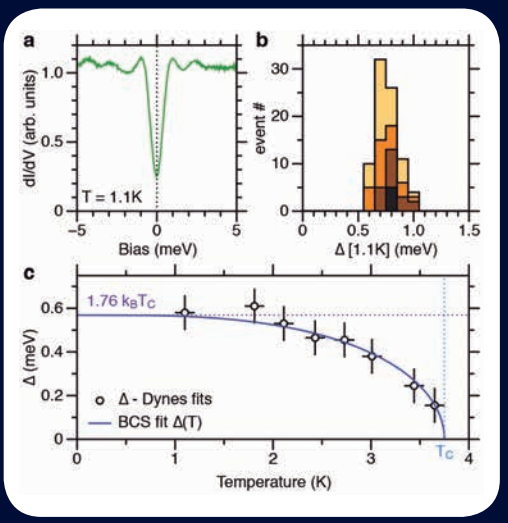
Research Lines

Our research activity in IMDEA Nanoscience is focused on the electronic and magnetic properties of metal supported graphene and their modification by interaction with organic molecules or heavy metal atoms. In particular we have explored the chemical functionalization of graphene with spatial control at the atomic level, as well as the enhancement of its spin-orbit coupling to gain control over its magnetic properties. These topics could contribute to the development of a graphene-based chemistry in general, and graphene-based spintronic devices in particular.

Our experimental approach starts with the sample preparation and characterization in Ultra High Vacuum (UHV) conditions followed by its subsequent study by means of cryogenic Scanning Tunnelling Microscopy (STM) and spectroscopy (STS). In order to access the magnetic properties we can apply external magnetic fields and prepare magnetic STM tips (also in our UHV system) that allow us to perform spin-polarized measurements (SP-STM). We are also developing a method to form superconducting structures at the STM tip apex, to gain further control on the tip electronic structure.

Our future research will pursue a deeper understanding of the electronic and magnetic properties of 2D systems in general, trying to extend our present research on metal-supported graphene to non-metallic substrates, like SiC or hBN, and also to other 2D systems like Transition Metal Dichalcogenides (TMDs). The use of non-metallic substrates will allow the possibility of transport measurements in addition to our current STM setup, towards the development of 2D-based devices in collaboration with other groups of the institute.

Controllable superconducting (SC) functionalization of tungsten STM tips on metal-supported graphene. The functionalization is achieved by means of voltage pulses on graphene, resulting in a SC nanostructure based on tungsten and carbon at the tip apex. Superconductivity is probed by measuring the BCS gap in the STS spectra. Temperature and magnetic field evolution reveal a transition temperature close to 3.7 K and a perpendicular critical field well above 3T. The method is reproducible (20% success rate) and reversible by tip manipulation on clean metallic surfaces. The nature of the nanostructure is currently being investigated by SEM, while at the same time the SC tips are being used to study molecular Kondo lattices.



a) STS spectrum showing the superconducting gap at 1.1K of a functionalized tip. b) Histogram of gap width obtained for 83 different SC tips, recorded on different surfaces (different color) at 1.1K. c) Temperature evolution of gap width and corresponding BCS fit.

highlight

Nanoarchitectures at Surfaces

GROUP LEADER

Dr. David Écija

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(tenure track)

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Previous Position: Technical University of Munich, Germany

Researcher ID:
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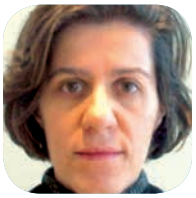
POSTDOC



Dr. Esther Carrasco
ICMM-CSIC, Spain

Dr. Christin David
DTU, Denmark

PhD STUDENTS

Borja Cirera
(co-supervised with Prof. R. Miranda

Ana Sánchez Grande

Daniel Moreno

TECHNICIAN

Isabel Ortiz

Group webpage:
http://ecija.hol.es

Research Lines

Our group is focused on the visualization and understanding of physico-chemical processes on surfaces, including three main lines of research:

1. Surface-confined metal-organic materials. Our main interest is to rationalize the coordination chemistry of functional metals like lanthanides on surfaces, creating unique architectures with advanced functionalities for sensing, catalysis, light emission and nanomagnetism.

2. On-surface synthesis of functional nanomaterials. Here we focus on the exploration of unprecedented chemical aiming at the design of novel 2D soft materials.

3. Nanocatalysis for energy applications. We pursue the on-surface design and atomistic characterization of metal-oxide nanocatalysts of relevance for water splitting and CO2 reduction.

J. Am. Chem. Soc., **2017**, 139 (40), pp 14129–14136

Abstract: Expanded porphyrins are large-cavity macrocycles with enormous potential in coordination chemistry, anion sensing, photodynamic therapy, and optoelectronics. In the last two decades, the surface science community has assessed the physicochemical properties of tetrapyrrolic-like macrocycles. However, to date, the sublimation, self-assembly and atomistic insights of expanded porphyrins on surfaces have remained elusive. Here, we show the self-assembly on Au(111) of an expanded aza-porphyrin, namely, an "expanded hemiporphyrazine", through a unique growth mechanism based on long-range orientational self-assembly. Furthermore, a spatially controlled "writing" protocol on such self-assembled architecture is presented based on the STM tip-induced deprotonation of the inner protons of individual macrocycles. Finally, the capability of these surface-confined macrocycles to host lanthanide elements is assessed, introducing a novel off-centered coordination motif. The presented findings represent a milestone in the fields of porphyrinoid chemistry and surface science, revealing a great potential for novel surface patterning, opening new avenues for molecular level information storage, and boosting the emerging field of surface-confined coordination chemistry involving f-block elements.

highlight

Fundamental Properties of Low Dimensional Systems and Quantum Materials

GROUP LEADER

Prof. Roberto Otero
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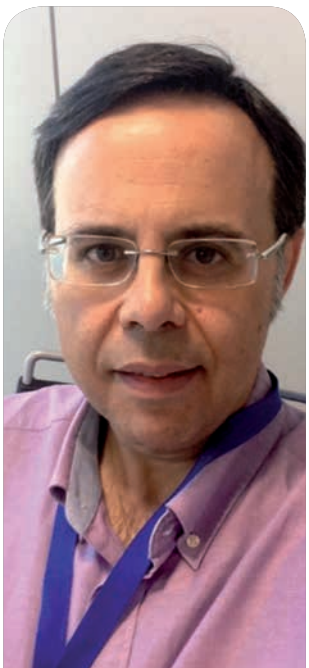


Group webpage:
http://www.imdeananociencia.org/home-en/people/item/roberto-otero-martin

Research Lines

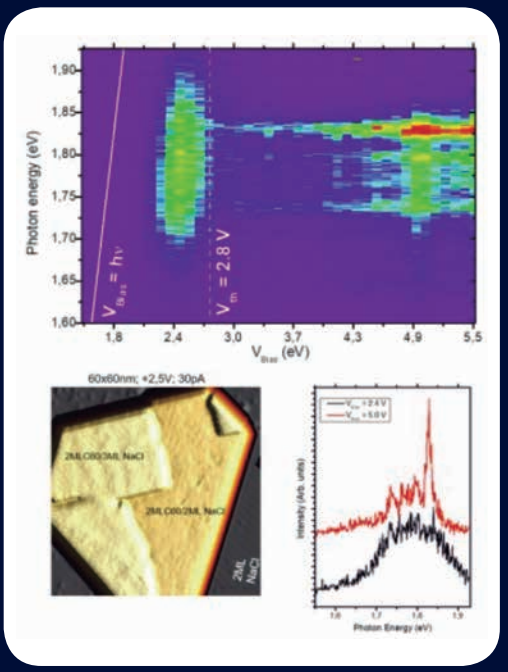
In our group we fabricate low-dimensional materials and quantum systems by deposition of organic and inorganic materials on solid surfaces, and investigate their unique properties by Low-Temperature Scanning Tunnelling Microscopy, Spectroscopy and Luminescence. In particular, we are interested in:

- Effects of quantum confinement within nanostructures (discretization of energy levels, quantization of effective masses). Our recent investigations have unraveled the discretization of energy levels in graphene quantum boxes and the origin of the finite mass of electrons confined in such nanostructures *(Phys. Rev. B, submitted).*

- Luminescence of single molecules excited by STM. We have added to our STM a system to collect the light emitted from the tunneling junction due to the injection of hot carriers. The experimental setup has already been tested with individual fullerene nanocrystals *(in preparation)*, and we are now moving to individual molecules.

- Interaction of spin polarized electrons with organic nanostructures. The interaction between organic molecules and the electron sea at solid surfaces leads to interesting electronic phenomena such as the existence of Kondo resonances or the existence of 1D electronic channels for interfacial electrons. We intend to explore the new effects that be expected when such organic molecules are supported by substrates with a non-trivial spin texture.

STM-induced luminescence of individual C60 nanocrystals as a function of the bias voltage. The light emission can be tuned from purely plasmonic (broad spectra a lower bias voltages) to purely excitonic (sharp peaks in the spectra), where the Raman side bands can be observed.



highlight

Modelling Physical Properties of Nanostructures

GROUP LEADER

Prof. Fernando Martín

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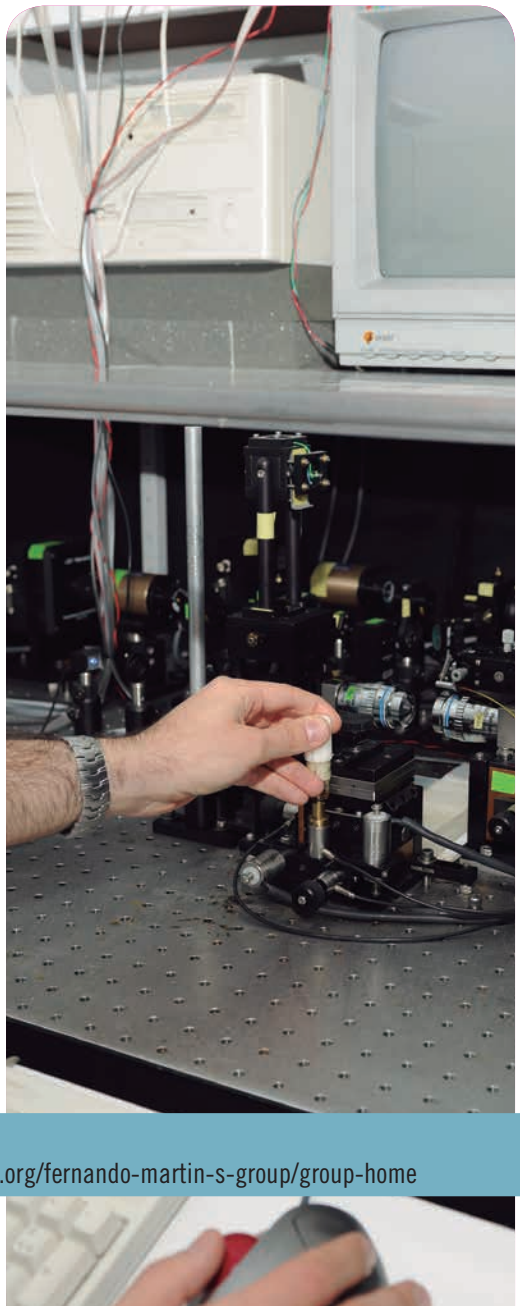
Marcos del Cueto



Group webpage:
http://nanociencia.imdea.org/fernando-martin-s-group/group-home

Research Lines

The research carried out by the group has mainly focused on:

1. The theoretical and computational modeling of photoexcitation and photoionization processes in atomic, molecular and solid-state systems induced by synchrotron radiation and ultrashort laser pulses with femto- and attosecond duration, with the aim, of imaging and controlling ultrafast electron and nuclear dynamics occurring in these systems ,and

2. The study and theoretical prediction of properties of materials and nano-objects of complex molecular systems, aggregates and fullerenes, isolated or deposited on metallic and nonmetallic surfaces, with emphasis on problems with potential interest in chemistry and biology and the design of novel two-dimensional materials, including graphene.

This, in close collaboration with prestigious Spanish and international experimental groups.

The group has published more than 400 articles in international journals, among them several in the journals Science (4) Nature (2), Chemical Reviews (1), Nature Chemistry (2), Nature Physics (2), Nature Photonics (1), Nature Communications (4), Proceedings of the National Academy of Science (3), Physical Review Letters (31), Angewandte Chemie (2), Journal of the American Chemical Society (3), ACS Nano (1), Advanced Materials (1), Small (1), and Nano Letters (1) as well as several reviews and book chapters.

Advances in attosecond science have led to a wealth of important discoveries in atomic, molecular, and solid-state physics and are progressively directing their footsteps toward problems of chemical interest. In this review, we detail the application of attosecond methods to the investigation of ultrafast processes in molecules, with emphasis in molecules of chemical and biological interest. The measurement and control of electronic motion in complex molecular structures is a formidable challenge, for both theory and experiment, but will indubitably have a tremendous impact on chemistry in the years to come. *Chemical Reviews* **117**, 10760. **DOI: 10.1021/acs.chemrev.6b00453**

highlight

Theoretical Study of Molecules on Surfaces

GROUP LEADER

Prof. Manuel Alcamí
Associate Research Professor

PhD: Universidad Autónoma de Madrid, Spain
Double Affiliation: Universidad Autónoma de Madrid, Spain

Research Lines

His field of expertise is the theoretical study of molecules both in gas phase and deposited on surfaces.

His current research lines are:

- Theoretical study of self-assembly and charge transfer processes of molecules deposited on surfaces. We have focused our research in this topic in donor or acceptor organic molecules as TCNQ or TTF deposited on metal surfaces.
- Carbon nanostructures (fullerenes, nanotubes and graphene), in the last years we have developed simplify models to understand the stability of charged fullerenes, fullerene derivatives *(J. Am. Chem. Soc.* **139**, 1609, 2017) or He-decorated fullerenes.
- Fragmentation and stability of highly charged and highly excited molecules, in his field we have performed Molecular Dynamic simulations on excited states to describe the coupling between nuclear and electronic dynamics, or to determine the energy deposit in ion collisions with biomolecules.

Group webpage:
http://www.imdeananociencia.org/home-en/people/item/manuel-alcami-pertejo

programme

Transport in 2D Systems

Programme Manager: **Prof. Jose Luis Vicent**

Research lines

Transport in 2D Systems
Prof. Jose Luis Vicent

Graphene
Prof. Francisco Guinea

2D Materials
Dr. David Pérez de Lara
Dr. Andrés Castellanos-Gómez

Electrical Conductivity of Single Molecules
Prof. Nicolás Agrait
Prof. Teresa González

Nanostructured superconductors
Dr. Elvira M. González

About the programme

The scientific developments in 2D materials other than graphene have led to many discoveries and potential applications that require a rearrangement of the efforts at IMDEA to move efficiently in this direction. This Programme was created to react quickly to these trends by attracting further scientists and to concentrate our efforts in a field where already our specific experimental strengths in Nanooptics, Nanophotonics, measurement of transport properties and Nanofabrication techniques, as well as in theoretical modelling could give us a better.

Transport in 2D Systems

GROUP LEADER

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PhD STUDENTS
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Group webpage:
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Research Lines

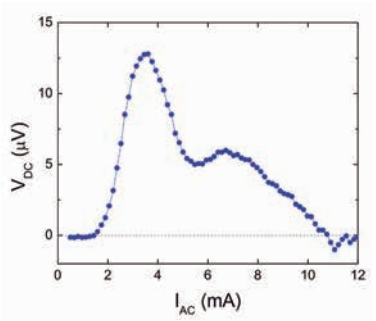
Our group has been working last year in three main research lines:

1. **Nanostructured superconductors:** Fabrication, structural characterization and transport of nanostructures based on superconducting/magnetic hybrids. We have singled out the possible pinning mechanisms in these hybrids. **Interestingly superconducting** vortex flow probes the magnetic state; i.e. magnetoresistance measurements detect the magnetic state of very small nanomagnets. *(Supercond. Sci. Technol.* **30 (2017)** *025014).*

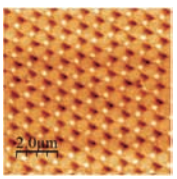
2. **Transport in 2D single crystals:** Layered 2D single crystals are the perfect playground for studying relevant effects in different scenarios. For example, we have studied the angle-dependent vortex helical instability. We have found that the vortex helical instability plays a role in dissipation even out of the force-free configuration. *(Phys. Rev.* **B 95**, *(2017) 224510).*

3. **Plasmonic devices:** Fabrication and characterization of plasmonic devices including magnetoplasmonic devices. As a relevant example we have studied the local heating effects in surface plasmon resonance sensors using low power lasers *(Sensors and Actuators* **B 243** *(2017) 806).*

Spin–Ice frustrated nanomagnets and topological protected ratchet effect: We have fabricated a ratchet device using a honeycomb array of Co bars embedded in a superconducting film. The magnetic states of this array follow the pseudo spin-ice rules: Two in- one out or one out –two in. We have determined by micromagnetic simulation and MFM that each vertex in the array consists of two charged Néel walls. These produce robust magnetic half vortices. The divergence of the magnetization associated to the magnetization rotation at the charged Néel walls generates the stray fields that will provide a magnetic potential for superconducting vortices. We show that a ratchet effect develops when superconducting vortices move on this spin-ice array. A rectifier effect occurs. An alternating force on the superconducting vortex lattice yields a net motion of the vortex lattice. Input alternating current (ac) turns out an output direct voltage.



Superconducting ratchet effect: Input AC current Output DC voltage



MFM Spin–Ice type II

highlight

Graphene

GROUP LEADER

Prof. Francisco Guinea

Senior Research Prof.

PhD: Universidad Autonoma de Madrid

Previous Position: Instituto de Ciencia de Materiales de Madrid-CSIC, Spain

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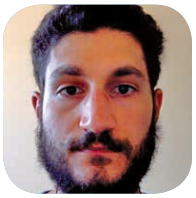

Dr. Tommaso Cea
University of Rome, Italy

PhD STUDENTS

Francesca Finocchiaro
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Group webpage:
http://www.imdeananociencia.org/graphene/group-home

Research Lines

The main goal of the research done within the group is the development of models which describe the properties of novel two dimensional materials. The best known case is graphene, which permits the fabrication of films of widths comparable to the radius of a single atom. After the synthesis of graphene, many other two dimensional materials have been fabricated, with a broad range of properties.

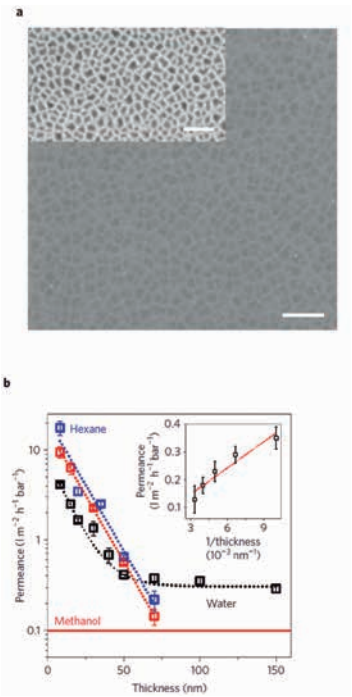
Finally, layers of different materials can be combined, leading to "metamaterials" with pre-designed features.

The models developed in the group emphasize those properties which are unique to these materials, and they include geometrical and structural features, electronic properties, and the possible formation of superconducting and magnetic phases. The group also considers devices based on these materials, highlighting those with functionalities which cannot be achieved in devices fabricated using other materials.

The research being carried out is expected to be useful for descriptions of these materials at the atomic scale, and also in samples of sizes much larger than the separation between atoms. A wide variety of techniques in theoretical physics are applied, from numerical calculations to the use of topological arguments, or methods based on the renormalization group.

The models developed in the group are checked against experimental results, and they attribute to their interpretation. A significant fraction of the research done by the group is carried out in collaboration with experimental teams.

Ultrathin graphene-based membrane with precise molecular sieving and ultrafastsolvent permeation. The potential of ultrathin GO laminates for organic solvent nanofiltration is demonstrated by showing >99.9% rejection of small molecular weight organic dyes dissolved in methanol. **a**, SEM image of an ultrathin 8-nm-thick HLGO membrane on an Anodisc alumina support. Scale bar, 1 _m. Inset: SEM image of bare alumina support. Scale bar, 500 nm. **b**, Thickness dependence of permeance for methanol, hexane, and water through HLGO membranes. Red and blue dotted lines are the best exponential fits. *This work significantly expands possibilities for the use of GO membranes in purification and filtration technologies. Nature Materials* **volume 16**, pages 1198–1202 (2017)



highlight

2D Materials

Dr. Andrés Castellanos-Gómez
Assistant Research Prof. (tenure track)

PhD: Universidad Autonoma de Madrid. Spain
Previous Position: Delft University of Technology, the Netherlands

Dr. David Pérez de Lara
Assistant Research Prof. (tenure track)

PhD: Istituto di Cibernetica del CNR, Italy / Universidad Autonoma de Madrid
Previous Positions: Universidad Complutense de Madrid, Spain. Istituto di Cibernetica del CNR, Italy. ESTEC, European Space Agency, The Netherlands

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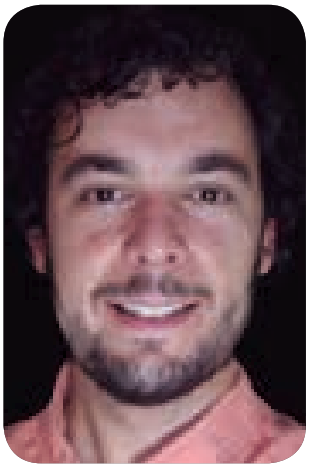

Group webpage:
http://www.imdeananociencia.org/2d-materials-devices/group-home

Research Lines

1. Isolation and characterization of novel and unexplored 2D materials. We mechanically exfoliate and investigate 2D materials (see *(Nanotechnology 28 455703 (2017))* and novel layered materials as naturally occurring van de Waals heterostructures like franckeite (see Beilstein Journal of Nanotechnology (2017), 8, 2357-2362, doi:10.3762/bjnano.8.235). We developed a differential reflectance and transmittance spectroscopy setup with a lateral resolution of ~1 μm in the visible and near-infrared part of the spectrum to determine the number of layers of 2D materials and characterize the fundamental optical properties, such as excitonic resonances (see *Journal of Physics D: Applied Physics 50(7) 074002 (2017)*).

2. Optoelectronic devices based on 2Ds: we study the physical properties of photodetectors, photodiodes and solar cells based on atomically thin materials. We have fabricated and characterized 2D materials based devices like hybrid stacks between 2D materials and other functional materials with different dimensionality (see 2D Materials 4, (2017) 034002, (DOI:10.1088/2053-1583/aa797b) or purely 2D devices like vertical homojunctions made by stacking few-layer flakes of MoS2 *(Journal of Materials Chemistry C 5(4) 854-861 (2017)).*

3. Strain engineering: we are very interested in tailoring the optical and electronic properties of 2D materials by means of mechanical deformations. Strain engineering provides a powerful route to modify the electrical and optical properties in 2D materials and thus it is an excellent candidate to be used as an external tuning knob. (see *NPJ 2D Materials and Applications 1, 10 (2017)* **DOI:10.1038/s41699-017-0013-7**).

Designer heterostructures can now be assembled layer-by-layer with unmatched precision thanks to the recently developed deterministic placement methods to transfer two-dimensional (2D) materials. This possibility constitutes the birth of a very active research field on the so-called van der Waals heterostructures. Moreover, these deterministic placement methods also open the door to fabricate complex devices, which would be otherwise very difficult to achieve by conventional bottom-up nanofabrication approaches, and to fabricate fully-encapsulated devices with exquisite electronic properties. The integration of 2D materials with existing technologies such as photonic and superconducting waveguides and fiber optics is another exciting possibility. Here, we review the state-of-the-art of the deterministic placement methods, describing and comparing the different alternative methods available in the literature, and we illustrate their potential to fabricate van der Waals heterostructures, to integrate 2D materials into complex devices and to fabricate artificial bilayer structures where the layers present a user-defined rotational twisting angle *(Chem. Soc. Rev., 2018, 47, 53)*.

highlight

Molecular Electronic

GROUP LEADER

Prof. Nicolás Agraït

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VISITING RESEARCHER

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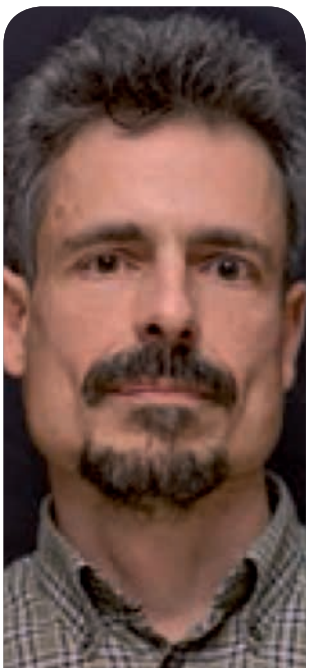
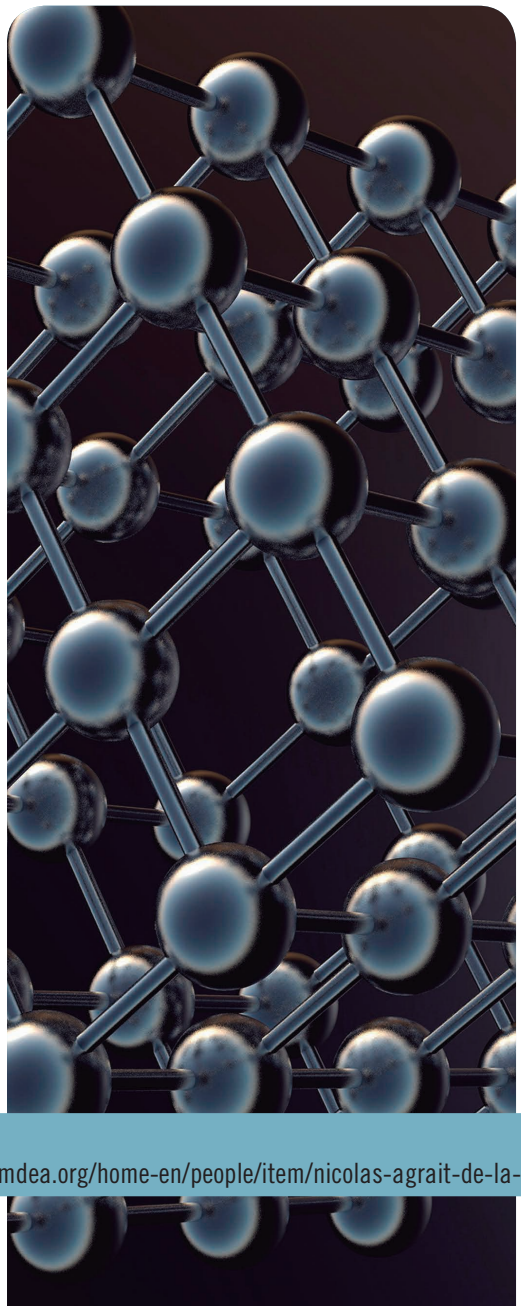




Group webpage:
http://www.nanociencia.imdea.org/home-en/people/item/nicolas-agrait-de-la-puente

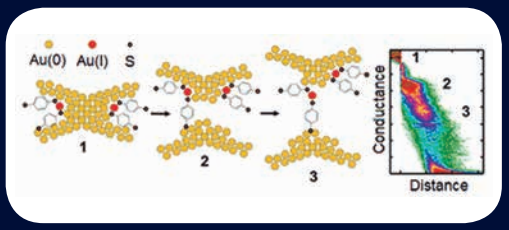
Research Lines

Using scanning tunneling microscopes (STMs) made in house, we assemble and study circuits formed by a single organic molecule chemically bond to two metallic electrodes. We work mainly in ambient conditions, and explore the electrical properties of these molecular circuits, including their thermopower, this is the electrical voltage created between the extremes of the molecule under a thermal gradient.

More specifically, we study:

- Electrical properties of organic molecule families: oligo(phenyl ethynylene)s,oligoynes, phthalocyanines, porphyrins... (JACS 2013, JACS 2014, JACS 2015, JACS 2018).
- Thermo power of single-molecule junctions: we explore to ability to a single molecule of different compounds to generate an electrical potential when they are under a thermal gradient (Nano Lett. 2013, Nature Mater. 2016, Chem. Soc. Rev. 2016).
- Key factors involved in the formation and stability of molecular junctions (J. Chem. Phys. C 2013, J. Am. Soc. 2013, Chem. Soc. Rev. 2015, J. Phys. Chem. C 2018).
- Graphene-like molecules containing non-hexagonal rings (Chem. Sci. 2017).
- Other electrode materials different from gold.

Using the break-junction technique, we show that "$Au(RS)_2$" units play a significant role in thiol-terminated molecular junctions formed on gold. We have studied a range of thiol-terminated compounds, with the sulfur atoms either in direct conjugation with a phenyl core or bonded to saturated methylene groups. For all molecules, we observe at least two distinct groups of conductance plateaus. By a careful analysis of the length behavior of these plateaus, comparing the behavior across the different cores and with methyl sulfide anchor groups, we demonstrate that the lower conductance groups correspond to the incorporation of $Au(RS)_2$ oligomeric units at the contacts. These structural motifs are found on the surface of gold nanoparticles, but they have not before been shown to exist in molecular-break junctions. The results, while exemplifying the complex nature of thiol chemistry on gold, moreover clarify the conductance of 1,4-benzenedithiol on gold. We show that true Au–S–Ph–S–Au junctions have a relatively narrow conductance distribution, centered at a conductance of $\log(G/G_0) = -1.7$. See: *J. Phys. Chem. C 2018, 122, 3211–3218*



highlight

programme

NanoMagnetism

Programme Manager: **Prof. Julio Camarero**

Research lines

Advanced Magneto-Optics
Prof. Julio Camarero

Hard Magnetic Materials
Dr. Alberto Bollero

Growth & Nanostructuring
Dr. Feng Luo

SpinOrbitronics
Dr. Paolo Perna

Epitaxial Growth
Dr. Miguel Ángel Niño

Dynamics
Dr. Francisco Terán

About the programme

The scientific activity of the Nanomagnetism Programme is at the forefront of both fundamental and applied research on magnetic nanostructures, dealing with the preparation and characterization of advanced multifunctional magnetic nanomaterials with enormous impact for our society, including sensing & information storage (spintronic & spin-orbitronic), energy production & conversion (permanent magnets), and biomedical (magnetic nanoparticles) applications.

We are equipped with a powerful battery of techniques that enable the investigation of many properties of multifunctional magnetic nanostructures, including both inorganic and organic materials, grown by Molecular Beam Epitaxy (MBE) or sputtering in ultra-high vacuum environment, as well as by chemical synthesis routes. These are ultrathin films, superlattices, or nanoparticles and their properties are characterized by morphological, chemical, structural, electronic, transport, and (mostly optic-based) advanced vectorial magnetometry techniques. Particular emphasis is paid to the growth, the magnetization reversal processes (in both quasi-static and dynamic regimes), and their magnetoresistance responses. Additionally, external large scale experimental facilities (i.e., synchrotron, neutron, or ion-accelerator sources) are often used to elucidate some fundamental aspects.

We aim at a better understanding of fabrication processes and physical properties of new materialsand functionalities as a first step towards the development of devices with custom- chosen properties, with potential for sensing, information storage, energy, and biomedical technologies.

Advanced Magneto-Optics

GROUP LEADER

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Dr. F. Javier Pedrosa
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PhD STUDENTS

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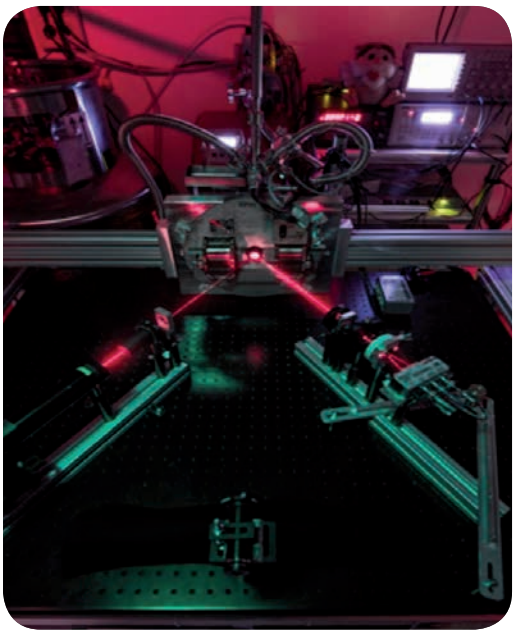
Adrián Gudín



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Group webpage:
http://www.nanociencia.imdea.org/research/research-programs/nanomagnetism/group-of-advanced-magneto-optics

Research Lines

We design and take use of advanced magneto-optic based instrumentation for nanotechnology research and development. Research is focused on low-dimensional artificial magnetic structures, such as ultrathin magnetic films and multilayers, magnetic nanostructures, magnetic nanoparticles and adsorbed molecules, with a particular emphasis on magnetization reversal processes and magnetoresitive responses.

We aim at probing and understanding both magnetization reversal and transport properties of magnetic nanostructures by systematically tuning intrinsic parameters, such as magnetic anisotropy and magnetic coupling, and extrinsic ones, like temperature and external fields (including dynamic effects). The current activities are focused on:

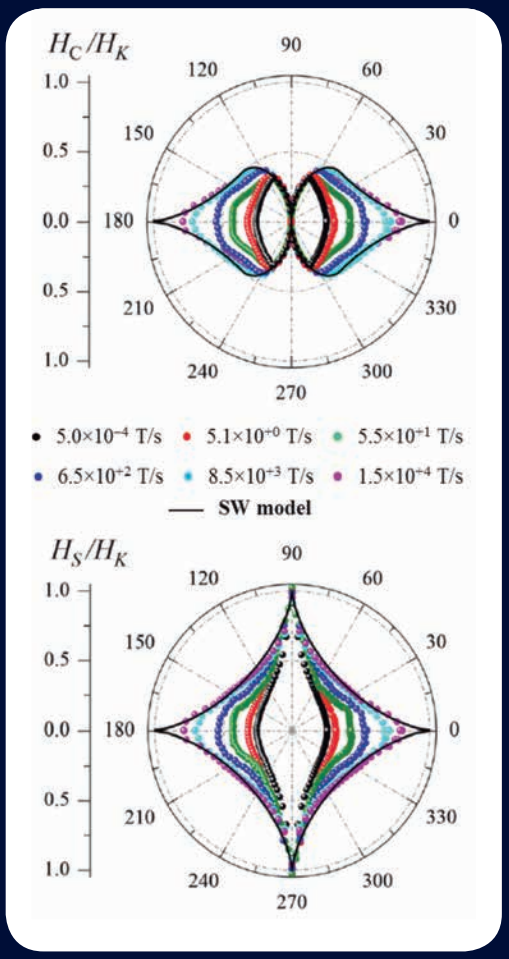
Magnetization reversal and magnetoresistive studies:

- Influence of anisotropies (in-plane vs. perpendicular) & nanostructuration;
- Static vs. dynamic and thermal effects; superparamagnetism;
- Exchange bias, spin-valves, tunnel-junctions, multiferroics, nanoparticles, molecules;

Polarization dependent element-resolved x-ray spectroscopy and microscopy studies:

- X-ray magnetic circular/linear dichroism, (XMCD/XMLD);
- X-ray photoemission electron microscopy, X-PEEM;
- Soft x-ray resonant magnetic scattering & Magnetic holography imaging;

Emerging single-particle like behaviour in thin films at dynamic regime. Angular polar-plot of dynamic coercivity (top) and switching field (bottom) of a thin film with well-defined uniaxial anisotropy, at the indicated applied field sweep rate (dH/dt). Note that the experimental data (symbols) are approaching to the ones predicted by the Stoner-Wohlfarth (SW) model (lines) as dH/dt increases *Scientific Reports* **7**, 13474 (2017).



highlight

Spinorbitronics

GROUP LEADER

Dr. Paolo Perna

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(tenure track)

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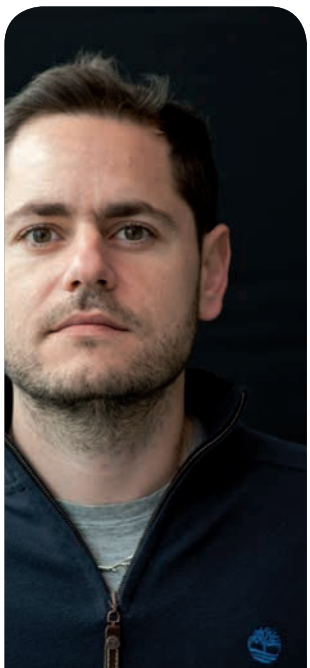

POSTDOCS

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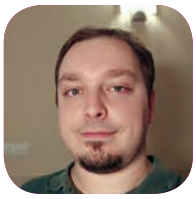

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Pablo Olleros

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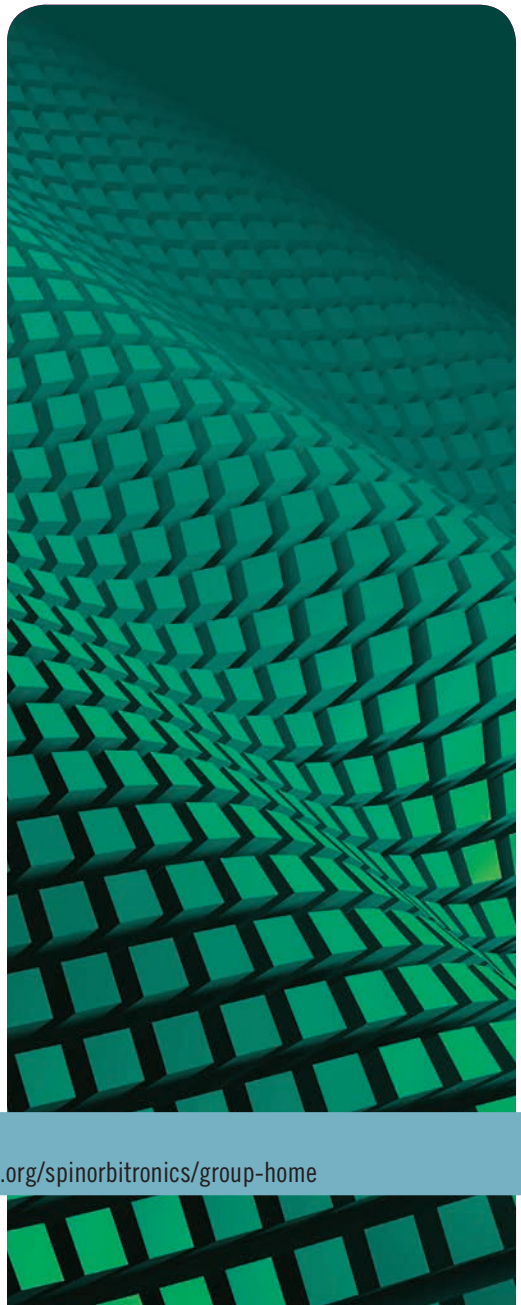


Group webpage:
http://nanociencia.imdea.org/spinorbitronics/group-home

Research Lines

The group focuses the interests on solid-state physics and material science of low dimensional magnetic materials, covering epitaxial growth, surface/interface and magnetotransport characterization, as well as nanofabrication.

The main research lines of the group are:

1. **Spin-Orbitronics functional interfaces:** investigating the growth and the structural, surface and magneto-transport properties of heterostructures in which spin-orbit coupling plays an important role. These include thin films and multilayer stacks, combining ferromagnetic (FM), antiferromagnetic (AFM), perpendicular magnetic anisotropy (PMA) systems, antisymmetric Dzyaloshinskii-Moriya interaction (DMI), as well as molecules and graphene.

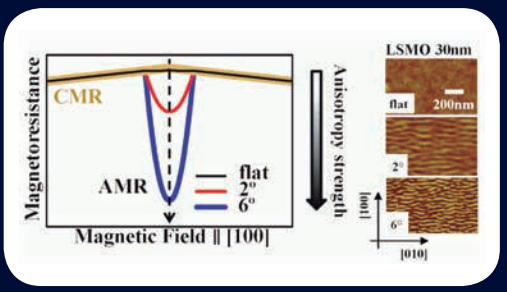
    a) ***Disentangling magnetoresistance responses in magnetic nanostructures:*** focus on the investigation of the magnetization reversal pathways vs. spin-dependent transport, in systems with tailored magnetic anisotropies (in-plane and perpendicular). *Phys. Rev B, 92, 220422(R) (2015)*; *Phys. Rev. B, 86, 024421 (2012)*; *Appl. Phys. Lett. 104 , 202407 (2014)*

    b) ***Novel hybrid (inorganic-organic) magnetic nanostructures:*** growth of artificial magnetic nanostructures; surface/interface analysis; graphene-based magnetic nanostructures. *Chem. Mater. 26, 2883–2890 (2014)*; *Nano Lett. 16, 2–7 (2016)*. *arXiv:1803.07443*

    c) ***Element and spatial resolved X-ray spectroscopy and microscopy:*** X-ray magnetic circular/linear dichroism (XMCD/XMLD), resonant magnetic reflectivity (XRMR), holography. *J. Appl. Phys. 109 (7), 07D357*.

2. **Oxide-Spintronics:** engineering artificially the surface/interface of nanostructures based on perovskite oxides (which show a wide variety of properties as half-metallicity, dielectricity, ferroelectricity, multiferroicity), with the aim to tailor their spin-dependent transport characteristics and merge in a single device the functionalities of their individual constituents. *Adv. Funct. Mater. 2017, 1700664*; *Appl. Phys. Lett.* **97**, *152111 (2010)* **J. Appl. Phys. 110, 013919 (2011).** *New Journal of Physics* **12**, *103033 (2010)*.

We find a dominant switchable magnetoresistance, at room temperature, in half metallic La0.7Sr0.3MnO3 epitaxial films that enables the realization of the manganite technological potential. This has been obtained by engineering an extrinsic magnetic anisotropy, through the use of substrates with progressively larger miscut angles, leading to an enhancement of the anisotropic magnetoresistance (AMR) signal, much larger than the other contributions such as the colossal magnetoresistance (CMR). *Adv. Funct. Mater. 2017, 1700664*



highlight

Epitaxial Growth

GROUP LEADER

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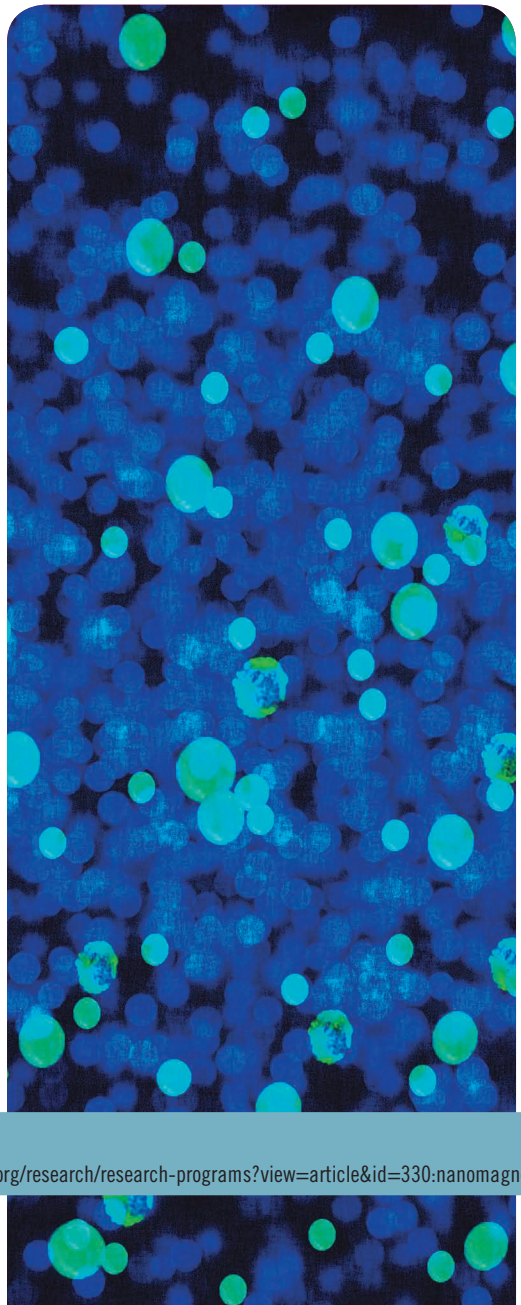


Group webpage:
http://www.imdeananociencia.org/research/research-programs?view=article&id=330:nanomagnetism

Research Lines

The main research lines in which our group is currently working are:

1. Surface magnetism and molecular chiral spintronic. We are studying the interaction of chiral molecules with surfaces, and the dependence of the adsorption and spin transfer with the enantiomer type *(Adv. Mat.* **26** *(2014), 7474).*

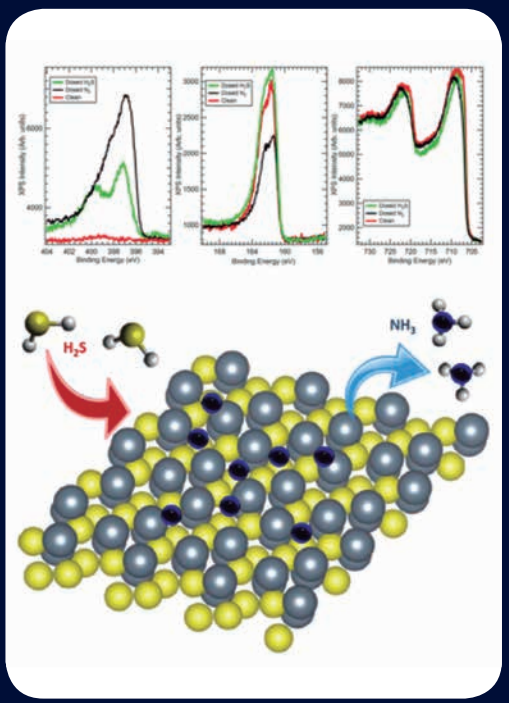
2. Prebiotic surface chemistry. Our interest is to apply Surface Science techniques to the study of chemical reactions that resemble the prebiotic iron sulfur- world *(J. Phys. Chem. B* **122** *(2017), 705-712.)*, the role of mineral surfaces on the development of complex molecules.

3. Catalytic properties of oxide surfaces. We are interested in the growth of Iron-Nickel thin films *(Phys. Rev. B* **94** *(2016), 085402)* and its oxy-hydroxides species for photocatalysis applications. We are interested too in the catalytic effects of Aluminium oxides for the polymerization of aminoacids on surfaces.

4. Molecular Beam Epitaxy growth of thin films and electronic structure characterization by X-ray Photoemission spectroscopy of surfaces and interfaces of 2D materials *(Nanotechnology* **28** *(2017), 455703)* and photovoltaic materials *(Organic Electronics (2018):* **doi.org/10.1016/j.orgel.2018.05.007**).

h i g h l i g h t

The synthesis of basic organic molecules needed for the origin of life, from elemental inorganic atoms or molecules present in the early stages of the Earth evolution such as N_2, CO, or H_2, preceded the formation of the first complex biomolecules. We have studied the effect of the iron sulfide pyrrothite mineral surface in the dissociation of N_2 and production of one of the basic molecule for life, ammonia NH_3. *(J. Phys. Chem. B* **122** *(2017), 705-712.)*



Growth & Nanostructuring

GROUP LEADER

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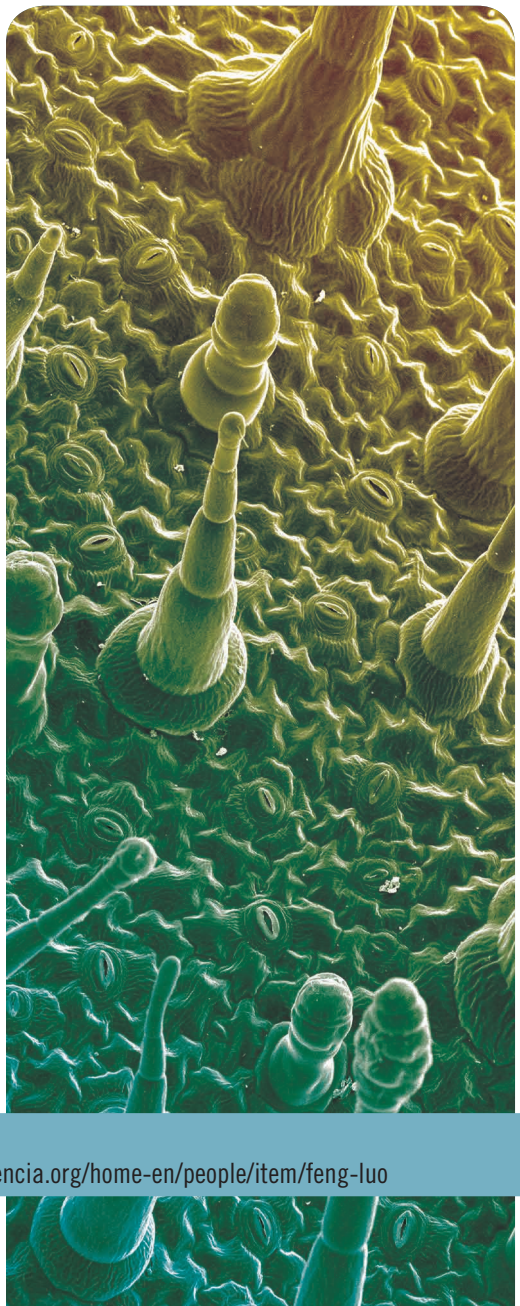


Group webpage:
http://www.imdeananociencia.org/home-en/people/item/feng-luo

Research Lines

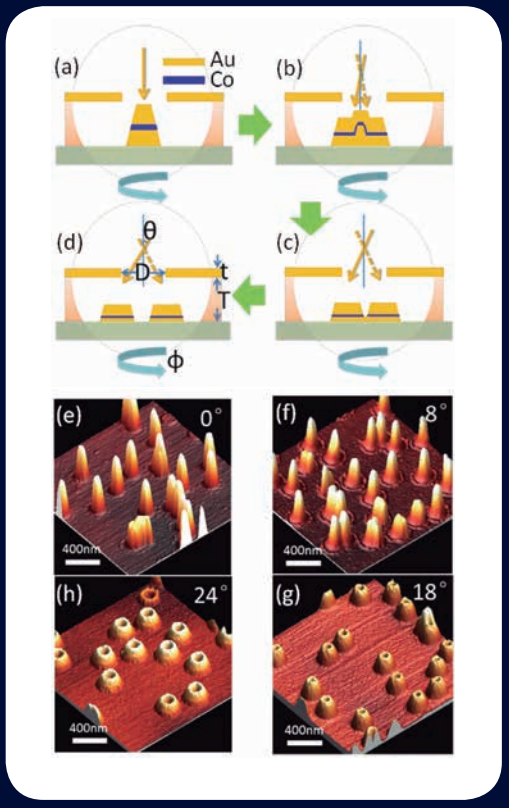
Our group has interests in three main research lines:

1. Micro/Nano Fabrication and Ultra-Precision Manufacturing for Applications in Magnetic Hard Disk Storage, Magnetic Random Access Memory (MRAM) and Magneto-Optical Sensors: Lithography methodologies including Electron beam, EUV Interference, Nanoimprinting and Two photon Polymerization 3D imprinting for Magnetic Recording Pattering such as "Nanoscale perpendicular magnetic island arrays fabricated by extreme ultraviolet interference lithography", Appl. Phys. Lett., 92 (10), 102505 (2008); "Template-directed self-assembled magnetic nanostructures for probe recording", Appl. Phys. Lett., 95, 023116 (2009); Sub-20 nm STT-MRAM key technologies for patterning and etching process.

2. Tuning Physical Properties by Design and Controlling: Interface Engineering at Atomic Scale and Lithography Patterning: "Perpendicular magnetic anisotropy induced by tetragonal distortion of FeCo alloy films grown on Pd (001)",Phys. Rev. Lett., 96 (25), 257205 (2006); "Tuning the perpendicular magnetic anisotropy in tetragonally distorted $Fe_{1-x}Co_x$ alloy films on Rh (001) by varying the alloy composition", Appl. Phys. Lett., 91 (26), 262512 (2007); "Magnetoplasmonic Nanorings as Novel Architectures with Tunable Magneto-optical Activity in Wide Wavelength Ranges" Advanced Optical Materials, 2, 612 (2014).

3. Advanced Characterization Techniques Based on X-ray and Electrons: "Element-Specific Hysteresis Loop Measurements on Individual 35 nm Islands with Scanning Transmission X-Ray Microscopy", J. Nanosci. Nanotechnol.12, 2484 (2012); "Strongly enhanced orbital moment by reduced lattice symmetry and varying composition of $Fe_{1-x}Co_x$ alloy films", Phys. Rev. Lett., 100 (3), 037205 (2008); "Correlation between magnetic spin structure and the three-dimensional geometry in chemically synthesized nanoscale magnetite rings", Applied Physics Letters, 92 (22), 222508 (2008); "Active magnetoplasmonic split-ring/ring nanoantennas". Nanoscale 9, 37 (2016).

Morphology tuning of a series of Au/Co/Au nanostructures which gradually evolve from disk to ring allows controlling their optical and magneto-optical spectral responses in the visible and near infrared ranges. Bimodal resonant behavior in the optical and MO activity is observed, and by either tuning the morphological parameters, or the distribution of the ferromagnetic constituent, the spectral response of MO activity shows a good tunability and fine control, not only in a wide wavelength range, but also in the relative ratio of the Low-energy and High-energy modes, which has great potential in detailed design for telecommunication and sensor devices.



highlight

programme

Nanoscience for Critical Raw Materials

Programme Manager: **Prof. Alberto Bollero**

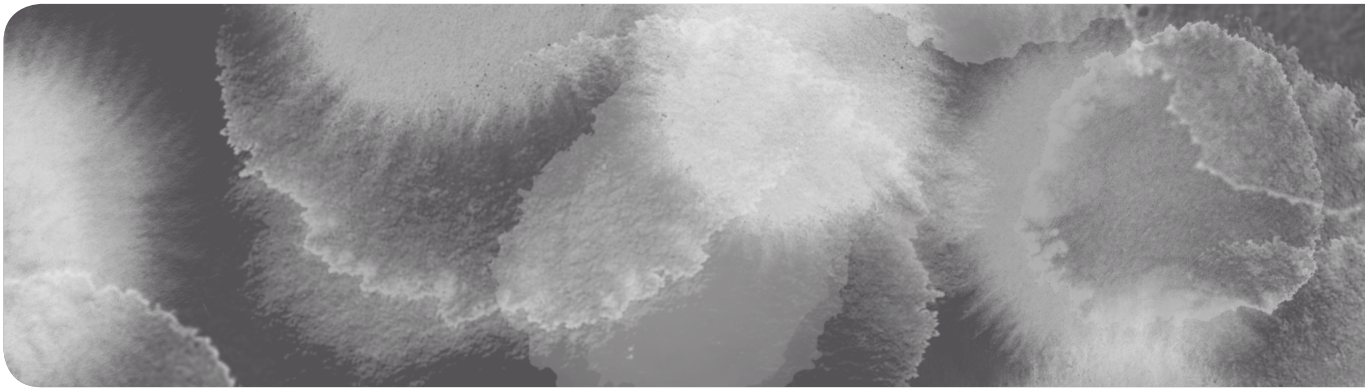
Research lines

Rare-Earth free Permanent Magnets
Dr. Alberto Bollero

Energy Harvesting
Dr. Juan Cabanillas-González

Multifunctional Materials

Recycling



About the programme

The Nanoscience for Critical Raw Materials Programme is based on four main pillars comprising fundamental research and applied development done in close collaboration with international companies:

- Rare earth-free permanent magnets.
- Recycling: "closing the loop" in industrial plants.
- Multifunctional materials.
- Energy harvesting.

This Programme finds its origin in the necessity of searching for alternatives to strategically materials (e.g. rare-earths), which are extremely important in our technological development, and without natural resources in Europe. Three important premises are considered:

(a) Development of basic research with perspective of translation to industry and end-users.
(b) Up-scalability of the procedures to avoid that achieved advances stop at the laboratory.
(c) Sustainability through recycling and efficient use of the resources.

The research begins with the preparation and study of thin films allowing realization of model systems, which will provide: understanding on the phenomenon at the nanoscale to be translated in a next step to bulky systems; tuning of final properties (magnetic, mechanical…) by varying the preparation conditions; and design of functional devices (sensors, magnetic markers…). Activities of the Programme go from development of novel permanent magnet alternatives *"Made in Europe"*, through efficient processing technologies (flash-milling, 3D-printing of magnets…), to the development of organic photodetectors based on molecular multilayers. These advances will be of extraordinary importance in systems aimed for applications in different technological sectors: energy, transport, medical devices, aeronautical and aerospatial.

Rare-Earth free Permanent Magnets

GROUP LEADER

Prof. Alberto Bollero
Senior Researcher Professor

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ICMM-CSIC, Spain

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Nadia A. Jiménez
Javier Rial

TECHNICIANS

Noelia Lopez
Javier de Vicente

Group webpage:
http://nanociencia.imdea.org/division-permanent-magnets-applications

Research Lines

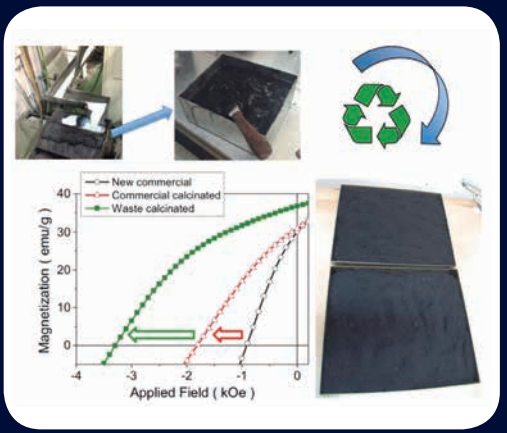
Our group is working on fundamental and applied aspects of permanent magnets (PMs) with no or reduced content of critical raw elements (rare-earths). The main research lines are:

1. Innovative methods for the synthesis of the ferromagnetic phase in MnAl. Control on nanostructuration and phase transformation (*J. Phys. D: Appl. Phys. 2017, 50, 105004*) has shown to be crucial to develop PM properties. The project "*NEXMAG*", coordinated by our group, has been designated Success Case by the M.ERA-NET network (*https://m-era.net/success-stories/new-exchange-coupled-manganese-based-magnetic-materials-nexmag*).
2. Recycling of PMs. Our group works on establishing the correlation between microstructure and magnetic properties that enables the reuse of PM waste as a high quality magnetic material (*ACS Sustainable Chem. Eng. 2017, 5, 3243*).
3. Advanced 3D-printing of rare earth free PMs. We are working to overcome the actual restrictions that predefined geometries of magnets have on the efficiency of devices. PM/polymer composite filament has been produced for bonding and 3D-printing technologies (*Sc. Tech. Adv. Mat. 2018. DOI: 10.1080/14686996.2018.1471321*).

Industrial collaborations

1. Industrial project "*GAMMA*": we are working closely together with the Swedish LE *Höganäs* to advance in the knowledge of MnAl(C) as a PM alternative.
2. Innovation Fund ("Cheque Innovación") by Regional Government of Madrid: we are applying advanced 3D-printing to the fabrication of functional components developed by the SME *RAMEM* (Madrid).
3. The company *IMA* (Barcelona) and our group collaborate to gain knowledge in the interactions of hybrid ferrite/NdFeB bonded magnets.

Recycling of strontium ferrite residues in a permanent magnet factory has been successfully applied for further use in magnet fabrication instead of disposal as waste. The magnetic properties of the recycled powder not only match those of the brand new starting material acquired by the company for the production of magnets but exceed them. A coercivity value 3.5 times larger than that of the new starting ferrite powder, accompanied by a 25% increase in remanence, makes this material a new and improved ferrite product to re-enter the production chain in the factory with an extended applications range. See: *ACS Sustainable Chem. Eng. 2017, 5, 3243*



highlight

programme

Nanomedicine

Programme Manager: **Prof. Rodolfo Miranda**

Research lines

Synthesis of magnetic nanoparticles
Dr. Gorka Salas

Neural Interfaces
Mª Teresa González

Tecnological and biomedical applications of magnetic nanoparticles
Dr. Francisco Terán

Metallodrugs
Dr. Ana Pizarro

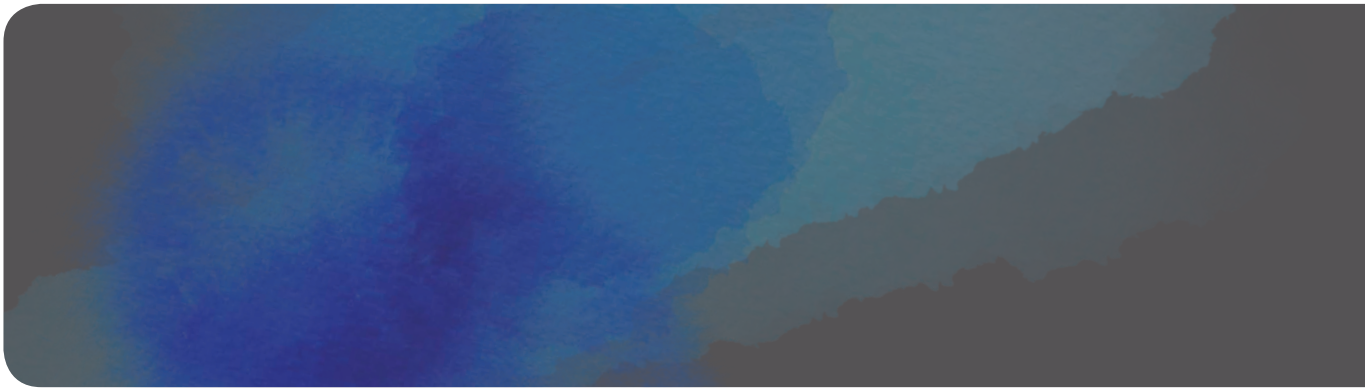
Hyperthermia
Dr. Daniel Ortega

Nucleic Acids and Nanoparticles in Nanomedicine
Prof. Álvaro Somoza

Engineering Biofunctional Nanostructures
Dr. Aitziber L. Cortajarena

NanoOncology
Dr. Cristóbal Belda M.D.
Dr. Ángel Ayuso

Magnetic Nanoparticles in Biomedicine. Cell-particle Interactions
Prof. Ángeles Villanueva



About the programme

The Nanomedicine Programme is focused on the development of novel nanotechnologies for medical applications that will result in better, more efficient, and cost-effective therapeutic and diagnostic tools. One of the important areas is the preparation and use of magnetic nanoparticles (MNPs) in medicine, in particular for cancer treatment and diagnosis. MNPs selectively target tumours for multimodal treatment as drug nanocarriers and heating inductors. This research is highly interdisciplinary, combining the range of expertise necessary to successfully develop this research from the nanoparticle synthesis to the pre-clinical applications. In search of efficiency in the fight against cancer, another area within Nanomedicine is addressing the need to reduce toxic side effects associated with cancer therapies using different strategies, (i) self-immolative linkers that attach drugs to nanoparticles and release a drug once in target cells and (ii) design of new pH-sensitive chemotherapeutic agents that can be activated by the tumor micro-environment. The development and utilisation of nanotechnology can further the search for new cancer therapies and this knowledge will impact across this multidisciplinary community.

The generation of sensors based on nanoparticles for detection of targets of medical interest is a research area that aims to exploit the higher sensitivity and specificity of nanostructure-based diagnostics platforms. Researchers at IMDEA Nanociencia are developing distinct diagnostic tools able to detect biological targets. One example is the use of nucleic acid conjugated gold nanoparticles to detect different biomarkers involved in diseases such as uveal melanoma, pancreatic cancer and Duchenne muscular dystrophy. Another area of interest is the use of nanotechnology-based solutions to the growing problem of antibiotic-resistant bacteria. Nanostructures and nanoparticles with antibacterial properties that rely on different antibacterial mechanisms are being investigated as promising alternatives to antibiotics. Selective bacterial entrapping nanotextures are also under development as bacteria sensor platforms.

Synthesis of Magnetic Nanoparticles

GROUP LEADER

Dr. Gorka Salas

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(tenure track)

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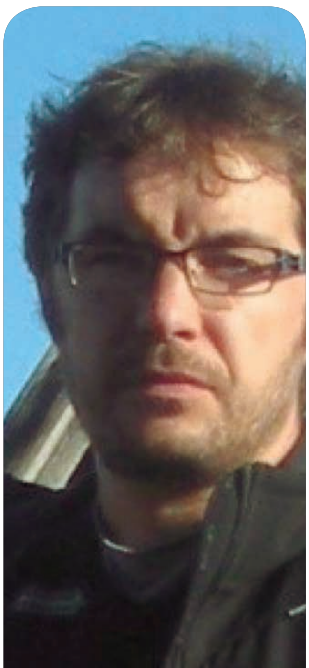

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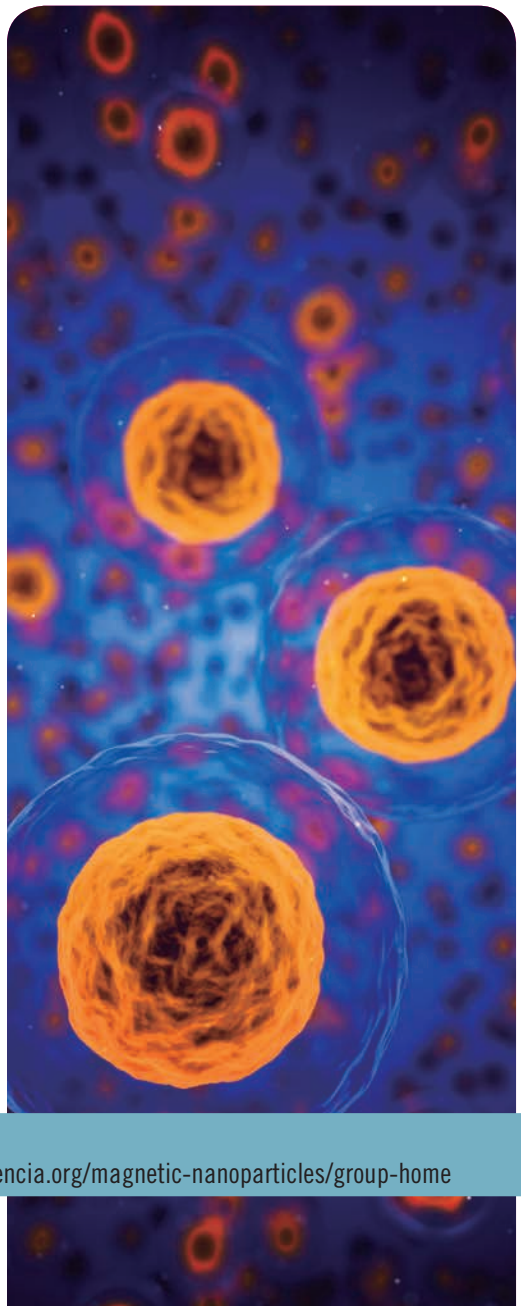


Group webpage:
http://www.imdeananociencia.org/magnetic-nanoparticles/group-home

Research Lines

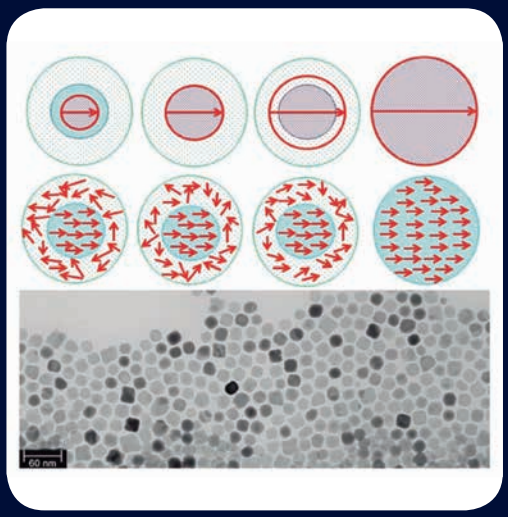
Our group has interests in three main and related research lines:

1. Synthesis of hybrid nanostructures based on magnetic materials of different compositions combined with other metals or metal oxides. Our aim is to understand the procedures that lead to well controlled inorganic hybrids that can respond different stimuli and to develop general synthetic routes for different magnetic materials.

2. Preparation and surface modification of magnetic nanoparticles (MNPs) for biomedical applications. MNPs are being extensively studied worldwide as contras agents for medical imaging and as nanoheaters under alternating magnetic fields. Many intrinsic and extrinsic factors (e. g. size, crystallinity, magnetism, aggregation, colloidal stability, dispersion medium, applied field) can influence the MNPs' performance in biomedicine, so all of them must be considered.

3. Synthesis of magnetically recoverable nanocatalysts for environmental applications. MNPs offer the possibility of acting as platforms that allow the recovery of a bound catalyst or even as the catalyst itself. We are interested in studying MNPs for different catalytic applications and to study the influence of composition and structure on the catalytic behaviour.

Very often, magnetic nanoparticles (MNPs) that are apparently similar when examined by transmission electron microscopy (TEM) have very different magnetic behaviors. The magnetic response of magnetic nanoparticles is driven by the internal structure of nanoparticles and the influence of MNP's size is sometimes overrated. We studied a fair number of MNPs obtained through different procedures using complementary methods such as X-ray diffraction, TEM, high resolution TEM and Mössbauer spectroscopy. Our results showed that the crystallinity level mirrored in the internal spin order drives the specific magnetic response of the single-domain MNPs. See: *Nanoscale* **2017**, *9*, 5129.



highlight

Neural Interfaces

GROUP LEADER

Dr. M. Teresa González

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(tenure track)

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Previous position: Basel University

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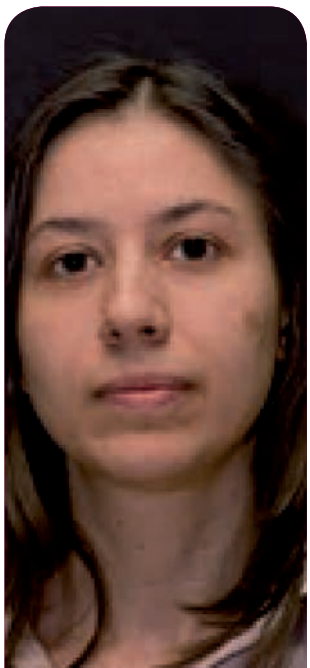

ASSOCIATE RESEARCHER

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Vicente Muñoz
Belén Cortes
Lucia Palomino

Research Lines

We fabricate and characterize nanostructured devices to be used as neural interfaces of enhanced performance respect to classic neural electrodes. We follow two parallel lines:

1. Electrical electrodes covered by vertical conducting nanowires for electrical stimulation of the neural activity.

    - Using the technique of template-assisted electrochemical deposition, we explore different materials to prepare conductive electrodes covered by vertical metallic nanowires.

    - We fabricate our own aluminium oxide nanotemplates by anodization, in order to explore different geometries, densities and distributions of the nanowires in the array.

    - Using IMDEA-Nanociencia clean room facilities, we pattern electrode heads by optical lithography. In this way, we prepare ready-to-use electrodes for biocompatibility and performance tests.

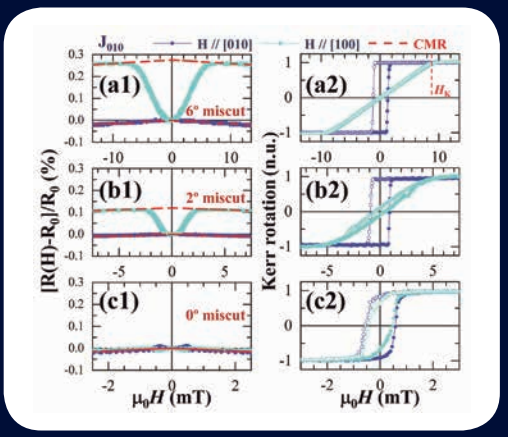
2. Sensors of neural activity base on magnetoresistive materials. We aim to demonstrate that magnetoresistive materials can be used to sense the neural activity without the use of cryogenic liquids (as SQUIDs detectors need).

   - Starting from the LSMO thin films grown over vicinal substrates by our colleagues at CNRS-GREYC, we pattern devices to be used as neural sensors which do not need to be in intimate contact with the neural tissue, and work at room temperature.

   - In order to explore the in-bench performance of the sensors, we measure two main figures of merit of the devices: the sensitivity, meaning how much the resistance of the sensor varies per unit of applied magnetic field, and its accuracy by performing power spectral density measurements.

   - A portable home-made magnetically isolated chamber is used for a first characterization of the sensors. In addition, we explore Wheatstone-bridge configurations together with strategic shielding layers.

The magnetoresistance (MR) effect is widely used in technologies that pervade the world, from magnetic reading heads to sensors. Diverse contributions to MR, such as anisotropic, giant, tunnel, colossal, and spin-Hall, are revealed in materials depending on the specific system and measuring configuration. Half-metallic manganites hold promise for spintronic applications but the complexity of competing interactions has not permitted the understanding and control of their magnetotransport properties to enable the realization of their technological potential. This study reports on the ability to induce a dominant switchable magnetoresistance in $La_{0.7}Sr_{0.3}MnO_3$ epitaxial films at room temperature (RT). By engineering an extrinsic magnetic anisotropy, a large enhancement of anisotropic magnetoresistance (AMR) is achieved which at RT leads to signal changes much larger than the other contributions such as the colossal magnetoresistance. The dominant extrinsic AMR exhibits large variation in the resistance in low field region, showing high sensitivity to applied low magnetic fields. These findings have a strong impact on the real applications of manganitebased devices for the high-resolution low field magnetic sensors or spintronics. See: *Adv. Funct. Mater. 2017, 1700664*



highlight

Tecnological and biomedical applications of magnetic nanoparticles

GROUP LEADER

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Group webpage:
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Research Lines

The scientific interest of the NANOMAGBIOTECH group mainly relies on exploiting physical phenomena of magnetic nanoparticles -activated by optical irradiation and alternating magnetic fields- for energy and biomedical applications. Moreover, the development of novel instrumentation or methodologies for probing new evidences are key issues in our research activities.

Our current research lines focus on:

1. The study of the influence of intrinsic (size, chemical composition) and extrinsic (field conditions, aggregation, concentration, viscosity, etc..) parameters on the AC magnetic response (including magnetic heating) of magnetic nanoparticles.
2. The study of the influence of biological matrices and fluids on the AC magnetic response of magnetic nanoparticles. We are highly interested on understanding the effects of cell processing on the intracellular magnetic response of magnetic nanoparticles in order to find solutions for its preservation.
3. The use of magnetic nanoparticles as magnetic transducer for sensing molecular markers in biological fluids. We have developed a novel methodology for detection of biomolecules dispersed in blood based on variation of AC hysteresis loops of magnetic nanoparticles after interacting with the targeted biomolecule.
4. Heating losses of iron oxide nanoparticles activated by optical means. We are interested on probing the parameters that influence the heat loses of magnetic nanoparticles subjected to laser irradiation.
5. The development and validation of instrumentation for advanced magnetic measurements. In the last 5 years, the Advanced Instrumentation Unit has developed high-tech instrumentation for reliable characterization of magnetic nanoparticles in colloidal dispersions or inside biological matrices.

Colloidal stability is a key parameter that determines the use of iron oxide nanoparticles in biomedical applications, and tightly depends on dispersion media and/or nanoparticle coating. Fifteen of the most employed biocompatible coatings have been studied to elucidate the colloidal stability of iron oxide nanoparticles in buffer saline and human plasma. Surface charge and hydrophilicity rule the colloidal stability of nanoparticles when dispersed in high ionic strength and protein rich media. More information can be found in the Full Paper by A. Aires, et al. on page 183 in Issue 3, 2017 (DOI10.1002/cnma.201600333).

highlight

Metallodrugs

GROUP LEADER

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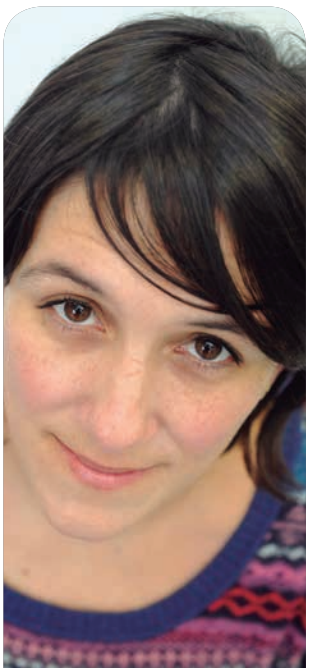

PhD STUDENTS
Francisco Martínez-Peña
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Group webpage:
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Research Lines

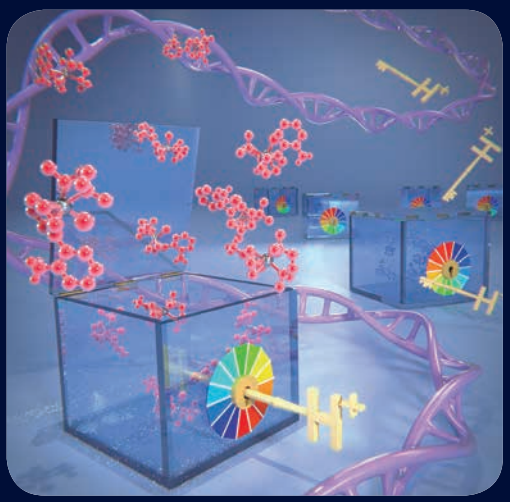
We exploit metal coordination and organometallic chemistry principles to design novel potent switchable bio-catalytic metallodrugs. These allow us to use amplified chemical reactivity in a controlled manner to modulate the cancerous cell machinery at the molecular level. We seek to get advantage of the physico-chemical features of the tumour (both intracellular and in the microenvironment) - resulting from their distinct metabolism, today known as the Warburg effect. A fundamental aspect of our research is to describe the chemical interactions of our metallodrugs with the intracellular components at the nanoscale.

1. We use a pro-drug approach for controlled drug activation. Our main goal is to produce new metallo-organic drugs that can exert bio-catalytic activity inside human cancer cells. This effect on cells - amplified through catalysis - will aim to break their finely tuned redox and pH homeostasis in order to control cancer proliferation and stop invasion.

2. We are also interested in disrupting the finely controlled pH balance in the tumour niche, which we approach by designing organometallic proton shuttles that work against the pH gradient of the cancer cell, driving the cancer cell to death.

3. Finally, we benefit from recent developments in nanomedicine to load our metallodrugs to a number of nanosystems which provide a variety of advantages, such as target cell accumulation or generation of local heat that can synergistically enhance the bio-catalytic activity of our drugs.

A new family of activatable ruthenium arene tethered complexes have been synthesized and characterized. These metal complexes can reversibly open and close a vacant position for interaction with biomolecules. Both the activation and inactivation processes are pH-dependent. This class of Ru^{II} tether complexes are presented as the first step towards rational design of organometallic pH-dependent switches with promising applications in cancer research. See: *Chem. Eur. J.* **2017**, *23*, 16231.



highlight

Hyperthermia

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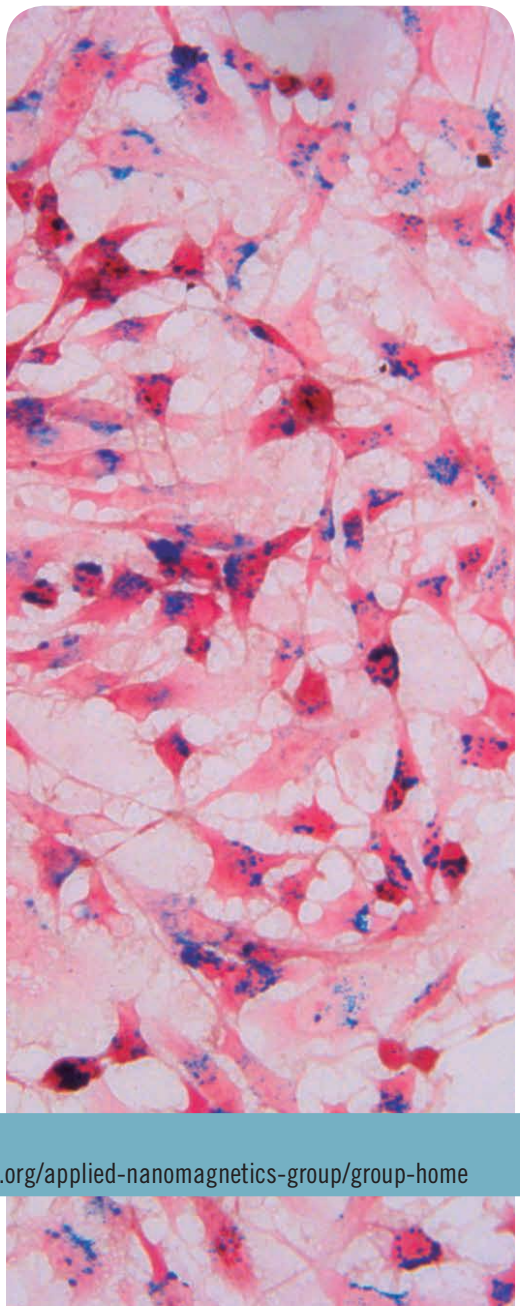


Group webpage:
http://nanociencia.imdea.org/applied-nanomagnetics-group/group-home

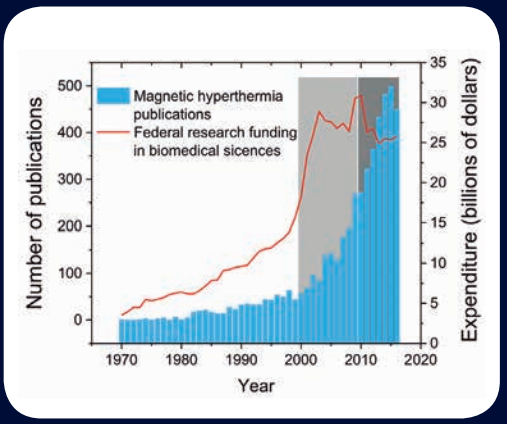
Research Lines

Following are our two main research lines:

- Computational electromagnetism for *in silico* testing. Starting from animal and human computable phantoms, we perform computer simulations of therapies and diagnostic techniques based on the interaction of electromagnetic fields and magnetic and optical nanomaterials in the frequency range of kHz. Our mission is to provide clinicians with powerful tools to choose the best therapeutical conditions by predicting body response. The group collaborates closely with hospitals and medical devices manufacturers within the remit of the European project **NoCanTher** focused on treating pancreatic cancer through magnetic hyperthermia, and is involved in the preparation of the clinical trials. We also aim to a wider validation of in silico temperature predictions with dedicated experimental measurements at the nanoscale in the NANOLICO project.

- Design of multifunctional magnetic nanomaterials. We design and synthesise a wide range of magnetic nanomaterials applied to biomedicine; for example, magnetic hyperthermia (MH), brain imaging contrasts, and magnetic particle imaging (MPI) tracers. Within this research line, the combination of magnetic hyperthermia and MPI is our current priority. These lines are embodied in the international collaborative networks we participate/coordinate: **RADIOMAG**, **NanoBioAp**, **NANO**.

Whither magnetic hyperthermia? The economic bonanza under which most of the pioneering research leading to its clinical development was funded under, perhaps will not happen again–at least in the short term. Nevertheless, the basic research has re-gained enough momentum to deepen into the underlying physics and to propose new, imaginative solutions to the long-standing problem around the limits of nanoparticle heating inside living beings. Does this means that a second, more effective era for magnetic hyperthermia may be looming? https://doi.org/10.1016/C2015-0-06003-8



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Nucleic Acids and Nanoparticles in Nanomedicine

GROUP LEADER

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PhD STUDENTS
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Group webpage:
www.nanobioimdea.com

Research Lines

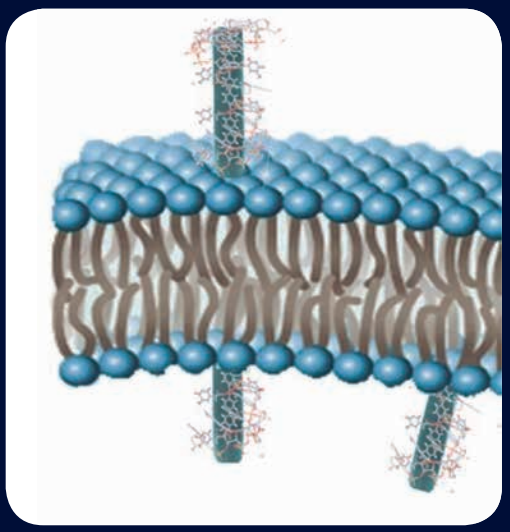
Our group is interested in novel approaches for the treatment and detection of diseases, particularly:

1. **Nanocarriers of bioactive molecules,** such as nucleic acids or drugs, that improve their delivery and reduce their toxicity. In this regard, we aim to develop smart nanoparticles that can release their cargo at the target cells. *Nanoscale* **2014**, *6, 7436–42; Breast Cancer Res.* **2015**, *17, 1–17.*

2. **Sensors of nucleic acids based on nanomaterials,** such as gold nanoparticles, that can provide sensitive and affordable sensors for the detection of genetic diseases. We are developing systems based on nucleic acids and gold nanoparticles that aggregate in the presence of the target sequence. *Chem. Commun.* **2014**, *50, 3018.*

3. **CRISPR-based gene editing systems** that can repair mutations involved in diseases. This powerful technology can be used to introduce indels efficiently. However, the precise control of the mutations edited is more complicated, and modified oligonucleotides might be required. *Angew. Chemie Int. Ed.* **2016**, *55, 3548–3550.*

In this work, we explore the interaction of coordination polymers based on nucleobases with nucleic acids. We observed that the polymers can interact more efficiently with oligonucleotides bearing their complementary nucleobase. Furthermore, the system was assessed as a potential carrier of oligonucleotides, which promising preliminary results. *Angew. Chemie Int. Ed.* **2017**, *56,* 987–991.



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Engineering Biofunctional Nanostructures

GROUP LEADER

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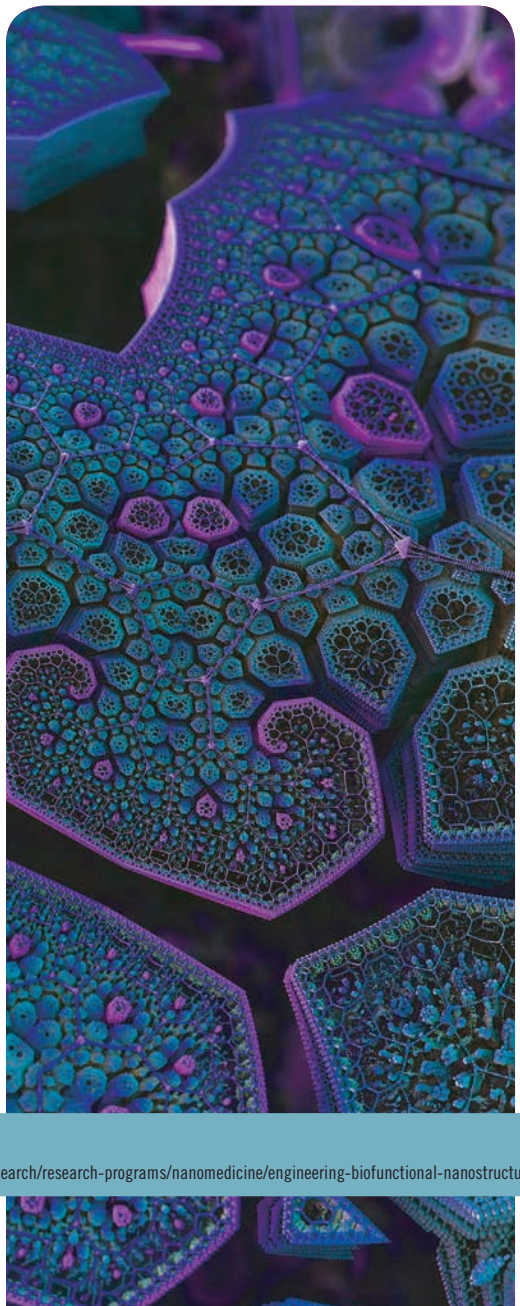


Group webpage:
http://www.nanociencia.imdea.org/research/research-programs/nanomedicine/engineering-biofunctional-nanostructures

Research Lines

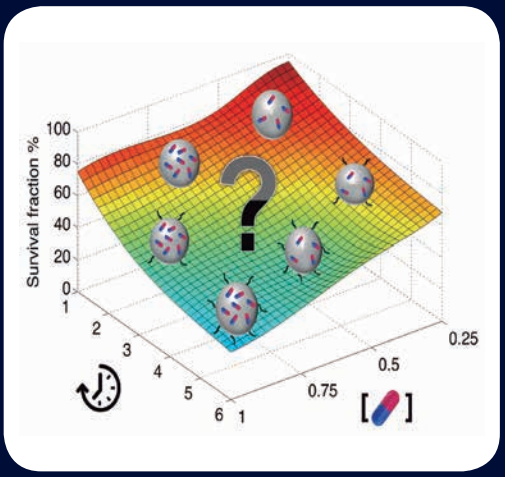
The group has varied interests at the interface of biochemistry, bioconjugation, functional materials and nanomedicine. The two main research lines of the group are:

1. Bio-functionalization of nanoparticles for biomedical applications The objective of this research line is the generation of versatile functional nanoparticles with a selection of biomolecules and optimized properties for targeting and diagnosis of several diseases. In this context, multifunctional nanoparticles are utilized as drug carries and as sensors for in vivo and ex-vivo applications (Sci Reports 2016 doi: **10.1038/srep35786**; ChemNanoMat 2017 doi: **10.1002/cnma.201600333**; Nanoscale 2017 doi: 10.1039/c7nr04475e).

2. Biomolecular design for functional nanostructures and biomaterials In this research line we use mainly proteins as platforms for the fabrication of multiple protein-based hybrid functional nanostructures and biomaterials for their use in different technological and biomedical applications. (Nanoscale 2014 **doi: 10.1039/c4nr01210k**, Biomacromolecules 2015 doi: **10.1021/acs.biomac.5b01147**; ACS Applied Mat Interfaces 2017).

A key challenge in the treatment of cancer with nanomedicine is to engineer and select nanoparticle formulations that lead to the desired selectivity between tumorigenic and non-tumorigenic cells. To this aim, novel designed nanomaterials, deep biochemical understanding of the mechanisms of interaction between nanomaterials and cells, and computational models are emerging as very useful tools to guide the design of efficient and selective nanotherapies. This works shows, using a combination of detailed experimental approaches and simulations, that the specific targeting of cancer cells in comparison to non-tumorigenic cells can be achieved through the custom design of multivalent nanoparticles.

See: *Nanoscale*. **2017** 9(36):13760-13771.
(Link: *http://pubs.rsc.org/en/Content/ArticleLanding/2017/NR/C7NR04475E#!divAbstract*)



highlight

Nanooncology

GROUP LEADER

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Associate Researcher

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Double Affiliation: Fundacion Hospitales de Madrid, Madrid, Spain
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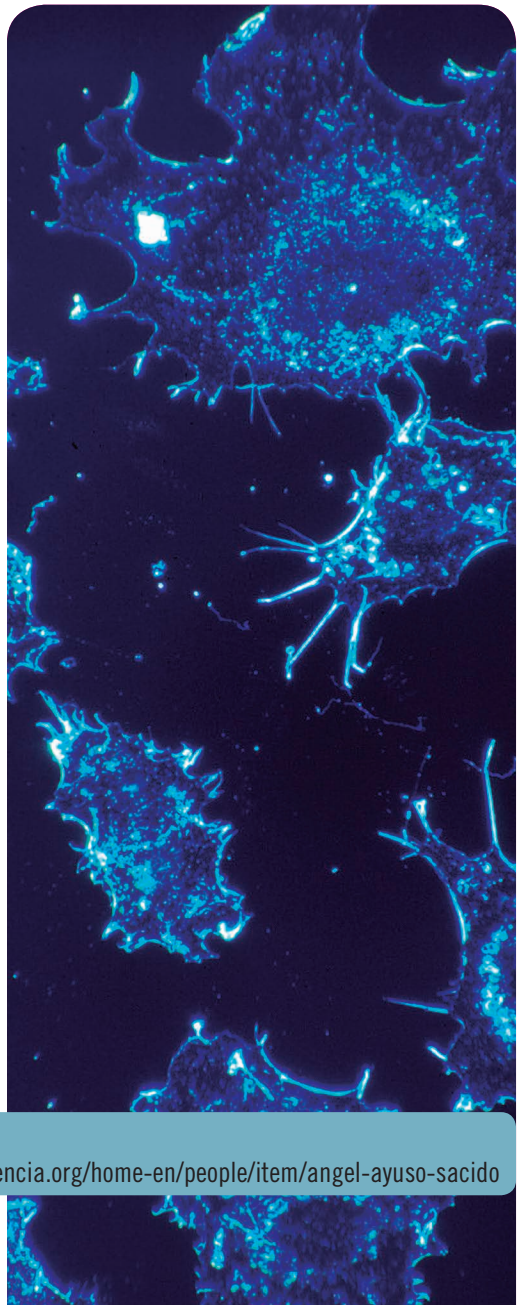
CNB-CSIC, Madrid, Spain



Group webpage:
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Magnetic Nanoparticles In Biomedicine. Cell-Particle Interactions

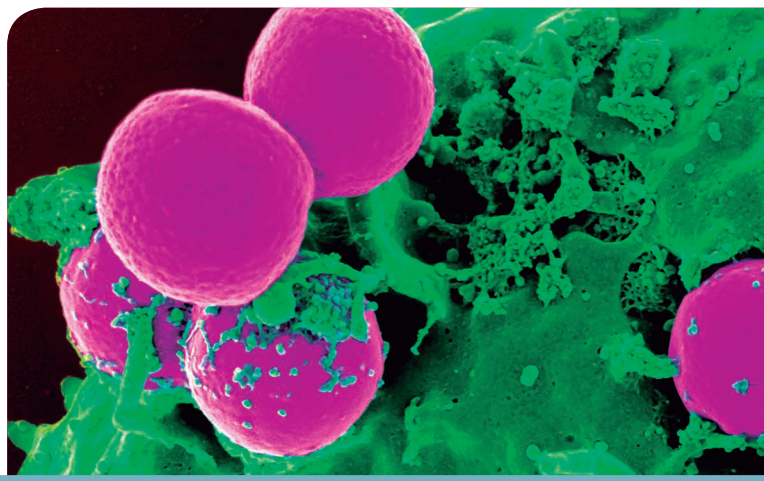
GROUP LEADER

Prof. Ángeles Villanueva
Associate Research Professor

PhD: Universidad Autonoma de Madrid, Spain
Double Affiliation: Universidad Autonoma de Madrid, Spain

Research Lines

- Medical applications of nanoparticles. Cell cultures.
- Biocompatibilty of magnetic nanoparticles.
- Mechanisms of cell death.
- Alterations in adhesion and cytoskeletal proteins.
- Liposomal drug delivery.
- Evaluation in cell cultures and in vivo experimental models of new antitumor agents.
- Signaling pathways involved in cell death.



Group webpage:
http://www.imdeananociencia.org/home-en/people/item/angeles-villanueva

programme

Nanobiosystems

Programme Manager: **Prof. J.L. Carrascosa**

Research lines

Nanobiosystems
Prof. J.L. Carrascosa

Optical Nanomanipulation
Dr. Ricardo Arias-González

Advanced Fluorescence Nanoscopy
Dr. Cristina Flors

Protein Engineering
Dr. Begoña Sot

Molecular Motors Manipulation Lab
Dr. Borja Ibarra

Mechanical properties of Biostructures
Dr. Johann Mertens

Protein Biophysics
Prof. Víctor Muñoz

About the programme

This programme aims at studying biological nanomachines, their assembly, structure and functional properties, as well as their interaction with defined substrates to build synthetic tools. In the area of single molecule analysis of macromolecular aggregates, there are groups working on protein engineering, computational chemistry, AFM analysis of macromolecular complexes, force spectroscopy analysis and manipulation of macromolecules and their aggregates, the study of nanomechanical properties of biological complexes of different complexities and optical trapping-based approaches to study the behaviour of single biological nanomotors. Other systems under study are tailor-made polypeptides of increasing complexity designed to dissect relationships between molecular structure and functional properties. A second area of interest in this Programme is the organization of macromolecular complexes on well-defined substrates. Biological membranes, the protein folding and viral assembly pathways, the bacterial cytoskeleton and the DNA structure are examples of self-organizing systems under study with highly specialized functions and properties.

Nanobiosystems

GROUP LEADER

José L. Carrascosa

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Dr. Ana Cuervo

PhD STUDENT
Mar Pérez

Research Lines

Our group is working in different aspects of technological developments in microscopy, as well as in applications of the use of viral systems for nanotechnological applications.

We have developed methods for correlative approaches in microscopy by combining transmission electron microscopy, light microscopy and X-ray microscopy. In particular, we have improved the acquisition process of soft-X ray microscopy images for tomographic reconstruction (José Javier Conesa, Joaquín Otón, Eva Pereiro, Francisco Javier Chichón and José L. Carrascosa. Near-Edge Absorption Soft X-ray Nanotomography of Cells Incubated with Nanoparticles. Proceedings of Microscopy & Microanalysis, 23, Issue S1, 992-993 (2017). doi: 10.1017/S1431927617005621), its application to the study of virus infected cells (Perez-Berna A.J., Valcarcel R., Rodríguez M.J., Chichon F.J., Sorrentino A., Carrascosa J.L., Gastaminza P. and Pereiro E. The Dual-axes for Soft X-Ray Cryo-tomography Reveals Ultrastructural Alterations of the Host Cell during Hepatitis C Infection by Increasing the Isotropic Axial Resolution Proceedings of Microscopy & Microanalysis. 23 (Suppl 1), doi:10.1017/S1431927617005542 (2017)), and the use of near-edge absorption X-ray spectroscopy to produce element-specific nanotomographic reconstruction of cells (José Javier Conesa, Joaquín Otón,

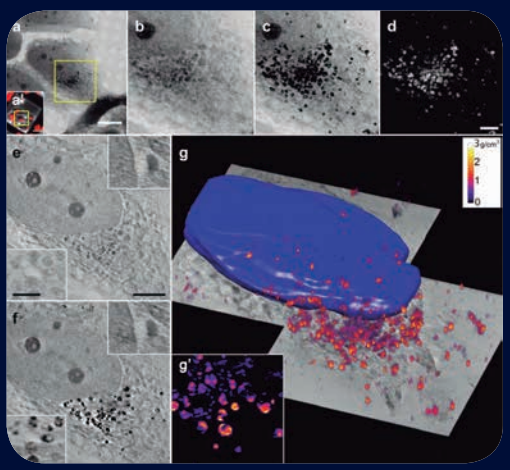
Group webpage:
http://macromolassemblies.wixsite.com/carrascosalab

Eva Pereiro, Francisco Javier Chichón and José L. Carrascosa. Near-Edge Absorption Soft X-ray Nanotomography of Cells Incubated with Nanoparticles. Proceedings of Microscopy & Microanalysis, 23, Issue S1, 992-993 (2017). doi: 10.1017/S1431927617005621).

The use of viral-related particles for development of vehicles for transfer of materials is an interesting area of research where we have worked on the characterization of assembly of viral cages (Elena Pascual, Carlos P Mata, José L Carrascosa and José R Castón. Assembly/disassembly of a complex icosahedral virus to incorporate heterologous nucleic acids.Journal of Physics: Condensed Matter, 29 (49) doi: 10.1088/1361-648X/aa96ec (2017)), and in the study of incorporation of specific protein determinants to viral particles (Carlos P. Mata, Daniel Luque, Josué Gómez-Blanco, Javier M. Rodríguez, José M. González, Nobuhiro Suzuki, Said A. Ghabrial, José L. Carrascosa, Benes L. Trus, José R. Castón. Acquisition of functions on the outer capsid surface during evolution of double-stranded RNA fungal viruses PLOS Pathogens, 8, doi.org/10.1371/journal.ppat.1006755 (2017)).

We have also worked in synthetic biological approaches for the use of viral components to produce vesicles capable to transfer specific DNAs (Moleiro, L.H., Mell, M., Bocanegra, R., López-Montero, I., Fouquet, P., Hellweg, T., Carrascosa, J.L., Monroy, F. Permeability modes in fluctuating lipid membranes with DNA-translocating pores. Advances in Colloid and Interface Science, 247, 543-554 (2017)), and in the development of new vaccination platforms against cancer (Lorea Villanueva, Leyre Silva, Diana Llopiz, Marta Ruiz, Tamara Iglesias, Teresa Lozano, Noelia Casares, Sandra Hervas-Stubbs, María José Rodríguez, José L. Carrascosa, Juan José Lasarte & Pablo Sarobe. The Toll like receptor 4 ligand cold-inducible RNA-binding protein as vaccination platform against cancer. Journal Oncoimmunology, e1409321, doi.org/10.1080/2162402X.2017.1409321 (2017)).

Superparamagnetic iron oxide nanoparticles (SPION) have become important tools in nano-biotechnology and nano-biomedicine. These new developments require a precise quantitative analysis at sufficient spatial resolution to model the interactions between nanoparticles and the cellular structures in a quantitative way. To tackle this issue 15 nm dimercaptosuccinic acid functionalized SPION were incubated with MCF-7 breast cancer cells as a model system to be analyzed exploiting the iron differential absorption contrast at the L3 iron edge. Near-edge absorption soft X-ray nanotomography (NEASXT) combines whole-cell 3D structure determination at 50 nm resolution, with 3D elemental distribution and quantification and high throughput. We have solved the three-dimensional distribution and quantification of SPIONs within the cells with sufficient sensitivity to detect the density corresponding to a single nanoparticle in the whole cellular volume (Fig. 1).



highlight

Optical Nanomanipulation

GROUP LEADER

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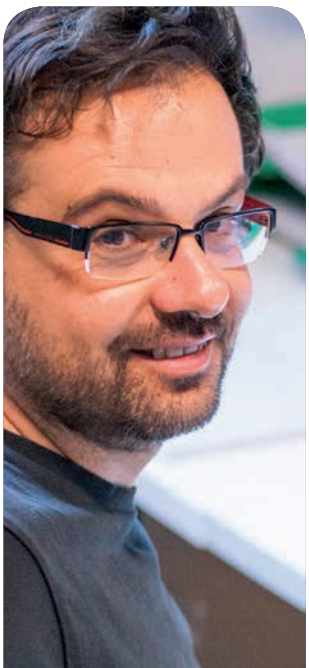
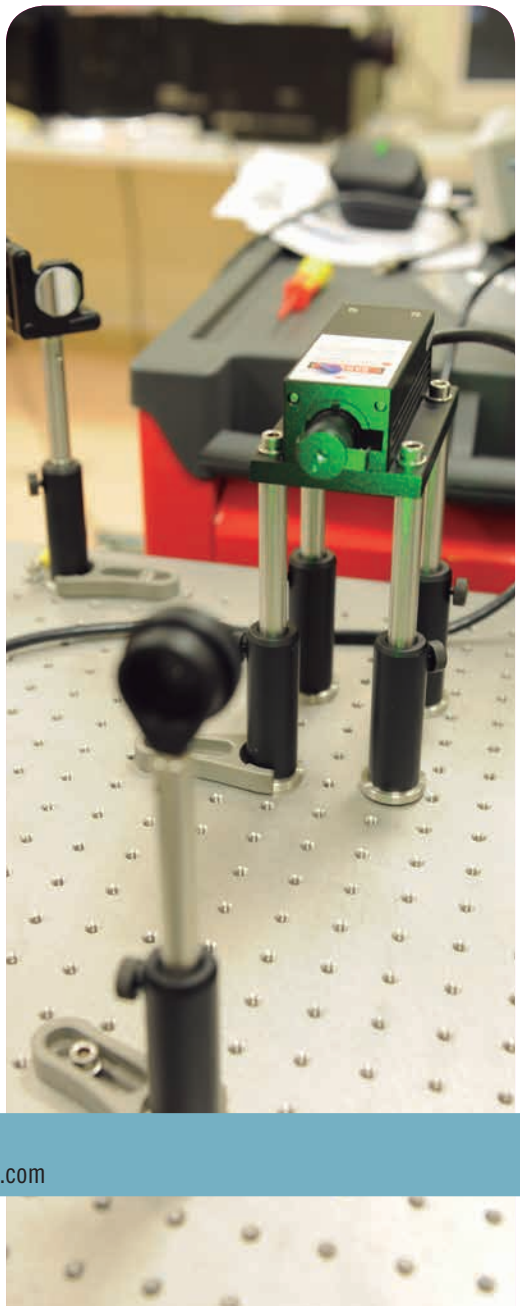


PhD STUDENTS

Irene Gutiérrez
Héctor Rodríguez-Rodríguez
(co-supervised by Dr. B.H. Juárez)



Group webpage:
http://www.ariasgonzalez.com

Research Lines

We focus on Molecular Biophysics and biocompatible nanosystems, with a strong bond to both Mesoscopic Physics and Biological Chemistry. Current research lines:

- **Mechanochemistry of Nucleic Acids:** We study DNA and RNA repetitive sequences, which are able to self-fold into non-canonical structures and which are important in telomere end-protection, chromosome stability or in senescence as a barrier to tumorigenesis (*Sci. Rep.* **2017**, *7*, 11756).

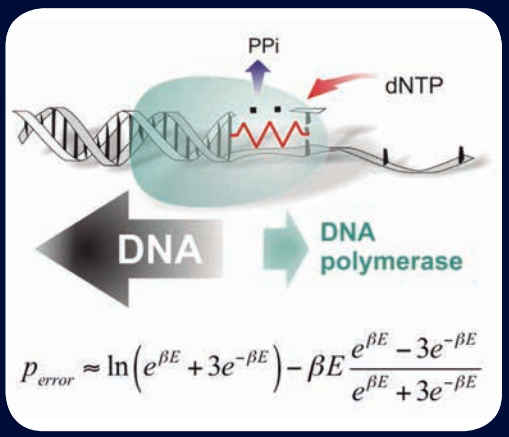
- **Thermodynamics of protein motors:** We study genetic information managing in replication and transcription as performed by polymerases, which are true molecular Maxwell's demons with a 2-bit nanoprocessor (*Sci. Rep.* **2017**, *7*, 7566, *Nucleic Acids Res.* **2017**, *45*, 7237).

- **Biocompatible nanoparticles with functional capacity:** Stringent control of stimulus-response phenomena in physiological media is demanded for tailoring biocompatible tools in nanomedicine and biosensor technology. We study quantum dots as sources of light for imaging purposes and magnetic and metallic nanoparticles as sources of heat for cancer therapies based on hyperthermia (*J. Phys. Chem. C* **2017**, *121*, 10124).

- **Non-equilibrium processes and Information:** Experimental research is the fundamental breeding ground for theory. The cell analyzed from the single-molecule perspective becomes a unique laboratory for the study of the so-called *Small Systems,* namely, those that exchange energy in quantities similar to those of the thermal fluctuations (*J. Chem. Phys.* **2017**, *147*, 205101).

Information management and thermodynamic efficiency of polymerase engines

The flexibility of the DNA double-helix polymer that results from replication is involved in the Brownian ratchet mechanism by which a DNA polymerase moves with a specific directionality and withstands high forces. This mechanochemistry has consequences for the maintenance of fidelity, which model by using Information Theory (*J. Chem. Phys.* **2016**, *145*, 185103). Our analysis allows the thermodynamic efficiency of these information biomachines to be understood, quantified and compared with those of macroscopic machines (*Sci. Rep.* **2017**, *7*, *7566*).



highlight

Advanced Fluorescence Nanoscopy

GROUP LEADER

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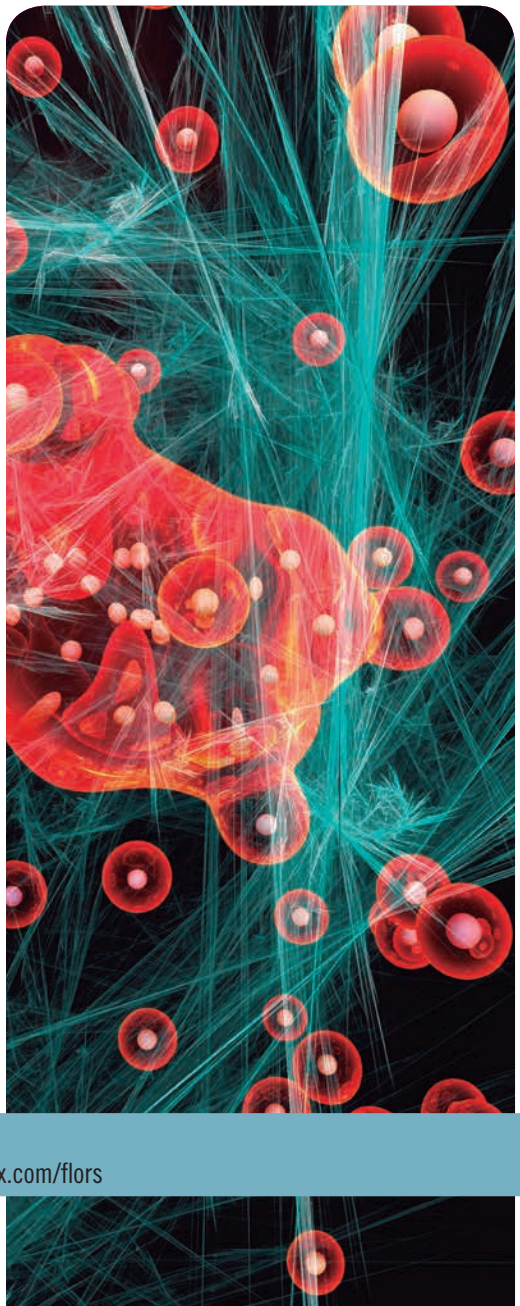
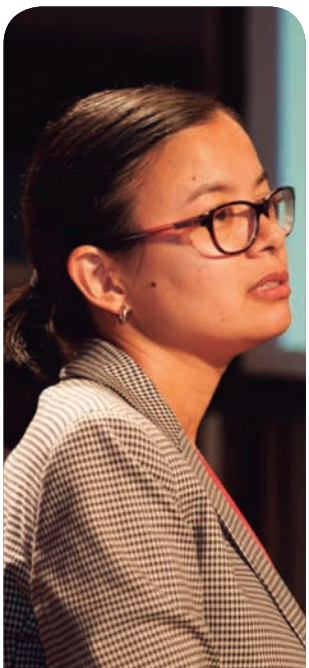




Group webpage:
http://imdeananotools.wix.com/flors

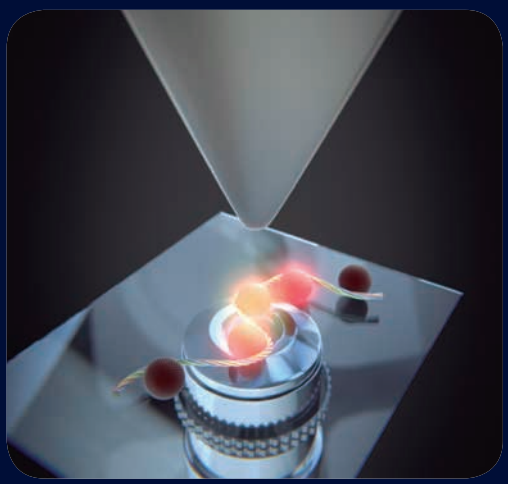
Research Lines

We develop novel methods, typically based on light, to study biology and biomaterials at the nanoscale. Our main research lines are:

- **Novel methods for super-resolution imaging:** super-resolution fluorescence microscopy techniques are able to image (biological) structures with a spatial resolution of tens of nm, one order of magnitude better than standard fluorescence microscopy. In our group, we develop novel methods that extend the application of super-resolution microscopy. A few years ago we were able to image for the first time directly-labelled DNA with a spatial resolution below 40 nm (*ChemPhysChem* **2009**, *10*, 2201; *J. Microscopy* **2013**, *251*, 1). More recently, we have implemented a novel microscope that allows us to correlate *in situ* super-resolution fluorescence imaging and atomic force microscopy (*ChemPhysChem* **2014**, *15*, 647). We are using this setup to study a range of nano/biomaterials, for example amyloid-like protein fibers (*Nanoscale* **2016**, 8, 9648; *Small* **2017**, *13*, 1603784).

- **Photosensitizing fluorescent proteins for advanced microscopy:** this project aims at developing improved light-responsive proteins capable of generating singlet oxygen, a particular form of reactive oxygen species that plays a crucial role in cell signalling and phototherapeutic applications. The possibility to have precise genetic control of the protein localization and thus the site of singlet oxygen generation is attracting much interest given its strong potential for applications in microscopy, optogenetics and photodynamic therapy (*JACS* **2013**, *135*, 9564; *Chem. Commun.* **2016**, *52*, 8405).

The combination of complementary techniques to characterize materials at the nanoscale is crucial to gain a more complete picture of their structure, a key step to design and fabricate new materials with improved properties and diverse functions. Correlative atomic force microscopy and localization-based super-resolution microscopy is a useful tool that provides insight into the structure and emissive properties of fluorescent β-lactoglobulin (βLG) amyloid-like fibrils. These hybrid materials were made by functionalization of βLG with organic fluorophores and quantum dots. Simultaneous labelling of βLG fibers by QD655 and QD525 allowed us to achieve correlative AFM and two-color super-resolution fluorescence imaging of these hybrid materials. These experiments allow combining information about the topography and number of filaments that compose a fibril, as well as the emissive properties and nanoscale spatial distribution of the attached fluorophores. This study represents an important step forward in the characterization of multi-functionalized hybrid materials, a key challenge in nanoscience. *Small* **2017**, *13*, 1603784.



highlight

Protein Engineering

GROUP LEADER

Dr. Begoña Sot
Assistant Research Prof.
(tenure track)

PhD: Universidad del País Vasco, Spain.
Previous position: CNB, Spain

Researcher ID:
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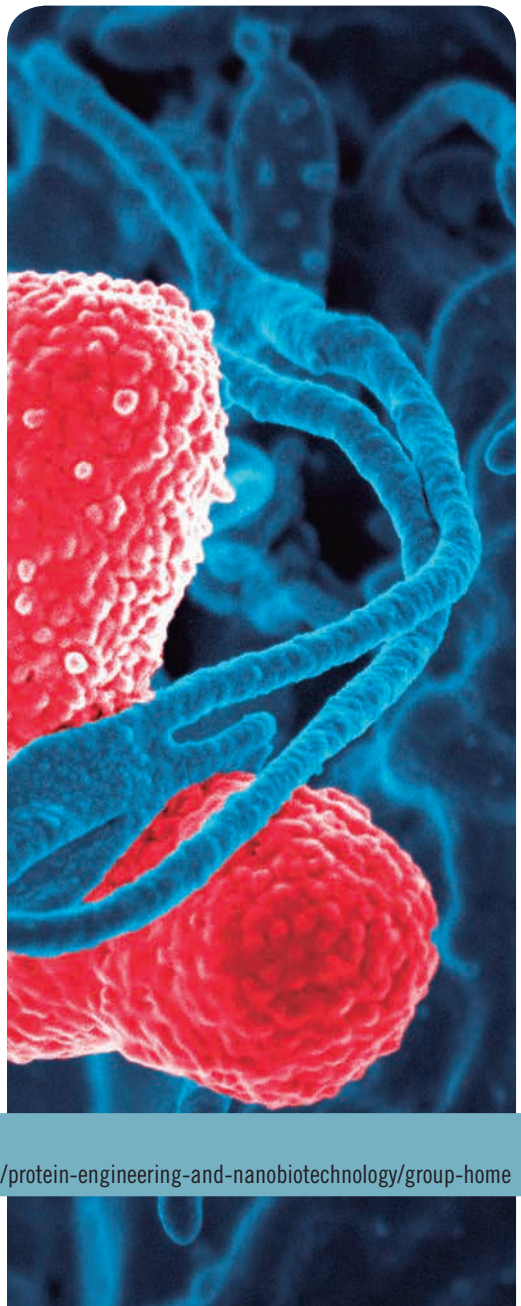


Group webpage:
www.nanociencia.imdea.org/protein-engineering-and-nanobiotechnology/group-home

Research Lines

The Protein Engineering group leads with several research lines, centered in the use of modified proteins to create new nanomedical tools:

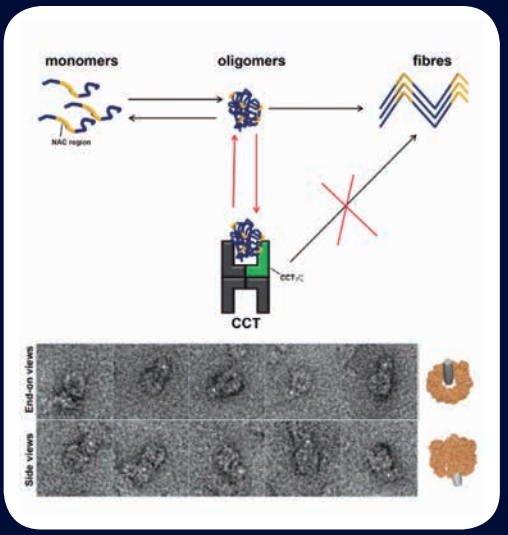
1. **Design of new immunotherapy tools based in engineered molecular chaperones and gold nanoparticles.** Molecular chaperones in complex with antigens are able to activate the immune system against these specific antigens. However, the instability of this complex is a handicap for their use in immunotherapy. We are modifying molecular chaperones to form covalent complexes with antigens, and conjugating them with gold nanoparticles for an efficient delivery.

2. **The design of new strategies for an efficient editing of Pancreatic cancer cells based on Cas proteins.** CRISPR/Cas system is a promising tool for gene editing, able to treat most genetic diseases. But the efficient delivery of Cas proteins is a bottle neck of this strategy. In this project we modify these proteins (cas9 and cpf1) to conjugate them to nanostructures able to deliver them efficiently to specific tissues.

3. **Effect of molecular chaperones in amyloid fibres assembly.** Amyloidopathies are neurodegenerative diseases produced by an aberrant folding of proteins, which form aggregates and amyloid fibres able to kill neurons. The capability of molecular chaperones to fold proteins opens the possibility of their use to treat these diseases. Thus, the study of the effect of different molecular chaperones in amyloid fibres is an indispensable step.

4. **Antibacterial activity of metal nanoparticles conjugated with modified bactericidal peptides.** The bacterial antibiotic resistance makes essential the design of new bactericides.

Effect of CCT in amyloid fibres assembly. The eukaryotic chaperonin CCT uses cavities built into its double-ring structure to encapsulate and to assist folding of a large subset of proteins. We show here that CCT inhibits amyloid fibre assembly of α-synuclein A53T, one of the mutants responsible for Parkinson's disease. We evaluated fibrillation blockade in α-synuclein A53T deletion mutants and CCT interactions of full-length A53T in distinct oligomeric states to define an inhibition mechanism specific for α-synuclein. CCT interferes with fibre assembly by interaction with the A53T central hydrophobic region (NAC). This interaction is specific to NAC conformation, as it is produced once soluble α-synuclein A53T oligomers form and blocks the reaction before fibres begin to grow. See *Sci Rep. 2017 Jan 19;7:40859.* doi: 10.1038/srep40859



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Molecular Motors Nanomanipulation Lab

GROUP LEADER

Dr. Borja Ibarra

Assistant Research Prof.
(tenure track)

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Previous Position: UC Berkeley, USA

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Researcher ID:
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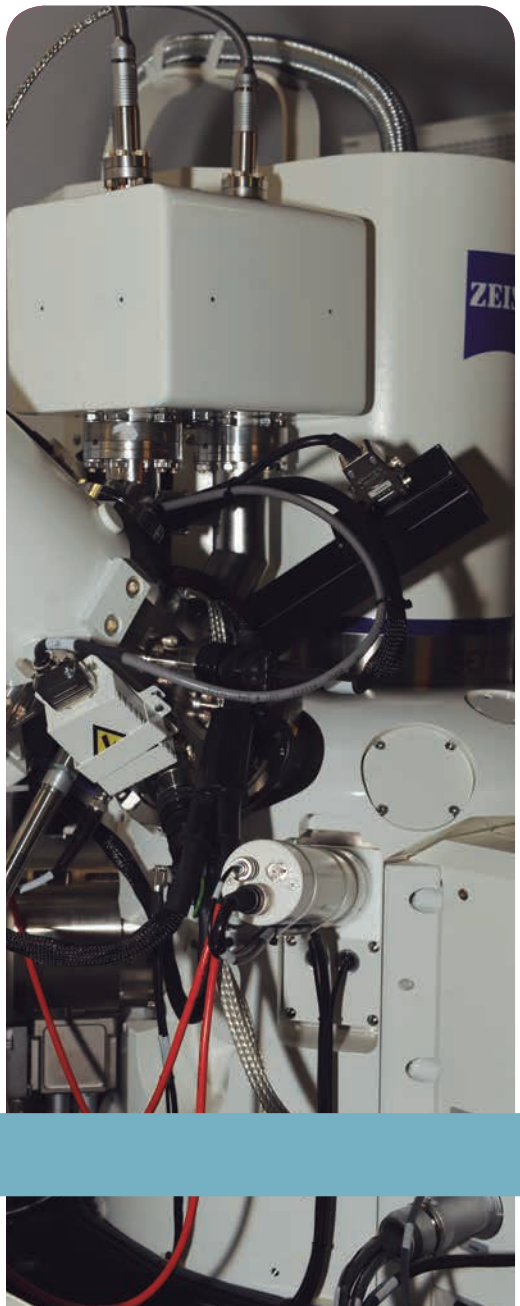
PhD STUDENTS

Fernando Cerrón
Katerina M. Lemishko
Carlos Rodriguez



Group webpage:
www.borjaibarralab.com

Research Lines

The design of synthetic molecular motors is one of the most exciting challenges facing nanotechnology. The major inspiration behind designing artificial motors is to mimic the precision of biological motors. Our laboratory uses nanoscale techniques to analyze and manipulate the activity biological and synthetic molecular motors one molecule at a time. This possibility provides unprecedented insight into the dynamics and mechano-chemical mechanisms that govern their operation at the molecular level. The main research lines of our laboratory include the study of:

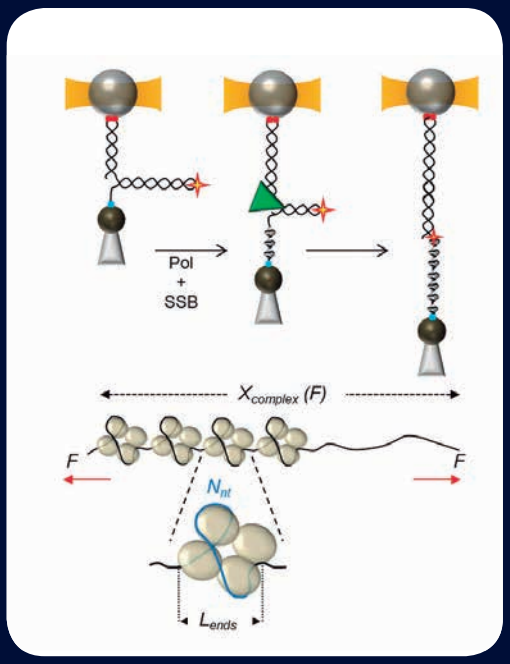
1. **Biological machinery involved in nucleic acids metabolism.** Replication and transcription of DNA are fundamental for life. We are measuring the operational dynamics of the biological machinery involved in: i) mitochondrial DNA replication *(NAR 2017; PLoS One 2017; JSAT 2016)* and ii) transcription of Influenza A viral genome.

2. **Membrane nanomechanics.** The cell membrane maintains the integrity of the cell. We have recently developed a method to measure the dynamics of motor proteins involved in remodeling of cell membranes.

3. **Synthetic molecular motors:** We have developed new methods to measure the mechanical strength of non-covalent interactions *(Chem. Science 2017)* and the dynamics and mechanistic principles of operation of individual synthetic molecular switches.

4. **Technology development.** We are working to combine optical manipulation with fluorescence detection and temperature control systems. This exciting marriage of techniques will open up a wealth of new promising applications.

DNA organization by SSB proteins. Single-stranded DNA-binding proteins (SSB) play a key role in genome maintenance. They provide a platform that allows molecular motors involved in DNA metabolism to process efficiently single-stranded DNA (ssDNA) intermediates. Here, using optical tweezers we determine the structure and energetics of individual SSB-ssDNA complexes assembled on preformed ssDNA, and on ssDNA generated gradually during DNA synthesis. Our results reveal a key role for the gradual generation of ssDNA during replication in generating the appropriate nucleoprotein structure for DNA synthetic reactions required for genome maintenance. *Nucleic Acids Res.* 2017;45(12):7237-48.



highlight

Protein Biophysics

GROUP LEADER

Prof. Víctor Muñoz

Senior Research Prof.

PhD: Universidad Autonoma de Madrid, Spain / EMBL-Heidelberg, Germany

Previous Position: University of California Merced

POSTDOCS

Dr. Sivandandam Natarajan
Johannes Kepler University, Austria

Dr. Cintia de Vequi
University of Sao Paulo, Brazil

Dr. Milagros Castellanos Molina
Universidad Autónoma de Madrid, Spain

Dr. Jörg Schöenfelder
Universidad Autónoma de Madrid, Spain

Dr. Raquel Santamaría
University of Santiago de Compostela, Spain

Dr. Pilar López-Navajas
Universidad Complutense de Madrid, Spain

Dr. Xiakun Chu
Jilin University, China

Dr. Rajendra Sharma
Universidad Autónoma de Madrid, Spain

TECHNICIAN

Mar Pulido

Group webpage:
http://www.nanoscience.imdea.org/home-en/people/item/victor-munoz

Research Lines

Our group focuses on the biophysical study of **protein folding mechanisms** with special emphasis on the ultrafast folding regime (*Biochem J.* 2016), including our pioneering work on the downhill and one-state scenarios. We use a divide-and-conquer strategy in which we extract mechanism-structure relationships by investigating a catalogue of 16 fold archetypes (*Curr. Op. Struc. Biol.* 2016). We investigate the folding behavior of such archetypes at the structural dynamic, thermodynamic, kinetic and single-molecule stochastic levels using kinetics, single-molecule fluorescence and single-molecule force spectroscopy, NMR, in conjunction with theoretical modeling and computer simulations. In addition, we have continued developing improved methods for investigating folding, such as microsecond-resolution single-molecule fluorescence (*J Phys Chem B.* 2015), analysis of protein folding at atomic resolution (*JACS 2015*), and the reversible mechanical (un) folding of fast folding proteins (*Nat Com*, 2016).

A second research focus targets the roles of folding mechanisms in protein function with an emphasis in **conformational rheostats**, a novel allosteric mechanism that exploits the conformational heterogeneity of downhill folding modules to produce analogical signals at the conformational heterogeneity of downhill folding modules to produce analogical signals at the single-molecule level (in contrast to the binary response of allosteric switches). Here we are pursuing four main avenues: 1) development of protein-based biosensors based on downhill folding modules; 2) investigating the role of conformational rheostats in coordinating protein-protein interaction networks (*Phys Chem Chem Phys*, 2017), and; 3) in the homing mechanism that transcription factors use to efficiently search for and bind to their target DNA sequence (*Phys. Chem. Chem. Phys.*, 2017); 4) engineering of controllable symmetric macromolecular complexes from monomeric globular proteins using the principle of partial unfolding coupled to assembly.

EnHD along DNA: Engrailed homeodomain, Drosophila transcription factor, specifically binding to its target sites on DNA in order to perform its biological function. The multiple binding modes existing in the DNA searching process have been addressed by coarse-grained molecular simulations. The dynamic picture facilitates the DNA co-localization as well as specific DNA binding (function-on) and releasing (function-off) process during EnHD-DNA recognition.

highlight

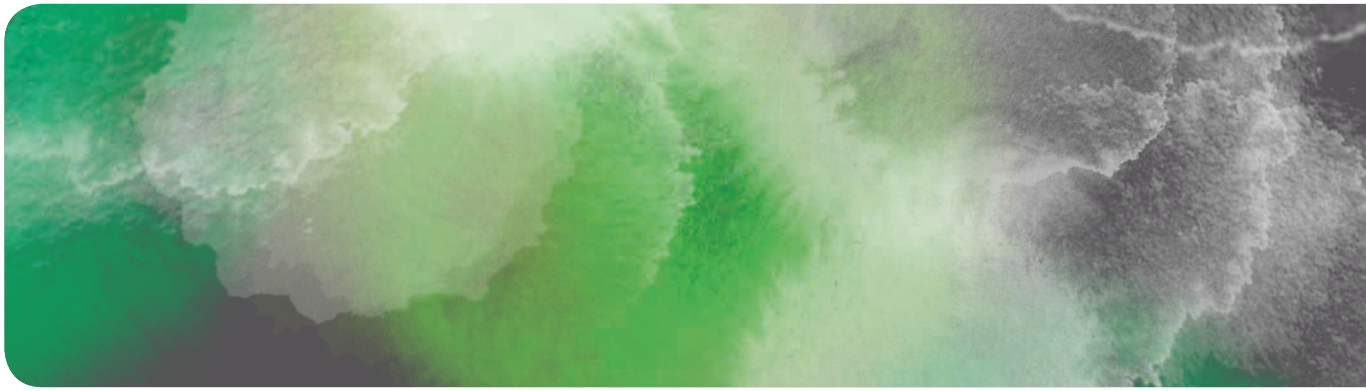
programme

Nanostructured Functional Surfaces

Programme Manager: **Prof. Isabel Rodriguez**

Research lines

Functional Surfaces
Prof. Isabel Rodríguez



About the programme

The Programme leverages on nanofabrication technologies with particular emphasis on cost-effective scalable processes to develop surface structured materials with new or improved functionalities. Much of the work is inspired by natural biological functional surface structures. Special competencies include surface patterning techniques such as nano-imprint lithography, soft lithography and molecular patterning. The Programme houses a nanoimprinting roll to roll pilot plant and processing knowledge of this large scale nanopatterning technology. The pilot plant is opened to external users for pilot trials and feasibility production studies.

Presently the Programme is active on the following research areas:

1. Multifunctional surfaces –the development of methodology to impart onto polymer nanocomposites additional surface properties, particularly those of super-hydrophobicity and self-cleaning based on bio-inspired surface nanotexturing.

2. Polymer optical devices such as polymer lasers and waveguides, antireflective surfaces and optical sensors. Nanoimprinting is currently employed to enable the fabrication of organic distributed feedback laser (DFB) on plastic materials for sensing applications.

3. Nano-engineered functional surfaces for medical applications, particularly in the development of biomimetic bactericidal functionalities and cell culture fluidic platforms for cell biomechanical assays.

Functional Surfaces

GROUP LEADER

Prof. Isabel Rodríguez

Senior Research Prof.

PhD: National University of Singapore

Previous Position: Institute of Materials Research and Engineering (IMRE), Singapore

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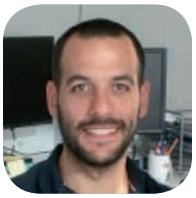
Researcher ID:
G-3178-2016

POSTDOCS



Dr. Jaime J. Hernández
Materials Science Institute of Mulhouse, France

Dr. Ivan Navarro-Baena
University of Perugia, Italy

PhD STUDENTS

Felipe Viela

María Teresa Alameda

TECHNICIAN

Alejandra Jacobo

Group webpage:
http://nanociencia.imdea.org/nanostructured-functional-surfaces-program/group-home

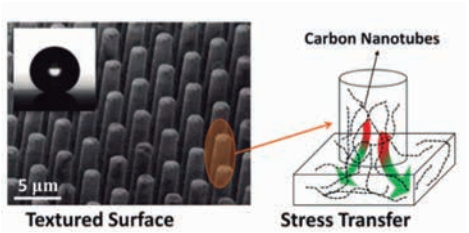
Research Lines

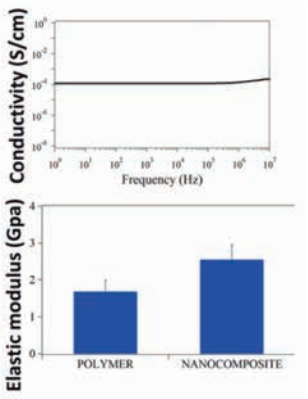
1. Nano-engineered functional surfaces for medical applications, particularly the development of biomimetic bactericidal functionalities *(Bioinspir Biomim 2018, 13,026011)* and cell culture platforms for cell biomechanical assays *(Adv. Funct. Mater. 2016, 26, 5599)*.

2. Multifunctional surfaces. The program is developing the methodology to impart onto polymer nanocomposites additional surface properties, particularly those of superhydrophobicity and self-cleaning based on bio-inspired surface nanotexturing *(Sci. Rep. 2017, 7, 43450)*. The program is also focused on up-scaling the methodology using Roll to roll nanoimprint technology.

3. Polymer nanoimprinting for optical applications such as polymer lasers and waveguides, antireflective surfaces and optical sensors in collaboration with the Organic Photophysics and Photonics group.

Here we describe the fabrication of nanoimprinted surfaces incorporating concurrently superhydrophobicity and self-cleaning properties together with the enhancement in mechanical performance and electrical conductivity. *(Sci. Rep. 2017, 7, 43450)*





highlight

programme

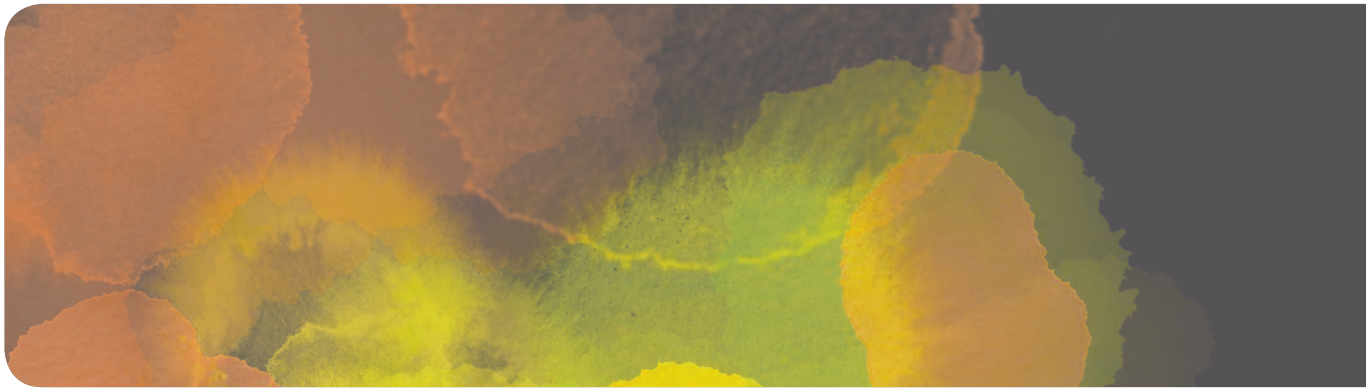
Quantum Nanodevices

Programme Manager: **Dr. Daniel Granados**

Research lines

Quantum Devices and Photonics
Dr. Daniel Granados

Superconducting Detectors



About the programme

Information society is experiencing a global challenge. Quantum technologies are expected to become crucial to address this challenge, with the second quantum revolution blasting off. Quantum technologies will enable new ways of computing, sending, screening, shorting and storing information. They will also empower scientific knowledge, with novel routes of simulating physical, chemical or biological phenomena; and will significantly contribute to the development of new sensors and new metrology or imaging methods. They will also be key players in the development of the internet of things, cloud computing and big data.

The EU has already acknowledged the importance of quantum technologies and in May 2016 announced a €1 billion Quantum Technologies Flagship imitative, starting in 2018, to place Europe at the forefront of this revolution. The EU expects the future markets for quantum technologies to be at least as significant as current ICT markets. Nevertheless, quantum technologies face important challenges to become accessible. Most of the quantum technologies have only been demonstrated at laboratory scale, and are hard, if not impossible to scale up at an affordable cost. For this reason, only quantum communication technologies, mostly based on photonics, are expected to reach the global market in the next five years, while others like quantum computing will only reach it in the next 20 to 50 years.

IMDEA-Nano, anticipating the importance of quantum technologies for the EU and worldwide, opened a new research programme on quantum devices for information technologies. This programme is our newborn and IMDEA nano is willing to invest significantly with the help of the recently Severo Ochoa Centre of Excellence Award.

The programme focuse on developing quantum technologies based on solid state platforms. We believe solid state devices will play a crucial role for quantum technologies to reach the global market at a reasonable price. Solid state solutions are relatively easy to fabricate and can be scaled up at a low cost, though they present the limitation that coherence times are extremely small, due to the interaction of the quantum states with the solid state environment.

The Quantum nanoDevices programme fosters strong internal synergies with different programmes. The broad in-house experience and knowledge in solid state physics can be successfully funnelled towards quantum technologies, while the available in-house expertises on synthetic organic and inorganic chemistry is an advantage for the development of hybrid devices.

In 2017 the Quantum Nanodevices programme has been active in the following topics:

- Generation of single photon emission based on 2D materials. The final goal is to explore schemes for electrically driven devices.
- Fabrication of Kinetic inductance superconducting detectors for Space exploration.
- Exploration of photonic cavity quantum electrodynamics effects in new 2D materials.
- Fabrication of quantum Physically Unclonable Functions for security and identification and counterfeit prevention.

Quantum Devices and Photonics

GROUP LEADER

Prof. Daniel Granados

Senior Research Prof.

PhD: Universidad Autónoma de Madrid. Spain and IMM-CNM-CSIC
Previous Position: Toshiba Research Europe Ltd. (TREL), Cambridge, UK

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Scopus Author ID:
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PhD STUDENTS

Fernando Jiménez
Andrés Black

Group webpage:
http://www.nanoscience.imdea.org/quantum-nanodevices/group-home

Research Lines

The Quantum nano-Devices Group (QnDG) focuses on micro and nanofabrication of electronic and photonic hybrid devices for quantum information technologies. A solid state approach is fostered towards the realization of single photon emitters (SPEs), cavity quantum electrodynamics (CQED), single photon detectors (SPDs), random number generators (RNDs) or physical unclonable functions (PUFs). The group also collaborates successfully with the Centre of Astrobiology (CAB-INTA-CSIC) in the development of Kinetic Inductance Superconducting Detectors (KIDs) for space exploration.

The following research lines are currently pursued:

1. Exploring novel patterning routes to tailor the properties of 2D materials such Graphene or Transition Metal Dichalcogenides (TMDCs).

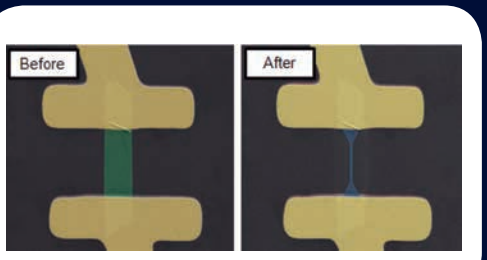
2. Development of Single Photon Emitters (SPEs) optically or electronically driven. Currently studying 2D Materials (WSe2, WS2, MoS2) and Nitrogen vacancy centers in diamond.

3. Seeking Cavity Quantum Electrodynamics effects directly onto 2D materials.

4. Micro and Nanofabrication of Kinetic Inductance Detectors for Space exploration.

5. Quantum Security: Development of Random Number Generators and Physical Unclonable Functions.

In 2017 we demonstrated a pioneering patterning nanofabrication method to modify the geometry and doping nature of monolayer and few layer field effect transistor devices based on MoS2. Pulsed Focused eBeam Gas assisted etching with XeF2 was employed to tailor the properties of devices after the fabrication process via conventional methods was completed, in a "post-processing" fabrication scheme. This allowed characterising the devices before and after the tailoring. *"Innovative patterning method for modifying few-layer MoS2 device geometries." Nanoengineering: Fabrication, Properties, Optics, and Devices XIV. Vol. 10354. International Society for Optics and Photonics, 2017*



highlight

Center for Micro and Nanofabrication

Prof. Daniel Granados
Director

Dr. Manuel Rodríguez
Research staff

Andrés Valera
Technician

The Centre for Nanofabrication is a joint proposal between the IMDEA-Nanociencia and Campus of Excellence UAM-CSIC to create a facility of excellence for the fabrication of nanostructures and devices based on a wide range of nanosciences such as 2D materials, nano-optics, photonics, nano-magnetism, bio-chemistry, micro-fluidics, nems&mems, or nanostructured organic semiconductors; among others. The fabrication of such nanostructures and devices is crucial for fundamental research, but also for the development of prospective nanotechnologies with commercial applications.

The Centre for Nanofabrication is hosted in a latest generation clean room, with more than 200m2 of clean room surface and more than 500m2 in total, including the technical gray area. The whole clean room is installed in a continuous solid concrete vibration isolation floor, and is fully independent of IMDEA- Nanociencia building, since it has it´s own foundations and services (acclimatization units, electrical power lines, water drains, earthings, gas lines, gas exhaust lines, etc.). This clean room is equipped with the all the necessary equipment and safety needs required to warranty the safety, quality and purity of its installations, such as evacuation, filtering and recirculation of air as well as temperature and humidity control. Also it is equipped with all the safety equipment for the manipulation and disposal of hazardous liquids and gases to ensure the safety of the users and environment.

The clean room is divided in two main areas. The smaller section is approximately 60m2 and has a certified air quality of ISO-5 (Class-100). The temperature is kept constantat 22±0.5º C and the relative air humidity is kept constant at 50±1%. This section is devoted to lithography processes. It is equipped with electron beam Lithography (e-Beam), Focused Ion Beam Lithography (FIB), Gas Assisted Ion/Electron beam lithography (Multi-GIS), Maskless Optical lithography and Nano-Imprint Lithography. This section is also equipped with a small wet chemistry room for all the processes related to nano and micro lithography, such as resist spinning, curing or developing.

The largest section of the clean room is about 140m2 and has a certified air quality of ISO-6 (Class-1000). In this section the temperature is kept constant at 22±2ºC and the relative air humidity is kept constant at 50±5%. This part is dedicated to sample and device fabrication. The clean room is equipped with several metal thin film evaporators, a unique Atomic Layer Deposition (ALD) reactor with 12 precursor lines and 800ºC sample chuck, inductively Coupled Plasma Reactive Ion etching (ICP-RIE) for deep cryo etching of Silicon compounds, Reactive Ion Etching for Metals and Insulators (RIE), Rapid thermal Processor (RTP), Stylus Profilometer (Dektak), Oxygen Plasma, Ozone Cleaner, Optical Microscopy, Wire Bonder, Diamond Scriber, Probe Satiation and Parameter analyzer. This section is also equipped with an encapsulation room and a large wet chemistry room for all wet chemistry related processes like wet etching and cleaning, and comprises three laminar flow hoods one for solvents and bases, one for acids and one fo HF. They are all fully equipped with drying spinner, ultra-sounds bath, reflow bath, DI water weir, mega-sounds bath, etc.

The Centre has been designed to provide service to all the scientists at IMDEA- Nanociencia as well as other users at the CEI UAM-CSIC and to a limited extent, elsewhere in Madrid and Spain. The latest available state of the art fabrication technologies will be on hand for the fabrication and manipulation of metallic, semiconducting and organic nanostructures and nanoscience-based devices.

The Centre for Nanofabrication provides the researches and users within the Cantoblanco campus of the UAM and in the framework of the Campus of Excellence project, with an efficient access to the necessary nanofabrication resources to be internationally competitive. Since IMDEA-Nanociencia is an institute created and financed jointly by the regional Government of Madrid and the Government of Spain, the Centre for Nanofabrication is intentionally planned to be able to provide under demand services of nanofabrication to researchers of public institutions as well as to private companies.

During 2017 a strong effort has been done to promote the activities of the Centre for Nanofabrication (#NanoFabLabonTour). More than 20 seminars have been given to explain the facilities and our activities to a broad audience. Prof. Granados, Director of the Centre for Nanofabrication visited several national institutions (CNIC, ICMM-CSIC, IMN-CSIC, CNB, CBM-SO, UAM) as well as International ones such as K4I Forum (Brussels), University of Cambridge (UK), University of Lancaster (UK), KISTA ICT Cluster Institute (Sweden), KTH-Royal Institute of Technology (Sweden), or SPAWAR Systems Pacific Centre (USA) to mention only a few.

US-Spain bilateral cooperation visit to the headquarters of SPAWAR SSC, Sand Diego, Ca, (USA) celebrated in October 2017. Prof. D. Granados (5th from the right) was part of the Spanish delegation.

highlight

Services

RMN and Mass Spec.Services

Dr. Zulay Pardo
PhD: Universidad Complutense de Madrid, Spain

Optical Tweezers

Dr. Rebeca Bocanegra
PhD: Universidad Autónoma de Madrid, Spain

Sara de Lorenzo
PhD: Universidad de Barcelona, Spain

AFM Service

Dr. Santiago Casado
PhD: Universidad de Cantabria, Spain

Cell Cultures

Dr. Adriana Arnaiz
PhD: Cambridge University, UK

Dr. Vanessa Rodríguez
PhD: Universidad Autónoma de Madrid, Spain

Workshop

Mr. Warren Smith
Technician

Fabiola Mogollon
Assistant

Nanofabrication Services

Dr. Manuel Rodríguez
PhD: Universidad de Santiago de Compostela, Spain

Mr. Andrés Valera
Technician

Cryogenics

Ivan Redondo
Technician

Management

Mr. Bonifacio Vega
General Manager

Dª Isabel Rodríguez
MS in Administration, Administration and Finance Manager

Dr. María Jesús Villa
Projects, Institutional Relations and HR Manager

Dr. José Luis Casillas
Facilities & Infrastructure General Manager

Dr. Mark William Davies
Industrial Liaison Manager

Dr. Elena Alonso
Project Assistant

Mr. Pablo Gómez
NANOFRONTMAGNET Project Assistant

Mr. Ignacio Torres
MOLRHEOSTAT Project Assistant

Dª Paloma Macua
Administrative Assistant

Óscar Bodas
Network and Systems Manager

Dª Elena Pérez
Administrative Assistant

Dª Juana Hemoso
Administrative Project Assistant

Dª Paloma Castillo
Director´s Assistant

Dª Margarita Gil
A3/ER System Technician

3

scientific report

2017 annual report

1. Publications, contributions to books and patents

1.1. Publications

1. **DNA sequences within glioma-derived extracellular vesicles can cross the intact blood-brain barrier and be detected in peripheral blood of patients.** García-Romero, N., Carrión-Navarro, J., Esteban-Rubio, S., Lázaro-Ibáñez, E., Peris-Celda, M., Alonso, M.M., Guzmán-De-Villoria, J., Fernández-Carballal, C., de Mendivil, A.O., García-Duque, S., Escobedo-Lucea, C., Prat-Acín, R., Belda-Iniesta, C., Ayuso-Sacido, A. (2017) *Oncotarget*, **8**(1) 1416-1428. doi:10.18632/oncotarget.13635

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155. **Photoionization using the xchem approach: Total and partial cross sections of Ne and resonance parameters above the 2s22p5 threshold.** Marante, C., Klinker, M., Kjellsson, T., Lindroth, E., González-Vázquez, J., Argenti, L., Martín, F. (2017) *Physical Review A*, **96**(2) 022507. doi:10.1103/PhysRevA.96.022507

156. **Chemical functionalization and characterization of graphene-based materials.** Bottari, G., Ángeles Herranz, M., Wibmer, L., Volland, M., Rodríguez-Pérez, L., Guldi, D.M., Hirsch, A., Martín, N., D'Souza, F., Torres, T. (2017) *Chemical Society Reviews*,**46** (15) 4464-4500. doi:10.1039/c7cs00229g

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189. **Elucidating the Methylammonium (MA) Conformation in MAPbBr3 Perovskite with Application in Solar Cells.** López, C.A., Martínez-Huerta, M.V., Alvarez-Galván, M.C., Kayser, P., Gant, P., Castellanos-Gomez, A., Fernández-Díaz, M.T., Fauth, F., Alonso, J.A. *Inorg. Chem.*, 2017, **56** (22), pp 14214–14219. doi: 10.1021/acs.inorgchem.7b02344

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200. **Elucidating the Methylammonium (MA) Conformation in $MAPbBr_3$ Perovskite with Application in Solar Cells.** López, C.A., Martínez-Huerta, M.V., Alvarez-Galván, M.C., Kayser, P., Gant, P., Castellanos-Gomez, A., Fernández-Díaz, M.T., Fauth, F., Alonso, J.A. (2017) *Inorganic Chemistry*, **56** (22), 14214-14219. doi: 10.1021/acs.inorgchem.7b02344

201. **Elucidation of the physicochemical properties ruling the colloidal stability of iron oxide nanoparticles under physiological conditions** Aires, A., Cabrera, D., Alonso-Pardo, L.C., Cortajarena, A.L., Teran, F.J. (2017) *ChemNanoMat,* **3**(3), 183-189. doi: 10.1002/cnma.201600333

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205. Ultrathin graphene-based membrane with precise molecular sieving and ultrafast solvent permeation. Yang, Q., Su, Y., Chi, C., Cherian, C.T., Huang, K., Kravets, V.G., Wang, F.C., Zhang, J.C., Pratt, A., Grigorenko, A.N., Guinea, F., Geim, A.K., Nair, R.R. (2017) *Nature Materials*, **16**(12) 1198-1202. doi: 10.1038/nmat5025

206. Extracellular vesicles compartment in liquid biopsies: Clinical application Garcia-Romero, N., Esteban-Rubio, S., Rackov, G., Carrión-Navarro, J., Belda-Iniesta, C., Ayuso-Sacido, A. (2017) *Molecular Aspects of Medicine* **60**: 27-37. doi: 10.1016/j.mam.2017.11.009

207. Room-Temperature-Phosphorescence-Based Dissolved Oxygen Detection by Core-Shell Polymer Nanoparticles Containing Metal-Free Organic Phosphors. Yu, Y., Kwon, M.S., Jung, J., Zeng, Y., Kim, M., Chung, K., Gierschner, J., Youk, J.H., Borisov, S.M., Kim, J. (2017) *Angewandte Chemie - International Edition*, **56**(51) 16207 16211. doi: 10.1002/anie.201708606

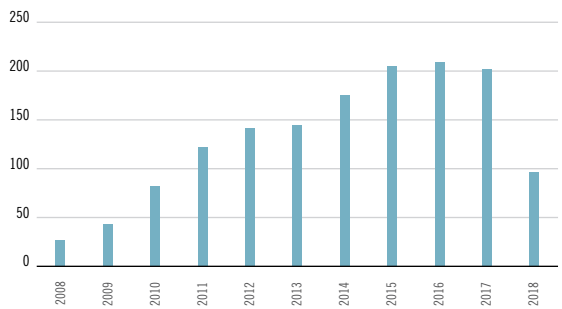
1.2. Contributions to books

1. **Correlative super-resolution fluorescence imaging and atomic force microscopy for the characterization of biological samples.** Bondia, P., Casado, S., Flors, C. (2017) Methods in Molecular Biology, **1663**, 105-113. doi:10.1007/978-1-4939-7265-4_9

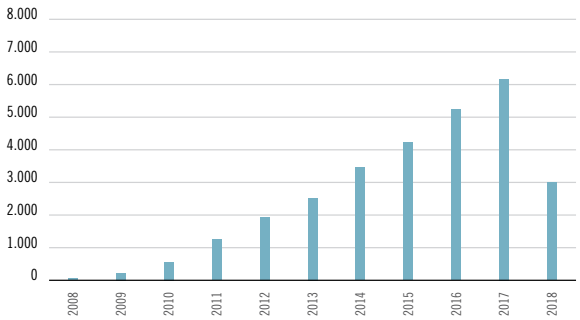
2. **Electronic Properties and Strain Engineering in Semiconducting Transition Metal Dichalcogenides.** Rafael Roldán, Francisco Guinea (2017) 2D Material. Properties and Devices pp **259-278.** doi.org/10.1017/9781316681619.015 Edited by Phaedon Avouris, IBM T. J. Watson Research Center, New York, Tony F. Heinz, Stanford University, California, Tony Low, University of Minnesota Publisher: Cambridge University Press.

- Sum of the times cited: **28.653**
- Average citation per item: **19,80**
- h index: **74**
- Papers: **1.455**

Publications in each year



Citations in each year



Impact factor of the publications in 2017

- Total indexed publications: **207**
- Average impact factor: **7,264**

1.3. Patents

Title	Publication Number	Publication Date	Inventor(S)	
Polymeric composites with functional surfaces	Wo2017167909 (A1)	2017-10-05	Hernández Rueda Jaime [Es], Hernández Rueda Jaime [Es], Rodríguez Fernández Isabel [Es], Navarro Baena Iván [Es], Viela Bovio Felipe [Es]	
Covalently modified graphene	WO2016124803 (A1)	2016-08-11	Calleja Mitjá Fabián [Es], Leret García Sofía [Es], Navarro Ocaña Juan Jesús [Es], Stradi Daniele [Dk], Black Morocoima Andrés [Es], Bernardo Gavito Ramón [Es], Garnica Alonso Manuela [Es], Granados Ruiz Daniel [Es], López Vázquez De Parga Amadeo [Es], Pérez Álvarez Emilio [Es], Miranda Soriano Rodolfo [Es]	
Systems and methods for obtaining unique identifiers and measuring displacements by sensing and analizing spatial magnetic field variations	EP3246722 (A1)	2017-11-22	Pedrosa Ruiz Francisco Javier [Es], Camarero De Diego Julio [Es], Bollero Real Alberto [Es]	
Modified solid support for the synthesis of oligonucleotides	US2016075680 (A1)	2016-03-17	Somoza Calatrava Alvaro [Es], Latorre Lozano Alfonso [Es]	
Detection and treatment of gnaq mutant uveal melanoma cells with gold nanoparticles	WO2015116502 (A1)	2015-08-06	Urda Susana Ortiz [Us], Somoza Calatrava Alvaro [Es], Latorre Lozano Alfonso [Es], Posch Christian [Us]	
Production of corrugated and porous graphene from cof for the use thereof as supercapacitors	ES2538604 (A1); ES2538604 (B1)	2015-06-22	Coronado Miralles Eugenio [Es], Ribera Hermano Antonio Luis [Es], Abellan Saez Gonzalo [Es], Zamora Abanades Félix [Es], Mas Balleste Rubén [Es], Rodriguez San Miguel David [Es]	
Functionalised magnetic nanoparticle	WO2016150521 (A1)	2016-09-29	López Cortajarena Aitziber [Es], Somoza Calatrava Álvaro [Es], Couleaud Pierre [Es], Ocampo García Sandra [Es], Aires Trapote Antonio [Es], Latorre Lozano Alfonso [Es]	
Functionalized metal nanoparticles and uses thereof for detecting nucleic acids	EP3099814 (A1)	2016-12-07	Somoza Calatrava Álvaro [Es], Latorre Lozano Alfonso [Es], Ortiz Urda Susana [Us], Posch Christian [Us]	
Method for the synthesis of covalent organic frameworks	WO2015015035 (A1)	2015-02-05	Zamora Abanades Félix Juan [Es], Mas-Ballesté Rubén [Es], Rodríguez San Miguel David [Es], Segura Castedo José Luis [Es], De La Peña Ruigómez Alejandro [Es]	
Graphene dried powder and method for its preparation	WO2015014862 (A1)	2015-02-05	Miranda Soriano Rodolfo [Es], Zamora Abanades Félix Juan [Es], Mas-Ballesté Rubén [Es], Azani Mohammad-Reza [Es], Carcelén Valero Verónica [Es], Castellano Doblaré Manuel [Es]	
Position-sensitive photodetector, method for obtaining same and method for measuring the response from the photodetector	ES2384766 (A1); ES2384766 (B1)	2012-07-12	Cabanillas Gonzalez Juan [Es], Campoy Quiles Mariano [Es]	
Position-sensitive photodetector, method for obtaining same and method for measuring the response from the photodetector	EP2650939 (A1)	2013-10-16	Cabanillas Gonzalez Juan [Es] Campoy Quiles Mariano [Es]	

	Applicant(S)	International Classification	Date Of Application	International Search Citation
	Fundación Imdea Nanociencia [Es]	B29C59/02 B29C70/64 B32B3/30 H01L51/00	20170330	US2013115420 (A1) US2014072720 (A1) US2005103457 (A1) US2013251948 (A1)
	Fundación Imdea Nanociencia [Es] Univ Autónoma De Madrid [Es]	C01B31/04 H01L21/20 H01L31/028	20160202	WO2008097343 (A2)
	Fundación Imdea Nanociencia [Es]	G01R33/10 G07D7/04	20160520	
	Fundación Imdea Nanociencia [Es] Fundacion Imdea Nanociencia [Es]	C07D339/04	20140429	
	Univ California [Us] Fundacion Imdea Nanociencia [Es]	C12Q1/68	20150123	US2009137418 (A1) US2013102653 (A1) US2004072157 (A1) US6221397 (B1) US2011223195 (A1) US2010201381 (A1)
	Uni De València [Es] Univ Madrid Autonoma Fundación Imdea Nanociencia	H01G9/042 B82Y30/00 B82Y40/00	20131122	
	Fundación Imdea Nanociencia [Es]	A61K47/48 A61P35/00	20150326	US2011165086 (A1) WO2008073856 (A2) KR20100070171 (A) CN102631687 (A) WO2006113668 (A1) WO02094325 (A2)
	Fundación Imdea Nanociencia [Es] Univ California [Us]	C12Q1/68	20150202	WO2007059514 (A2) WO0218951 (A2) US2010201381 (A1) WO2014149071 (A1)
	Fundación Imdea Nanociencia [Es] Univ Autónoma De Madrid [Es] Univ Madrid Complutense [Es]	C08G73/02 G03G5/05	20140730	US2010224867 (A1) WO2012039683 (A1)
	Fundación Imdea Nanociencia [Es] Univ Autónoma De Madrid [Es] Abengoa Res S L [Es]	C01B31/04 C08K3/24 C09D5/24 C09D7/12 C09D11/00	20140729	WO2013036272 (A1) US7097788 (B2) WO2012051597 (A2) WO2011162727 (A1)
	Fundacion Imdea Nanociencia [Es] Consejo Superior Investigacion	H01L51/42	20101210	
	Fundacion Imdea Nanociencia [Es] Consejo Superior Investigacion [Es]	H01L51/42	20111207	

2. International Congresses

2.1. Invited lectures

18/01/2017

DARTRIX-Meeting London UK

Applications of Nanotechnology against Cancer

A. Somoza

31/01/2017

VIII Congreso Nacional Biocomputación y Física de Sistemas Complejos BiFi 2017, Zaragoza, Spain

On nucleic acids and their information ratchets

J. R. Arias-Gonzalez

03/03/2017

Trends in Nanoscience 2017, Kloster Irsee, Germany

Quantum Thermoelectricity in Single-Molecule Junctions

N. Agrait

14-16/03/2017

4th Annual meeting of the European COST Action \XUV/X-ray light and fast ions for ultrafast chemistry (XLIC), Prague, Czech Republic

Exploring surface landscapes with molecules: rotationally induced diffraction of H2 on LiF(001) under fast grazing incidence conditions

F. Martín

15/03/2017

The World of Nanomaterials Workshop, Universidad Carlos III de Madrid, Spain

Biofunctional metallic nanoclusters and magnetic nanomaterials: biomedical applications

A.L.Cortajarena

26-31/03/2017

International Workshop on Photoionization and Resonant Inelastic X-ray Scattering (IWP-RIXS-2017), Aussois, France

Shaping surface landscapes with molecules: rotationally induced diffraction of H2 on LiF(001) under fast grazing incidence conditions

F. Martín

04/04/2017

2017 World Graphene Innovation, Conference, Changzhou, China

Phthalocyanines: Old Dyes, New Molecular Materials

T. Torres

04-09/04/2017

13 International Symposium on Functional pi-electron systems F-pi-13, Hong-Kong , China

New Organic Compounds for Photovoltaics

N.Martin

13/04/2017

Symposium of Molecular Design for Optoelectronic Materials, Beijing, China

Towards Organic Solid State Emitters by Targeted Design

J. Gierschner

22/04/2017

7th European Nanomanipulation Workshop Jena, Germany

STM tip for coordination chemistry

D. Écija

07-12/05/2017

5th International Workshop on 2D Materials El Escorial Spain

Quantum Thermoelectricity in Single Molecules

N. Agrait

Recent Progres son Antimonene

F. Zamora

Biaxial strain of single-layer transition metal dichalcogenides

R. Frisenda

Glycofullerenes for Ebola Virus Infection

N. Martin

25-26/05/2017

International Workshop on Massive Computation for Ultrafast Molecular Breaking, (MACUMB2017), Madrid, Spain

Attochemistry: imaging and controlling electron dynamics in molecules

F. Martín

28.05-01.06/2017

231st Meeting of the Electrochemical Society (ECS), New Orleans, USA

Stereodivergent-at-Metal Synthesis of [60]Fullerene Hybrids

N. Martín

Stereodivergent-at-Metal Synthesis of [60]Fullerene Hybrids
N. Martín
Site-Selective Covalent Patterning of Epitaxial Graphene with Periodicity at the Nanometer Scale
R. Miranda et al.
Rotaxanes and SWNTs Tie the Knot
E. M. Pérez
Subphthalocyanine-Fullerene Conjugates
T. Torres et al.

06/06/2017
From Bioinorganic Chemistry to Catalysis Workshop (UPV/EHU) San Sebastian, Spain
Reversible activation dynamics of ruthenium(II) and iridium(III) metallodrugs
A. M. Pizarro

12/06/2017
1st ELECMI International Workshop. Zaragoza, Spain
Quantum Thermoelectricity in Single-Molecule Junctions
N. Agraït

25-29/06/2017
36th Biennial Meeting of the Spanish Royal Society of Chemistry (RSEQ), Sitges, Spain
Una historia de la química actual: las nanoformas de carbono y Sir Harry W. Kroto Sitges
N. Martín

02-06/07/2017
International Symposium on Macrocyclic and Supramolecular Chemistry (ISMSC) in conjunction with ISACS: Challenges in Organic Materials & Supramolecular Chemistry, Cambridge, UK
Multivalent Glycofullerenes for Ebola Virus infection
N. Martín

03-06/07/2017
Microscience & Microscopy Congress Manchester UK
Correlative super-resolution fluorescence imaging and AFM to study luminescent biomaterials at the nanoscale
C. Flors

05-07/07/2017
X International School on Organometallic Chemistry Marcial Moreno Mañas , Ciudad Real , Spain
Chiral fullerenes from asymmetric catalysis"
N. Martín (Plenary lecture)

23-29/07/2017
17th International Symposium on Novel Armatics (ISNA-17), Stony Brook, New York, USA
Highly-Efficient Perovskite Solar Cells from Sulfur-rich Heterocyclic Hole-Transporting Materials
N. Martín

25/07/2017
Telluride Workshop on Energy Transport in Nanoscale Gaps and Molecular Junctions, Telluride, Co., USA
Thermal conductance of metallic contacts
N. Agraït

27.08-01.09/2017
11th Triennial Congress of the World Association of Theoretical and Computational Chemists (WATOC 2017), Munich, Germany
Theoretical modeling of attosecond electron dynamics in molecules
F. Martín

28.08-01.09/2017
3rd NGP-NET Symposium on Non-globular Proteins, Kosice, Slovakia,
Repeat proteins: scaffolds for artificial bioelectronic materials,
F. L. Cortajarena

03-06/09/2017
7th Conference on Elementary Processes in Atomic Systems (CEPAS 2017), Prague, Czech Republic
Attochemistry: imaging and controlling electron dynamics in molecules
F. Martín

04-08/09/2017
17th Congress of the European Society for Photobiology, Pisa, Italy
Novel correlative microscopy tools to study biology and biomaterials at the nanoscale
C. Flors
Operating Quantum States in Atoms and Molecules at Surfaces – QMol, Ascona, Switzerland
Quantum Thermoelectricity in Single-Molecule Junctions
N. Agraït

10-13/09/2017

15th Conference on Methods and Applications of Fluorescence, Bruges, Belgium

Correlative super-resolution and AFM to study biomaterials at the nanoscale

C. Flors

10-14/09/2017

7th European Optical Society Topical Meeting on Optical Microsystems - Flexible Photonics Symposium, Capri, Italy

All-Polymer Waveguides and Laser Resonators from Conjugated Polymer and Cellulose Acetate

J. Cabanillas-González

13-15/09/2017

FRIAS Junior Researcher Conference - Beyond molecular movies: Bringing timedomain spectroscopy to di raction imaging, Freiburg, Germany

Attochemistry: imaging and controlling electron dynamics in molecules

F. Martín

14/09/2017

Composites of MOFs and COFs. Workshop, Granada, Spain

Confining functional nanoparticles into colloidal imine-based COF spheres by a sequential encapsulation-crystallization method

F. Zamora

26-29/09/2017

Workshop on Photophysics and Nanomaterials (WONPHYS 2017), Varadero, Cuba

The Effect of Host Exciton Confinement on Polymer Blend Lasing

J. Cabanillas-González

02-06/10/2017

8th International Symposium on Atomic Cluster Collisions (ISACC 2017), Varadero, Cuba

Attochemistry: imaging and controlling electron dynamics in molecules

F. Martín

04-06/10/2017

Topical Meeting on Single Quantum Emitters, Braga, Portugal

Hybrid nanoscopy of hybrid nanomaterials

C. Flors

17-19/10/2017

12th Annual event of the European Technology Platform on Nanomedicine ETPN 2017, Torremolinos, Spain

Smart nanoparticles and magnetic hyperthermia as anticancer tools

Álvaro Somoza

23-27/10/17

Conference "Conference on Weyl Fermions in Materials" (smr 3157) ICTP Trieste, Italy

Time-reversal and rotation symmetry breaking superconductivity in Dirac materials

L. Chirolli

26/10/2017

Yañez Workshop, San Sebastian, Spain

Attosecond molecular dynamics

F. Martín

07-10/11/2017

IX Congreso Argentino de Química Analítica, Córdoba, Argentina

Nanomaterials and metal complexes to improve biosensor platforms

E. Lorenzo, Plenary Lecture

22-24/11/2017

Ultrafast Science and Technology Spain 2017, Salamanca, Spain

Attochemistry: imaging and controlling electron dynamics in molecules

F. Martín

22/11/2017

NanoBio&Med2017, Barcelona, Spain

Smart Nanoparticles for the Treatment of Cancer

A. Somoza

30.11-01.12/2017

1st InternationalWorkshop on Computational and Theoretical Nanoscience, Madrid, Spain

Attochemistry: imaging and controlling electron dynamics in molecules

F. Martín

Nanoscience & Nanotechnology in the Service of Society

J. Camarero

06/12/2017

Chemistry as Innovating Science (CHAINS), Veldhoven, The Netherlands

Novel photosensitizing flavoproteins as tags for correlative light and electron microscopy

C. Flors

2.2. Regular contributions

08-13/01/2017

Single Molecule Biophysics Conference 2017, Aspen, USA

Poster Contribution

DNA synthesis determines the binding mode of the human mitochondrial single-stranded DNA-binding protein

B. Ibarra

12/01/2017

Biophysical Society 61st Annual Meeting, New Orleans, USA

Poster Contributions

How the barrierless folding helps DNA recognition: theoretical investigation on ultrafast folding protein engrailed homeodomain

X. Chu and V. Muñoz

Beyond diffusion controlled kinetics: how a protein implements a fast searching on DNA until get its specific binding site?

M. Castellanos and V. Muñoz

25-26/01/2017

Spanish Nanolithography Network Nanolito Workshop: Nanodevices based on graphene and 2D materials, Salamanca, Spain

Oral Contributions

2D Materials and Devices

A. Castellanos et col.

Bandgap tuning of single-layer transition metal dichalcogenides under biaxial strain

R. Frisenda et col.

Novel method to measure electrical properties of two dimensional materials based on carbon fibres

P. Gant et col.

Poster Contributions

Fabrication of hybrid systems: suspended graphene/superconductor.

V. Rollano, A. Gómez, P. Prieto, M. R. Osorio, D. Granados, E. M. González, J. L. Vicent

Fabrication of Lumped Element Kinetic Inductance Detectors for millimeter and sub-millimeter Astronomy

Víctor Román, Alicia Gómez, Patricia Prieto, Daniel Granados, José Luis Costa-Kramer, Juan Bueno, Johannes Goupy, Jesús Martín-Pintado

Electrical and optical properties of LSMO/Monolayer MoS2 photodiodes

Yue Ni, Riccardo Frisenda, Simon A. Svatek, Gloria Orfila, Fernando Gallego, Patricia Gant, Nicolás Agrait, Federico Monpean, Carlos León, Alberto Rivera Calzada, David Pérez De Lara, Jacobo Santamaria, Andres Castellanos-Gomez

27-28/01/2017

8th Symposium on Computing pi-Conjugated Compounds, Málaga, Spain

Oral Contributions

Charge Transfer Materials - Challenges for Targeted Materials Design

J. Gierschner

Twist Elasticity at Work - a New Polymorph of Cyano-Substituted Distyrylbenzene (b-DCS)

Junqing Shi

Mechanical and Electronic Properties of Mechanically Interlocked Carbon Nanotubes (MINTs)

B. Nieto-Ortega

07-10/03/2017

NanoSpain Conference 2017, San Sebastian, Spain

Oral Contributions

Spin-Orbit driven effects in graphene based perpendicular magnetic anisotropy structures

Paolo Perna; Fernando Ajejas; Ruben Guerrero; Manuel Valvidares; Rodolfo Miranda; Julio Camarero

Hybrid magnetic and luminescent nanostructures for self-monitored photothermal therapy

D. Ortgies, U. Rocha, L. de la Cueva, G. Salas, F.J. Teran, Y. Orlovskiy, E. Martín Rodríguez, J. Garcìa Solé and D. Jaque

Poster Contribution

Functionalized Gold-based Nanostructures for Uveal Melanoma Treatment

Beatriz Álvarez Rodríguez, Ana Belén Latorre, Alfonso Latorre, Alvaro Somoza

23-24/03/2017

Workshop on New Trends in Material Science, Madrid, Spain

Oral Contributions

Electronic structure of 2H-NbSe2 single-layers in the CDW state
J. A. Silva-Guillén; P. Ordejón; F. Guinea; E. Canadel

Hamiltonian optics and light-matter collective modes
A. Gutierrez

27-28/03/2017

2nd Annual Conference and Expo on Biomaterials, Madrid, Spain

Oral Contribution

Modulation of cell behavior on artificial materials by functional nano-topographies for applications in regenerative medicine
I. Rodriguez, F. Viela

28-31/03/2017

4th European Conference Optical Nanospectroscopy, Lisbon, Portugal

Oral Contributions

Self-Assembled Low-Dimensional Host-Guest Supramolecular Polymers: Structural Insights by Polarized Fluorescence and Morphology Studies
J. Gierschner

Electronic Effects in the Self-Assembly of Strong
R. Otero

02-06/04/2017

253rd American Chemical Society National Meeting & Exposition, San Francisco, USA

Oral Contribution

Ruthenium complexes as new pH-dependent switchable metallodrugs
F. Martínez-Peña; A. M. Pizarro

03-04/04/2017

European Nanomedicine Meeting, London, United Kingdom

Poster Contribution

Functionalized Gold-based Nanostructures for Breast Cancer and Uveal Melanoma Treatment
Ana Latorre, Beatriz Álvarez Rodríguez, Paula Milán, Jose Lombardía, Eduardo García Garrido, Alfonso Latorre, Mercedes Lecea, Ana Lázaro-Carrillo, Macarena Calero, Ángeles Villanueva, Álvaro Somoza

03-05/04/2017

COST TO-BE Spring meeting Strasbourg, France

Oral Contributions

In-plane magnetic anisotropy studies of bi-axially strained $La_{0.7}Sr_{0.3}MnO_3$ thin films by Magneto-Optical Kerr Magnetometry
Sandeep Kumar Chaluvadi; Paolo Perna; Fernando Ajejas; Julio Camarero; Laurence Méchin

Disentangling low field Anisotropic Magnetoresistance in $La_{0.7}Sr_{0.3}MnO_3$ Films
Fernando Ajejas; Davide Maccariello; Ruben Guerrero; Laurence Méchin; Stephane Flament; Jacobo Santamaria; Julio Camarero; Rodolfo Miranda; Paolo Perna

08-13/04/2017

New trends in Nanomedicine, International School of Nanomedicine, Erice, taly

Oral Contribution

NoCanTher: Addressing Pancreatic Cancer with Nanoparticles
F. J. Terán, O. Ibarrola, R. Zimmer, R. Quaas, P. P. Lopez-Casas, I. Hilger, P. Southern, S. Schwartz, Y. Volkov, F. Gazeau, T. Macarulla, R. Miranda, and A. Somoza.

24-28/04/2017

IEEE International Magnetics Conference INTERMAG 2017, Dublin, Ireland

Oral Contributions

3D magnetometry in micrometer-wide and nanometer thick magnetite crystals using XMCD-PEEM
S. Ruiz-Gomez, L. Pérez, A. Quesada, P. Prieto, I. Palacio, L. Martín-Garcia, M. Foerster, L. Aballe, J. De la Figuera.

Domain wall dynamics and Dzyaloshinskii-Moriya interaction
Dayane Chaves; Fernando Ajejas; Viola K?iû·kov·; Jan Vogel; Andre Thiaville; J Sampaio; Julio Camarero; Paolo Perna; Stefania Pizzini.

Emergence of the Stoner-Wohlfarth astroid in thin films at dynamic regime
Alberto Bollero; T. Pérez; JL Cuñado; Paolo Perna; A. Maldonado; Fernando Ajejas; Javier Pedrosa; Miguel Angel Niño; Ruben Guerrero; D. Cabrera; Francisco Terán; Rodolfo Miranda; Julio Camarero

Chiral asymmetry driven by unidirectional magnetic anisotropy in Spin-Orbitronic systems
Fernando Ajejas; Ruben Guerrero; Rodolfo Miranda; Julio Camarero; Paolo Perna.

Angular-dependent magnetic properties of exchange-coupled ferromagnetic and multiferroic $BiFeO_3$ thin films
Fernando Ajejas; Davide Maccariello; JLF Cuñado; Sergio de las Heras; Jullie Albille; Cyrille Deranlot; Agnes Bartelemy; Julio Camarero; Manuel Bibes; Rodolfo Miranda; Paolo Perna

Coercivity development in MnAl permanent magnet powders through flash-milling processing of gas-atomized particles
J. Rial; M. Villanueva; E. Céspedes; N. López; J. Camarero; L. G. Marshall; L. H. Lewis; and A. Bollero

High coercive rare earth-free magnets for medium temperature applications: from quasi-isotropic to highly textured MnBi films
E. Céspedes; M. Villanueva; F. J. Mompén; C. Navío; J. Rial; A. Inchausti; P. Pedraz; M. R. Osorio; A. Bollero

Poster Contribution

Engineering Large Anisotropic Magnetoresistance in $La_{0.7}Sr_{0.3}MnO_3$ Films at Room Temperature
Fernando Ajejas; Davide Maccariello; Ruben Guerrero; Laurence Mèchin; Stephane Flament; Jacobo Santamaría; Julio Camarero; Rodolfo Miranda; Paolo Perna.

Angular-dependent magnetic properties of exchange-coupled ferromagnetic and multiferroic BiFeO3 thin films
Fernando Ajejas; Davide Maccariello; JLF Cuñado; Sergio de las Heras; Jullie Albille; Cyrille Deranlot; Agnes Bartelemy; Julio Camarero; Manuel Bibes; Rodolfo Miranda; Paolo Perna

28.05-03.06/2017

231st Electrochemical Society Meeting, New Orleans, USA

Oral Contribution

Heterostructures Beyond Van Der Waals
E.M. Pérez

Graphene Nanoribbon Heterojunctions with Dbtp Precursors on Ag(111)
R. Miranda et al.

Porphyrinoids for Molecular Photovoltaics
T. Torres et al.

Efficient Electron Transport Layer-Free Solar Cells Based on Innovative Perovskite: Fullerene Blends
J. L. Delgado, N. Martín, S. Collavin, R. Tena-Zaera, J.Pascual, I. Kosta, R. Sandoval-Torrientes, and I. García Benito

27-28/04/2017

RADIOMAG Congress - COST Association, Bilbao, Spain

Oral Contribution

Towards in silico clinical trials of magnetic hyperthermia
D. Ortega

28/04/2017

NanoBioSystems, Madrid, Spain

Oral Contribution

On optically-active nanoparticles, non-canonical nucleic acid conformations and information ratchets
J. R. Arias-Gonzalez

29.04-02.05/2017

34th Annual Society for Thermal Medicine Meeting, Cancun, Mexico

Oral Contribution

Towards an understanding of heating effects and magnetisation response of magnetic nanoparticles associated with live cells
N. Telling, D. Cabrera, F. J. Terán

02-05/05/2017

Challenges for Magnetic Skyrmions and Opportunities for Skyrmionic Devices SKYMAG2017, Paris, France

Oral Contribution

Domain wall dynamics and Dzyaloshinskii-Moriya interaction
D Chaves; Fernando Ajejas; Viola Křižáková; Jan Vogel; Andre Thiaville; J Sampaio; Julio Camarero; Paolo Perna; Stefania Pizzini

07-12/05/2017

5th International Workshop on 2D Materials El Escorial Spain

Oral Contribution

Innovative patterning method for modifying few-layer MoS2 device geometries
F. J. Urbanos, Andrés Black, Ramón Bernardo-Gavito M. Rodríguez, Santiago Casado, Rodolfo Miranda and Daniel Granados

14-20/05/17

Majorana states in condensed matter: towards topological quantum computation, Mallorca, Spain

Poster Contributions

Time-reversal and rotation symmetry breaking superconductivity in Dirac materials
L. Chirolli

Quantum Spin Hall in Twisted Bilayer Graphene
Francesca Finocchiaro

17-19/05/2017

Symposium Frontiers in Polymer Science, Sevilla, Spain

Poster Contribution

Superhydrophic Nanoimprinted Structures with Enhanced Durability
J. Hernández, F. Viela, I. Navarro-Baena, M. Rodríguez, M. Moncl´s, J. Molina, I. Rodríguez

22/05/2017

COST TO-BE Spring Meeting, Strasbourg, France

Oral Contributions

Disentangling low field Anisotropic Magnetoresistance in $La_{0.7}Sr_{0.3}MnO_3$ Films
Fernando Ajejas; Davide Maccariello; Ruben Guerrero; Laurence Mèchin; Stephane Flament; Jacobo Santamaria; Julio Camarero; Rodolfo Miranda; Paolo Perna

In-plane magnetic anisotropy studies of bi-axially strained $La_{0.7}Sr_{0.3}MnO_3$ thin films by Magneto-Optical Kerr Magnetometry
Sandeep Kumar Chaluvadi; Paolo Perna; Fernando Ajejas; Julio Camarero; Laurence Mèchin

28.05-01.06/2017

231st Meeting of the Electrochemical Society (ECS), New Orleans, USA

Oral Contributions

Graphene Nanoribbon Heterojunctions with Dbtp Precursors on Ag(111)
R. Miranda et al.

Porphyrinoids for Molecular Photovoltaics
T. Torres et al.

Efficient Electron Transport Layer-Free Solar Cells Based on Innovative Perovskite:Fullerene Blends
J. L. Delgado, N. Martín, S. Collavin, R. Tena-Zaera, J.Pascual, I. Kosta, R. Sandoval-Torrientes, and I. García Benito

28.05-03.06/2017

16th International Workshop on Vortex Matter in Superconductors, Natal, Brazil

Oral Contribution

Vortices on the move: Probing nanomagnets with different magnetic states
J. L. Vicent, A. Gomez, V. Rollano, J. del Valle, F. Valdés-Bango, J. I. Martin, M. Vélez, M. R.Osorio, D. Granados, and E. M. Gonzalez

05-09/06/2017

Oral Contribution

TNT-2017-Trends in NanoTechnology, Dresden, Germany

Graphene on SiO2 under ultrahigh pressure
M. Pisarra, C. Díaz, F. Martín, P. Ares, C. Gómez-Navarro, F. Zamora, J. Gómex-Herrero, E. G. Michel, P. Segovia

06-08/06/2017

16th Congress of the Spanish Biophysical Society SBE2017, Sevilla, Spain

Oral Contributions

Mechano-chemical characterization of dynamin-mediated membrane fission

Bocanegra, R; Velasco, A; de Lorenzo, S; Frolov, V; Carrascosa, JL; Ibarra, B.

DNA synthesis determines the binding mode of the human mitochondrial single-stranded DNA-binding protein

J. Morin, J. Jarillo, F. Cerrón, E. Beltran-Heredia, G. Ciesielski, L.S. Kaguni, F.J. Cao, B. Ibarra

Engineered proteins as scaffolds for functional nanostructures and materials

S.H. Mejías, A. Aires, J. Lopez Andarías, P. Couleaud, M.T. Gonzalez, C. Atienza, N. Martin, A.L. Cortajarena

Poster Contributions

The folding complexity of TERRA molecules unveiled at the single molecule level

I. Gutiérrez; M. Garavis; S. de Lorenzo; A. Villasante; C. González; J. R. Arias-Gonzalez

Coordinated activity of human mitochondrial DNA polymerase and SSB proteins at the replication fork.

F Cerrón, G. Cielsiesky, LS Kaguni, F Cao, Ibarra, B.

Towards the mechanochemical characterization of the human mitochondrial replisome

K Lemishko, G. Cielsiesky, LS Kaguni, Ibarra, B.

Self Assembled Designed Proteins For The Organization Of Gold Nanomaterials

E. López, J. Kumar, A. Aires, S. H Mejías, L. Liz-Marzán, A. L Cortajarena

07-10/06/2017

14th International Symposium on Applied Bioinorganic Chemistry ñ ISABC, ISABC14, Toulouse, France

Poster Contribution

Reversible activation dynamics of tethered ruthenium (II) arene complexes

F. Martínez-Peña; A. M. Pizarro

19-23/06/2017

Conference Optical Probes, Quebec, Canada

Oral Contributions

Exciton Features in Highly Luminescent 1D Host-Guest Supramolecular Polymers

J. Gierschner

Lèvy Defects in Matrix-Immobilized J aggregates

L. L$_{\text{ɔ}}$er, S.K. Rajendran, T. Stoll, L. Ganzer, J. Rehault, D.M. Coles, D. Lidzey, T. Virgili, G. Cerullo,

19-21/06/2017

European Conference on Surface Crystallography and Dynamics (ECSCD-13), San Sebastian, Spain

Poster Contribution

Surface spectroscopy and spin filtering of DPEDA chiral molecular film

M.A. Niño, F.J. Luque, I. Kowalik, P. Gargiani, D.Arvanitis, J.J. de Miguel

18-23/06/2017

24th International Symposium on Metastable, Amorphous and Nanostructured Materials ISMANAM 2017, San Sebastian, Spain

Oral Contribution

High coercive MnAl powders produced by rapid milling for permanent magnet applications

A. Bollero; J. Rial; M. Villanueva; E. Céspedes; N. López"

21-22/06/2017

7th Early Stage Researchers Workshop, Madrid, Spain

Oral Contributions

Efficient benzodithiophene/benzodithiazole-based n-channel charge transporters

R. Sandoval, J. Calbo,2 W. Matsuda, W. Choi, J. Santos, S. Seki, E. Ortí and N. Martin

Self-assembled low-dimensional host-guest supramolecular polymers: structural perceptions by PL spectroscopy and microscopy

Paramjyothi. Nandajan, Hyeong-Ju Kim, Santiago Casado, Reinhold Wannemacher, Soo Y. Park and Johannes Gierschner

Engineering quantum dots with enhanced performance for optical manipulation

Héctor Rodríguez-Rodríguez, María Acebrón, Beatriz H. Juarez and J. Ricardo Arias-González

Nanoscience and advanced processing routes unite to improve commercial rare-earth free permanent magnets
Melek Villanueva, Javier Rial, Noelia López, Julio Camarero and Alberto Bollero

Large-area 2D-0D heterostructures via langmuir-blodgett film deposition
A. Black, J. Roberts, M. Acebrón, R. Bernardo-Gavito, G. Alsharif, F.J. Urbanos, B.H.Juárez, D. Granados, B.J. Robinson, A.L. Vázquez de Parga and R.J. Young

Scanning Tunneling Spectroscopy of BiTeCl
P. Casado Aguilar, A. Norris, C. G. Ayani, E. V. Chulkov, R. Miranda, A. L. Vázquez de Parga

Light-exciton strong coupling in MoS2
Á. Gutiérrez-Rubio, L. Chirolli, F. J. García-Vidal, L. Martín-Moreno and F. Guinea

LSMO/single layer MoS2 PN junctions: complex oxide/2D material hybrid devices
Yue Niu, Riccardo Frisenda, Simon A. Svatek, Gloria Orfila, Nicolás Agraït, Federico Monpean, Carlos León, Alberto Rivera-Calzada, David Pérez De Lara, Jacobo Santamaria, and Andres Castellanos-Gomez

Anisotropic features in the electronic structure of the two-dimensional transition metal trichalcogenide TiS3: electron doping and plasmons
J A Silva-Guillén, E Canadell, P Ordejón, F Guinea and R Roldán

Poster Contributions

Gold Bioconjugate designs as antigen and siRNA delivery systems to dendritic cells
Álvaro del Moral Jiménez and Begoña Sot

Effect of N- and C- terminal domains of α-synuclein on amyloid fibril formation
José Gallardo Hernanz and Begoña Sot

Towards mechanochemical characterization of the human mitochondrial replisome
Kateryna M. Lemishko, Laurie S. Kaguni and Borja Ibarra

BSA-stabilized gold nanoclusters for breast cancer and uveal melanoma treatment
Ana Latorre, Alfonso Latorre, Ana Lázaro, Macarena Calero, Alejandra Crespo, Mercedes Lecea, Pilar Martín-Duque, Ángeles Villanueva, and Álvaro Somoza

Functionalized gold-based nanostructures for uveal melanoma treatment
Beatriz Álvarez Rodríguez, Ana Belén Latorre, Alfonso Latorre, Álvaro Somoza

Combination of photodynamic therapy and chemotherapy using gold nanoclusters: novel and effective approach for cancer treatment.
Andrea Tabero, Oriol Planas, Ana Lázaro-Carrillo, Santi Nonell, Juan Carlos Stockert, Magdalena Cañete and Ángeles Villanueva

Coordinated activity of the human mitochondrial DNA polymerase and SSB proteins at the replication fork
Fernando Cerrón, Grzegorz L. Cieselki, Francisco J. Cao, Laurie S. Kaguni and Borja Ibarra

The folding complexity of TERRA molecules unveiled at the single-molecule level
Irene Gutiérrez, Miguel Garavís, Sara de Lorenzo, Alfredo Villasante, Carlos González, and J. Ricardo Arias-Gonzalez

Mechanics, thermodynamics, and kinetics of ligand binding to biopolymers
Javier Jarillo, José A. Morín, Elena Beltrán-Heredia, Juan P. G. Villaluenga, Borja Ibarra, and Francisco J. Cao

Fast folding states of engrailed homeodomain assessed by relaxation dispersion NMR
V. N. Sivanandam, Matija Popovic, Milagros Castellanos , Ma del Pilar López Navajas and Victor Muñoz

Conformational disorder and fast-folding marginal barrier modulate protein-DNA recognition
Xiakun Chu and Victor Muñoz

pH-Dependent ruthenium metallodrugs (best poster award)
F. Martínez-Peña; A. M. Pizarro

Tert-thienobenzene based supramolecular polymers in water
Nicolás M. Casellas, Miguel García-Iglesias and Tomás Torres

Subphthalocyanines axially substituted with a tetracyanobuta-1,3-diene-aniline moiety: synthesis, structure, and physicochemical properties
G. Lavarda, J. Guilleme, T. Torres and G. Bottari

From conventional STM to Electrochemical STM
Lucía Palomino-Ruiz and M. Teresa González

Novel organometallic drug candidates based on osmium
S. Infante Tadeo; A. M. Pizarro

Electrocatalytic processes promoted by diamond nanoparticles in enzymatic biosensing devices
M. Briones, M. D. Petit-Domínguez, A. M. Parra-Alfambra, L. Vázquez, F. Pariente, E. Lorenzo and E. Casero

Colloidal gallium nanoparticles: synthesis and UV absorption
F. Nucciarelli, I.Bravo, S. Catalán-Gomez, L. Vázquez, E. Lorenzo and J. L. Paud

New design of sulfur-rich polycyclic aromatic compounds as hole-transporting materials for high-efficiency perovskites solar cells
J. Urieta-Mora, I. Zimmermann, J. Aragó, E. Ortí, A. Molina-Ontoria, M. K. Nazeeruddin and N. Martín

Pathway complexity in the supramolecular polymerization of minimalist peptide-based molecules
Alicia López-Andarias, Carmen Atienza-Castellanos and Nazario Martín

Porphyrin-based mechanically interlocked SWNTs
Leire de Juan and Emilio M. Pérez

New porphyrazines for dye sensitized solar cells (DSSCs) by modification of the anchoring group
Diana Paola Medina, Salome Rodriguez and Tomas Torres

Subcomponent self-assembly of $M_2L_3^{4+}$ subphthalocyanine based helicates
Miguel Ángel Revuelta Maza, Gema de la Torre Ponce and Tomás Torres Cebada

Band gap opening in metallic single-walled carbon nanotubes by encapsulation of an organic salt
Julia Villalva, Belén Nieto-Ortega, Mariano Vera-Hidalgo, Luisa Ruíz-González, Enrique Burzuri and Emilio M. Pérez

Pulling work out of molecular shuttles
Teresa Naranjo, Kateryna Lemishko, Álvaro Somoza, Borja Ibarra and Emilio M. Pérez

Molecular swimmer at low reynolds number
Sofía Mena and Emilio M. Pérez

Mechanically Interlocked SWNTs for Catalytic Applications
Mariano Vera, Matías Blanco and Emilio M. Pérez

Ag/Ag2S nanocrystals for high sensitivity near-infrared luminescence nanothermometry
Diego Ruiz, Blanca del Rosal, María Acebrón, Cristina Palencia, Chen Sun, Juan Cabanillas-González, Miguel López-Haro, Ana B. Hungría, Daniel Jaque and Beatriz H. Juárez

Thermopower measurements using STM - Break Junction: length dependence and backbone tunability
Laura Rincón-García, Edmund Leary, M. Teresa González, Gabino Rubio-Bollinger and Nicolás Agraït

Inorganically coated colloidal quantum dots in polar solvents using a microemulsion-assisted method
María Acebrón, Facundo C. Herrera, Martín Mizrahi, Cristina Navío, Ramón Bernardo-Gavito, Daniel Granados, Félix G. Requejo and Beatriz H. Juarez

A surprising finding: An extremely robust and beautiful Fe(II) Metal-organic framework
Estefania Fernandez-Bartolome, Saeed Khodabakhshi, Jose Santos, Laura J. McCormick, Simon J. Teat, Nazario Martín and Jose Sanchez Costa

Increasing the bit density from quantum-confinement physically unclonable functions
Hamzah Shokeir, Ramón Bernando-Gavito, Manuel Rodríguez Osorio, Daniel Granados and Robert J. Young

Two different strategies to obtain high PL quantum yield of polythiophene
Chen Sun, Larry Lüer and Juan Cabanillas-Gonzalez

Twist elasticity controlled crystal emission in highly luminescent polymorphs of cyano-substituted distyrylbenzene (βDCS)
Junqing Shi, Seong-Jun Yoon, Lucas Viani, Soo Young Park, Begoña Milián-Medina and Johannes Gierschner

Detection of explosive and toxic gases with MOFs through ASE phenomena
Ahmad Sousaraei Jose R. Castro Smirnov José M. Pedrosa, Ana M. G. Silva and Juan Cabanillas-González

Enhanced amplified spontaneous emission and lasing from flexible transparent full plastic devices
José R. Castro Smirnov, Ahmad Sousaraei, Longfei Wu, Reinhold Wannemacher, Santiago Casado, Isabel Rodríguez, Ruidong Xi and Juan Cabanillas-González

Nano-electrodes for neural electrical activity measurements
Beatriz L. Rodilla, Belén Cortés, Andrés Valera, Julio Camarero, M. Teresa González and Lucas Pérez

Determination of the Dzyaloshinskii-Moriya interaction in epitaxial asymmetric trilayers
F. Ajejas, A. Gudin, R. Guerrero, D. Chaves, V. Křižáková, J. Vogel, S. Pizzini, P. Perna and J. Camarero

Innovative patterning method for modifying few-layer MoS2 device geometries
F. J. Urbanos, Andrés Black, Ramón Bernardo-Gavito M. Rodríguez, Santiago Casado, Rodolfo Miranda and Daniel Granados

Two-dimensional materials and devices: fabrication and characterization
Patricia Gant, Riccardo Frisenda, Yue Niu, David Pérez de Lara and Andres Castellanos-Gomez

In the route to produce last generation of nanostructured permanent magnets based on MnAl
Javier Rial, Melek Villanueva, Eva Céspedes, Noelia Lopez, Ester M. Palmero, Julio Camarero, Luke G. Marshall, Laura H. Lewis and Alberto Bollero

Intervalley back scattering in lead intercalated graphene
C. G. Ayani, J. J. Navarro, F. Calleja, A. I. Vazquez de Pargaa, and R. Miranda

23/06/2017

9th International Conference on Materials for Advanced Technologies ICMAT 2017, Singapore, Singapore

Oral Contributions

Isolation of Highly Stable Antimonene under Ambient Conditions
F. Zamora

Molecular Wires Based on Highly Conductive Metal-Organic Chains
F. Zamora

21-23/06/2017

BioOrigami meeting, Ljubljana, Slovenia

Repeat proteins as scaffolds for hybrid biomaterials and nano-sensors,
Aitziber L. Cortajarena

25-29/06/2017

36th Biennial Meeting of the Spanish Royal Society of Chemistry (RSEQ), Sitges, Spain

Oral Contributions

Interfacing molecules and nanomaterials: the mechanical bond and beyond
E. M. Pérez

Charge Generation and Recombination in Rhodanine based organic solar cells
L. Luer

Efficient benzodithiophene/benzodithiazole-based n-channel charge transporters
R. Sandoval-Torrientes

High-efficiency perovskite solar cells using heterocyclic hole-transporting materials: influence of heteroatom on power conversion efficiency
Agustín Molina

Tailoring sulfur-rich polycyclic aromatic compounds as hole-transporting materials for high-efficiency perovskites cells
Javier Urieta

02-07/07/2017

13th International Workshop on Magnetism & Superconductivity at the Nanoscale, Tarragona, Spain

Oral Contributions

Ultra thin films of L10-MnAl on GaAs(001): tuning the properties of the Mn-Ga interphase Compound
C. Navío, E. Céspedes, M. Villanueva, F.J. Monpeán, M. García-Hernández, A. Bollero

From laboratory to factory: Understanding the microstructure-magnetic correlation in Sr-ferrite translates to a successful recycling case in industry
A. Bollero, J. Rial, M. Villanueva, K. Golasinski, A. Seoane, J. Almunia, R. Altimira

Poster Contributions

High coercive MnBi magnets for medium temperature applications: from quasi-isotropic particles to textured films
M. Villanueva; E. Céspedes; F. J. Mompen; C. Navío; J. Rial; A. Inchausti; P. Pedraz; M. Rodríguez; M. Garcìa-Hernández; A. Bollero

High coercive MnAl powder: ultrafast-milling of MnAl gas-atomized particles
J. Rial; M. Villanueva; E. Céspedes; N. López; E. M. Palmero; J. Camarero; L. G. Marshall; L. H. Lewis; A. Bollero

03-05/07/2017

8th International Congress on Analytical Nanoscience and Nanotechnology NyNA 2017, Barcelona, Spain

Oral Contributions

Nanoparticles based label-free DNA biosensors
T. García-Mendiola , Iria Bravo, Cristina García Elosegui, J. M. López Moreno, F. Pariente and E. Lorenzo

Gene mutation detection by carbon nanodots nanostructured biosensors
Tania García-Mendiola, José María' López Moreno, Iria Bravo, Félix Pariente, Reinhold Wannemacher, Dana Cialla-May, Jurgen Popp and Encarnación Lorenzo

03/07/2017

11th RANN Reunión de Ácidos Nucleicos y Nucleósidos, Madrid, Spain

Oral Contributions

The folding complexity of TERRA molecules unveiled at the single-molecule level
I. Gutiérrez; M. Garavis; S. de Lorenzo; A. Villasante; C. González; J. R. Arias-Gonzalez

DNA synthesis determines the binding mode of the human mitochondrial single-stranded DNA-binding protein.
Fernando Cerrón, Jose A. Morín, Javier Jarillo, Elena Beltrán-Heredia, Grzegorz L. Ciesielskid, Francisco J. Cao, Laurie S. Kaguni, Borja Ibarra.

Mechanics, Thermodynamics and Kinetics of ligand binding to biopolymers
Javier Jarillo, José A. Morín, Elena Beltrán-Heredia, Juan P. G. Villaluenga, Borja Ibarra, Francisco J. Cao

Poster Contributions

Graphene-based oligonucleotide sensor
Särka Salajkov·,Romina Lorca, Beatriz Álvarez, Ana Latorre, Carlos Gibaja, Félix Zamora, and Álvaro Somoza

Nanoparticle-based vehicles for the delivery of the CRISPR/Cas9 system
José Lombardía Gutiérrez; Ana Latorre; Álvaro Somoza

Reprograming uveal melanoma cells combination therapy using gold nanoparticles against uveal melanoma
Paula Milán Rois; Eduardo G. Garrido; Alfonso Latorrre; Ana Latorre; Álvaro Somoza

05-07/07/2017

XXXVIII Reunión del Grupo de Electroquímica de la Real Sociedad Española de Química. XIX Encuentro Ibérico. Vitoria-Gasteiz, Spain

Oral Contributions

Carbon nanodots based biosensors for gene mutation detection
E. Lorenzo, T. García, I. Bravo, F. Pariente, Reinhold Wannemacher

Plataformas electrocatalÌtica nanoestructuradas basadas en la quÌmica de las sales de diazonio
M. Revenga, A. Amor, F. Pariente, E. Lorenzo

Poster Contribution

Reducción y modificación química de grafeno en un solo paso para el desarrollo de plataformas electro-catalíticas
I. Bravo, M. Revenga, F. Pariente, E. Lorenzo

09-12/07/2017

X Reunión Cientifica de Bioinorgánica BioBilbao2017, Bilbao, Spain

Oral Contribution

Reversible activation dynamics of tethered ruthenium(II) arene complexes
F. Martínez-Peña, A. M. Pizarro

Poster Contribution

pH-Activatable tethered iridium organometallic complexes
A. C. Carrasco; A. M. Pizarro

16-20/07/2017

19th International Union of Pure and Applied Biophysics (IUPAB) and 11th European Biophysical Societies' Association Congress (EBSA), Edinburgh, United Kingdom

Oral Contribution

Correlation of 3D structure and chemical determination at whole cell level by near-edge soft X-rays nanotomography.
José L. Carrascosa

Poster Contribution

DNA synthesis determines the binding mode of the human mitochondrial single-stranded DNA-binding protein
F Cerrón, J Jarillo, G. Cielsiesky, LS Kaguni, F Cao, Ibarra, B.

16-22/07/2017

26th Annual International Conference on Composites/Nano Engineering (ICCE-26) ICCE-25 Rome Italy

Oral Contributions

A rare earth-free permanent magnet alternative: coercivity development mechanism in MnAl powder
E. M. Palmero; J. Rial; M. Villanueva; E. Céspedes; N. López; J. Camarero; L. G. Marshall; L. H. Lewis; A. Bollero

From the lab to the factory: correlation of microstructure and magnetic properties in Sr-ferrite applied to recycling in a permanent magnet company
A. Bollero; J. Rial; M. Villanueva; A. Seoane; J. Almunia; R. Altimira

17-21/07/2017

36th Biennial Meeting of Spanish Royal Society of Physics RSEF, Santiago de Compostela, Spain

Oral Contribution

Chiral Organic Molecules for Molecular Spintronics Applications
F. J. Luque, M. A. Niño, I. A. Kowalik, D. Arvanitis, J. J. de Miguel

30/07/2017

Nanophotonics of 2D materials, San Sebastián, Spain

Oral Contribution

Strong coupling of MoS2 excitons and photons in a cavity
A. Gutierrez

20-25/08/2017

26th International Materials Research Congress IMRC2017, Cancun, Mexico

Oral Contribution

Phthalocyanines: Old Dyes, New Molecular Materials for Electronics and Photonics

T. Torres et al.

23-28/07/2017

Royal Australian Chemical Institute (RACI) Centenary Congress, Melbourne, Australia

Poster Contribution

A hybrid-basis close-coupling interface to quantum chemistry packages for the treatment of ionization problems: the XCHEM code

F. Martin

27.08-01.09/08/2017

33th European Conference on Surface Science, Szeged, Hungary

Oral Contributions

Chemical transformation and magnetic induced properties of a fluorinated Tetraphenylporphyrin on Au(111)

Borja Cirera, Roberto Otero, Jose Maria Gallego, D. Écija

Bragg Diffraction of Surface State Electrons

A. Martín-Jiménez, D. Écija, R. Otero, R. Miranda

Symmetry reduction on metal-supported graphene by intercalation of Pb

C.G. Ayani; J.J. Navarro; F. Calleja; A.L. Vázquez de Parga; R. Miranda

Covalent and periodic functionalization of graphene/Ru(0001)

J.J. Navarro; F. Calleja; R. Miranda; E.M. Pérez; A.L. Vázquez de Parga

Opening a pseudo-gap, and the rich interplay of Dirac fermions with singularities, dopin and assymetric potentials in graphene

A. Norris; F. Calleja; A.L. Vázquez de Parga; R. Miranda

Scanning tunnelling spectroscopy of BiTeCl

P. Casado Aguilar, Andrew Norris, C.G. Ayani, E.V. Chulkov, R. Miranda, A. L. Vázquez de Parga

Shaping surface landscapes with molecules: rotationally induced diffraction of H2 on LiF(001) under fast grazing incidence conditions

M. del Cueto, A. S. Muzas, M. F. Somers, G. J. Kroes, C. Díaz, F. Martín

A hybrid-basis close-coupling interface to quantum chemistry packages for the treatment of ionization problems: the XCHEM code

F. Martín

Poster Contribution

Gold intercalation in graphene/Ir(111)

J.J. Navarro; F. Calleja; A.L. Vazquez de Parga; R. Miranda

10-13/09/2017

23th Soft Magnetic Material Conference, Sevilla, Spain

Oral Contribution

Towards in silico clinical trials for magnetic hyperthermia

I. Rubia-Rodríguez, H. Verdaguer, T. Macarulla and D. Ortega

Poster Contribution

Dynamical magnetic response of magnetic nanoparticles in biological environments

D. Cabrera, E. J. Artés-Ibañez, N. Telling, F. J. Terán

11-13/09/2017

COST TO-BE FALL MEETING Riga, Latvia

Oral Contribution

Thickness and angular dependent magnetic anisotropy studies of bi-axially strained $La_{0.7}Sr_{0.3}MnO_3$ thin films on LSAT (001) by Magneto-Optical Kerr Magnetometry

Sandeep Kumar Chaluvadi; Fernando Ajejas; Giovanni Vinai; Alexander Yu Petrov; Daniel Cano; Julio Camarero; Piero Torelli; Julio Camarero; Paolo Perna; Laurence Méchin

13/09/2017

Annual Meeting of the Spanish Magnetism Club, Sevilla, Spain

Oral Contribution

Addressing the magnetic heat release of magnetic nanoparticles in live cells

D. Cabrera, E. J. Artés-Ibañez, N. Telling, F. J. Terán

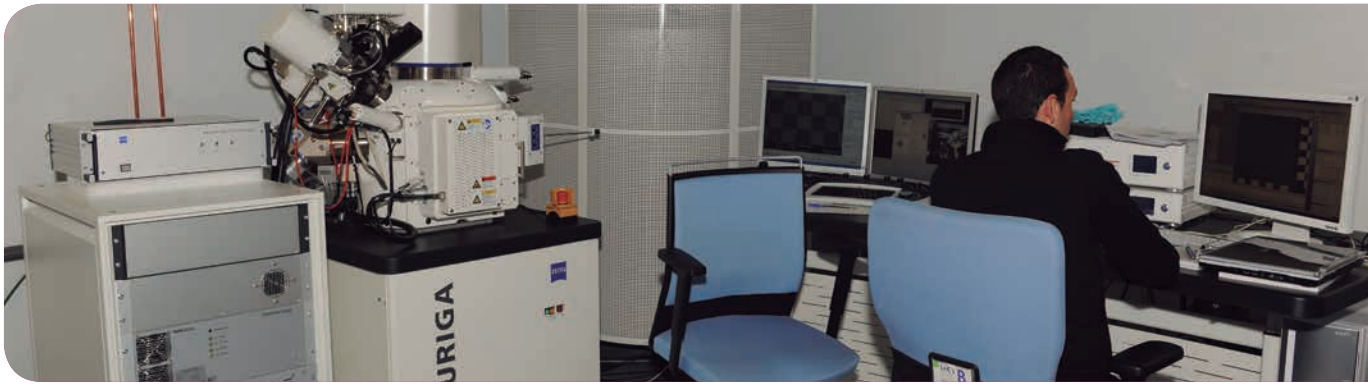
17-21/09/2017

European Materials Research Society E-MRS Fall Meeting, Warsaw, Poland

Oral Contributions

Dominant switchable magnetoresistance in half-metallic $La_{0.7}Sr_{0.3}MnO_3$ epitaxial films at room temperature

Fernando Ajejas; Davide Maccariello; Ruben Guerrero; Laurence Mèchin; Stephane Flament; Jacobo Santamaría; Julio Camarero; Rodolfo Miranda; Paolo Perna



Spin-Orbit driven effects in graphene based perpendicular magnetic anisotropy structures

Fernando Ajejas; Ruben Guerrero; Manuel Valvidares; Rodolfo Miranda; Julio Camarero; Paolo Perna"

20/09/2017

Towards Oxide-Based Electronics TO-BE COST Fall Meeting, Riga, Latvia

Oral Contribution

Thickness and angular dependent magnetic anisotropy studies of bi-axially strained $La_{0.7}Sr_{0.3}MnO_3$ thin films on LSAT (001) by Magneto-Optical Kerr Magnetometry

Sandeep Kumar Chaluvadi; Fernando Ajejas; Giovanni Vinai; Alexander Yu Petrov; Daniel Cano; Julio Camarero; Piero Torelli; Julio Camarero; Paolo Perna; Laurence Mèchin

25-26/09/2017

XIV Congreso Interamericano de Microscopía CIASEM 2017, Varadero, Cuba

Oral Contribution

Nanoparticle Interaction with Cancer Cells by Correlating Electron Microscopy and soft X-ray nanotomography.

José L. Carrascosa

26-29/09/2017

Workshop on Photophysics and Nanomaterials (WONPHYS 2017), Varadero, Cuba

Oral Contributions

Amplified Spontaneous Emission for Sensing Applications

J.R. Castro-Smirnov and J. Cabanillas-Gonzalez

Spectroscopy and Applications of Carbon Dots

A. Jacobo, I. Navarro, J. Hernandez, I. Rodriguez, J. Sánchez, J. Castro, R. Wannemacher

24-29/09/2017

17th European Conference on Applications of Surface and Interface Analysis (ECASIA-17), Montpellier, France

Oral Contribution

Chiral X-Ray Dichroism and induced spin filtering effects in organic thin films

M. Niño Orti, F.J. Luque, P. Gargiani, I.A. Kowalik, D. Arvanitis, J.J. De Miguel

Poster Contribution

Surface chemical reactions on pyrrothite (FeS) thin films

M. Niño Orti, E. Flores, C. Sánchez, J.M. Rojo

01-06/10/17

Conference Fismat2017 ICTP Trieste, Italy

Oral Contribution

Time-reversal and rotation symmetry breaking superconductivity in Dirac materials

L. Chirolli

04-06/10/2017

X Iberian Vacuum Conference, RIVA-X, Bilbao, Spain

Oral Contribution

Chiral induced spin filtering effects in organic thin films

M. Niño Orti, F.J. Luque, I.A. Kowalik, P. Gargiani, D. Arvanitis, J.J. De Miguel

Poster Contribution

Surface reactivity of iron monosulfide (FeS) thin films
M. Niño Orti, E. Flores, C. Sánchez, J.M. Rojo

07/10/2017

Symposium NanoBIOSOME CNB-CSIC. Madrid, Spain

Oral Contribution

Design of new tools for immunotherapy based on molecular chaperones
B. Sot

09-11/10/2017

8th Spanish Synchrotron User Association AUSE Congress and III ALBA Users Meeting, Madrid, Spain

Poster Contribution

X-Ray Dichroism and chirality: spin filtering effects in organic thin films
M.A. Niño, P. Gargiani, F.J. Luque, I. Kowalik, P. Gargiani, D.Arvanitis, J.J. de Miguel

17-19/10/2017

12th Annual event of the European Technology Platform on Nanomedicine ETPN 2017, Torremolinos, Spain

Poster Contributions

Magnetic nanoparticles for fast and efficient cell labelling
L. de la Cueva, G. Salas

Towards in silico clinical trials for magnetic hyperthermia (2nd best poster communication)
I. Rubia-Rodríguez, H. Verdaguer, T. Macarulla. P. Southern, S. Hattersley, Q. A. Pankhurst and D. Ortega

19/10/2017

I Reunión Química Prebiótica en Superficies y Quiralidad, Madrid, Spain

Oral Contribution

Espectroscopìa de superficies aplicada a reacciones en monosulfuro de hierro y al estudio de la relaciÛn quiralidad-magnetismo
M. A Niño, J. M. Rojo, E. Flores, J. R. Ares, I. Ferrer, C. Sánchez

23-25/10/2017

7th Spanish Workshop in Nanolithography RedNanolito, Madrid , Spain

Oral Contributions

Exploring Novel Patterning Routes on 2D Materials
F.J. Urbanos, Andrés Black, Ramón Bernardo-Gavito, M. Rodríguez, Rodolfo Miranda, Daniel Granados

Domain wall pinning at chemical notches in NiFe nanowires
L. Pérez, S. Ruiz-Gómez, M. Foerster, L. Aballe, M. Proenca, I. Lucas, J. L. Prieto, A. Mascaraque, A. Quesada and J. de la Figuera

Synchrotron radiation based techniques for confinement and nanostructures investigation
Álvaro Rodríguez-Rodríguez, Tiberio A. Ezquerra, Esther Rebollar, Jaime J. Hernández, Inés Puente-Orenchd and Mari-Cruz García-Gutiérrez

Nanoimprinting of antireflective surfaces
Iván Navarro-Baena, Jaime J. Hernández, Alejandra Jacobo, J. R. Castro Smirnov, Felipe Viela, Miguel A. Monclús, Manuel R. Osorio, Jon M. Molina-Aldareguia, Isabel Rodríguez

Nanoimprinted Structures with Enhanced Mechanical Resistance
Jaime Hernández, Iván Navarro, Miguel Monclus, Alejandra Jacobo, Felipe Viela, Manuel R. Osorio, Jon Molina, Isabel Rodríguez

Magnetic properties of individual cylindrical nanowires microcontacted by e-beam lithography
Mariana P. Proença, Manuel Muñoz, Lucas Pérez, João P. Araújo, João Ventura and José L. Prieto

Poster Contributions

Magnetic field probe at the nanoscale using the superconducting vortex lattice
V. Rollano, J. del Valle, A. Gomez, M.R. Osorio, D. Granados, C. Quiros, M. Velez, J.I. Martin, E.M. Gonzalez, J.L. Vicent

Interplay between two type II superconductors at the nanoscales
V. Rollano, J. del Valle, A. Gomez, J. L. Prieto, E. Navarro , E.M. Gonzalez, I. K. Schuller, J.L. Vicent

Innovative Patterning Method for modifying few-layer MoS2 Device Geometries
F.J. Urbanos, Andrés Black, Ramón Bernardo-Gavito, M. Rodríguez, Santago Casado, Rodolfo Miranda, Daniel Granados

Influence of fabrication process on Kinetic Inductance Detectors' performance
Maite Magaz, Alicia Gómez, Olivier Dupré, Johannes Goupy, Manuel R. Osorio, Jaime J. Hernández, Daniel Granados, Jesús Martín-Pintado

Hierarchical micro-nano surface topographies by combined photo and nanoimprinting lithography

Manuel R. Osorio, Jaime J. Hernández, Iván Navarro-Baena, Alejandra Jacobo, María Teresa Alameda, Daniel Granados and Isabel Rodríguez

29/10/2017

64th International Symposium & Exhibition of the American Vacuum Society AVS, Tampa, USA

Oral Contribution

Enantio-sensitivity Charge Transfer in Adsorbed Chiral Molecules Probed with X Ray Circular Dichroism

F.J. Luque; I. A. Kowalik; M. A. Niño; D. Arvanitis; J.J. de Miguel

05-08/11/2017

National Cancer Research Institute (NCRI) Cancer Conference, Liverpool, United Kingdom

Poster Contribution

Exploiting the Warburg effect to activate ROS modulators

F. Martínez-Peña; A. M. Pizarro

06-10/11/2017

Conference on Magnetism and Magnetic Materials MMM, Pittsburgh, USA

Oral Contributions

Spin-Orbit driven effects in graphene based perpendicular magnetic anisotropy structures

Fernando Ajejas; Adrian Gudin; Ruben Guerrero; Miguel Angel Niño; Manuel Valvidares; Stefania Pizzini; Jan Vogel; Nicolas Jaouen; Vincent Cros; Rodolfo Miranda; Julio Camarero; Paolo Perna,

Determination of the Dzyaloshinskii-Moriya interaction in epitaxial asymmetric trilayers

Fernando Ajejas; Adrian Gudin; Ruben Guerrero; Dayan Chaves; Stefania Pizzini; Jan Vogel; Rodolfo Miranda; Julio Camarero; Paolo Perna

Disentangling and quantifying temperature-driven symmetry-breaking effects in magnetic nanostructures

Jose Luis Fernandez Cuñado; Paolo Perna; Alberto Bollero; Rodolfo Miranda; Julio Camarero

Dominant switchable magnetoresistance in half-metallic $La_{0.7}Sr_{0.3}MnO_3$ epitaxial films at room temperature

Fernando Ajejas; Davide Maccariello; Ruben Guerrero; Laurence Mèchin; Stephane Flament; Jacobo Santamaría; Julio Camarero; Rodolfo Miranda; Paolo Perna.

Exchange bias revisited: unusual field-dependent effects

Jose Luis Fernandez Cuñado; Paolo Perna; Alberto Bollero; N.S. Sokolov; S Gastev; S Suturin; A Banshikof; V Fedorov; D Baranov; K Koshmak; Josep Nogues; Luca Pasquali; Rodolfo Miranda; Julio

Large perpendicular magnetic anisotropy and Dzyaloshinskiiñ Moriya chiral interaction at room temperature in epitaxial graphene-based nanostructures

Fernando Ajejas; Adrian Gudin; Ruben Guerrero; Miguel Angel Niño; Manuel Valvidares; Stefania Pizzini; Jan Vogel; Nicolas Jaouen; Vincent Cros; Rodolfo Miranda; Julio Camarero; Paolo Perna

07-10/11/2017

IX Congreso Argentino de Química Analítica, Córdoba, Argentina

Oral Contributions

Desarrollo de plataformas electrocataliticas basadas en nanodiamantes

Briones, M., Revenga-Parra, M., Pariente, F., Lorenzo, E.

Plataformas electroquímicas (bio)sensoras basadas en nanomateriales químicamente modificados

Bravo, I., Revenga-Parra, M., Pariente, F., Lorenzo, E.

Poster Contributions

Sensores electroquímicos nanoestructurados para la determinación rápida de analitos de interés agroalimentario

Revenga-Parra, M., González, M. M., Martínez-Periñan, E., Robledo, S. N., Lorenzo, E., Pariente, F.

Detección de mutaciones genéticas mediante biosensores basados en nanopuntos de carbono

García-Mendiola, T., Bravo, I., López-Moreno, J. M., Wannemacher, R., Pariente, P., Lorenzo, E.

15-17/11/2017

European Academy for Biomedical Science ENABLE Conference, Barcelona, Spain

Poster Contributions

BSA-Stabilized Gold Nanoclusters for Breast Cancer and Uveal Melanoma Treatment

Ana Latorre, Alfonso Latorre, Ana Lázaro, Macarena Calero, Alejandra Crepo, Mercedes Lecea, Pilar Martín-Duque, Ángeles Villanueva, and Alvaro Somoza

Smart Nanostructures for Drug Delivery

Eduardo G. Garrido, Paula Milán, Beatriz Álvarez Rodríguez, Mercedes Lecea, Álvaro Somoza

24/11/2017

Molecular-Scale Electronics MOLESCO Meeting, Muggendorf, Germany

Oral Contribution

Phthalocyanines: Old Dyes, New Molecular Materials for Molecular Photovoltaics

T. Torres et al.

26.11-01.12/2017

Materials Research Society Fall Meeting, Boston, USA

Poster Contribution

Experimental Detection of Thermal Effects in Sensors Based on Surface Plasmon Resonance

Jose Vicent, Fernando Gálvez , Miguel A. Garcia, Jorge Spottorno , David Pérez de Lara

13-15/12/2017

Nanomaterials Applied to Life Sciences, Gijón, Spain

Oral Contributions

Magnetic nanoparticles in cellular environments: understanding and optimising their behaviour for biomedical applications

Neil Telling, Sarah Berry, Helen Price, David Cabrera, Fran Terán

Dosimetric and safety aspects of magnetic hyperthermia: an in silico approach

Daniel Ortega, Irene Rubia-Rodriguez

Engineering Nanomaterials for biomedical applications

Antonio Aires, Aldo Martínez-Banderas, Daniel Cabrera, Alfonso Latorre, Alvaro Somoza, Jurgen Kose, Francisco J. Terán, Aitziber L. Cortajarena

BSA-Stabilized Gold Nanoclusters for Breast Cancer and Uveal Melanoma Treatment

Ana Latorre, Alfonso Latorre, Ana Lázaro, Macarena Calero, Alejandra Crespo, Mercedes Lecea, Pilar Martín-Duque, Ángeles Villanueva, and Álvaro Somoza

Gold nanoparticles against uveal melanoma

Paula Milán Rois, Eduardo G. Garrido, Ana Latorre, Alfonso Latorre, Mercedes Lecea, Alvaro Somoza

In silico magnetic hyperthermia: considerations about blood perfusion and nanoparticles arrangement on tissue power deposition

I. Rubia-Rodríguez, H. Verdaguer, T. Macarulla and D. Ortega

Quick and versatile methodology for magnetic detection of biomarkers dispersed in biological fluids

D. Cabrera, A. Aires, E.J. Artés-Ibañez, A.L. Cortajarena, F.J. Terán (Best oral award)

Poster Contributions

Smart Nanostructures for Drug Delivery

Eduardo G. Garrido, Paula Milán, Mercedes Lecea, Alvaro Somoza

Nano-electrodes for neural electrical activity measurements

Beatriz L. Rodilla, Andrés Valera, Julio Camarero, M. Teresa González and Lucas Pérez

18/12/2017

Graphene Flagship - Division 3 Meeting, Aachen, Germany

Poster Contribution

Polariton Hall effect in MoS2

A. Gutierrez

18-19/12/2017

Progress in Organic Optoelectronics, Valencia, Spain

Oral Contributions

Chemical Sensing Schemes Combining Fluorescence, Colorimetry and Amplified Spontaneous Emission of Conjugated Systems

J. Cabanillas-Gonzalez

Amplified Spontaneous Emission in Supramolecular Controlled Self-Encapsulated Polythiophenes

C. Sun and J. Cabanillas-Gonzalez

MultiCrom - an (Inter)National Project

J. Gierschner

Spectroscopy and Applications of Carbon Dots

A. Jacobo, I. Navarro, J. Hernandez, I. Rodriguez, J. Sánchez, R. Wannemacher

Noncovalent Chemistry of SWNTs inside-out

E.M.Pérez

3. Workshops & courses (co)-organized by IMDEA Nanociencia

15-18/01/207

COST Winter School on Photophysics of Hybrid Interfaces, Ambroz pod Krvavcem, Slovenia, 15.-

19th-20th January 2017

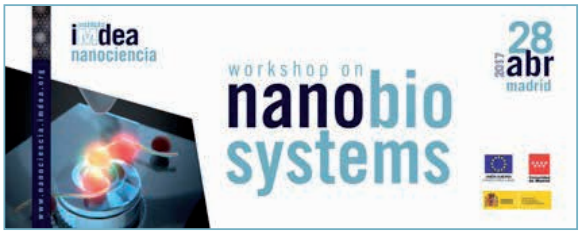
NANOLEAP Project Open Day Workshop

2nd-3rd February 2017

By-Axon Kick-off Meeting

28th April 2017

Workshop on Nanobiosystems



21th-22th June 2017

7th Early Stage Researchers Workshop in Nanoscience

26th June 2017

2nd Workshop on “Nanoparticles for biomedical applications”

3rd-4th July 2017

Workshop on Nanobiosystems

12th September 2017

Third PHOTOCARBON Workshop organic and hybrid photovoltaics: Synthesis, Phophysics and Photochemistry

23th-25th October 2017

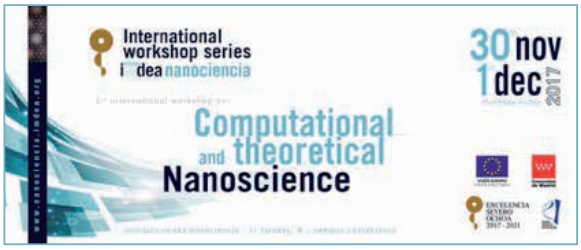
The Seventh Spanish Workshop in Nanolithography

26th October 2017

2nd IMDEA Nanoscience celebrates The Nobel Prize Winners Symposium

30th November-1st December 2017

International Workshop Series "Severo Ochoa"



18th-19th December 2017

Conference on Progress in Organic Optoelectronics, Valencia, Spain

4. Seminars

Tuesday, 10th January 2017

Photoexcited two-dimensional materials

Dr. Maxim Trushin

University of Konstanz, Germany

Tuesday, 17th January 2017

Nanofabrication and Characterization of Superconducting Kinetic Inductance Detectors for Space Exploration

Dr. Alicia Gómez

Centro de Astrobiología (INTA-CSIC), Spain

Monday 23th January 2017

New Aspects in Dipyrrin-Metal Complexes: From Molecular Science to Low-Dimensional Molecular Assemblies

Prof. Ryota Sakamoto

University of Tokyo, Japan

Friday 27th January 2017

Exploring the metal-insulator transition in pure and doped V2O3 (ultra)thin films

Dr. Mariela Menghini

KU Leuven, Belgium

Tuesday, 31st January 2017

Strains and novel properties of graphene and other two dimensional materials

Prof. Fco. Guinea

IMDEA Nanociencia, Spain

Friday 3rd February 2017

Structural and Electronic Characteristics of Conjugated Materials: The key Role of DFT calculations

Dr. M. Carmen Ruiz Delgado

University of Málaga, Spain

Tuesday 7th February 2017

Collective modes of the excitonic condensate in 1T-TiSe2

Dr. Jasper van Wezel

Institute of Physics, University of Amsterdam, the Netherlands

Tuesday 14th February 2017

Application of Rare-Earth Doped NaYF4 Nanocrystals for Biological Application

Dr. Jorge Rubio Retama

Universidad Complutense de Madrid, Spain

Tuesday 21st February 2017

Does God play dice?

Prof. Mikhail I. Katsnelson,

Nijmegen University, the Netherlands

Tuesday 21st February 2017

Is liquid helium an absolutely "pure liquid"?

Prof. Conrado Rillo

ICMA, CSIC-Universidad de Zaragoza, Spain

Wednesday 22nd February 2017

2D materials polaritons

Prof. Tony Low

University of Minnesota, Minneapolis, USA

Tuesday 28th February 2017

Low dimensional effects in transition metal oxides

Dr. Alejandro Gutiérrez

Universidad Autónoma de Madrid, Spain

Tuesday 14th March 2017

Electrodeposition meets Nanotechnology

Dr. Lucas Pérez

Universidad Complutense de Madrid & IMDEA Nanociencia, Spain

Thursday 16th March 2017

Making the Tiniest Machines

Prof. David A. Leigh FRS

University of Manchester, United Kingdom

Tuesday 21st March 2017

Monodisperse and star-shaped organic semiconductors for photonic applications

Prof. Peter Skabara

University of Strathclyde, United Kingdom

Tuesday 28th March 2017

Seeing is Believing: Atoms, Molecules, Exotic Electron

Dr. Andrew Norris

IMDEA Nanociencia, Spain

Tuesday 9th May 2017

Quantifying the lipid-protein interplay using advanced light microscopy

Dr. Jose Requejo-Isidro

IUPV/EHU-CSIC and CNB-CSIC, Spain

Tuesday 23th May 2017

Emergent mechanical properties in biology: from proteins to tissues and back

Dr. Jorge Alegre-Cebollada

National Institute of Cardiovascular Research (CNIC), Spain

Wednesday 24th May 2017

Disordered Weyl semimetals: chiral superuniversality, fate of Fermi arcs and bulk-boundary correspondence.

Dr. Vladimir Juricic

University of Stockholm, Sweden

Thursday 25th May 2017

Fabrication, linear and nonlinear spectroscopy of optical nano-antennas and hybrid antenna-systems

Prof. Monika Fleischer

University of Tübingen, Germany

Friday 15th September 2017

Atomic resolution electron microscopy and spectroscopy: principles and examples

Dr. Neven Biškup

IMDEA Nanociencia, Spain

Wednesday 20th September 2017

Indenofluorenes and Ring-Expanded Analogues: From Quinoidal Electron-Accepting Materials to Stable Organic Biradicals

Prof. Michael Haley

University of Oregon, USA

Thursday 21st September 2017

Nanocellulose based functional materials

Prof. Aji P. Mathew

Stockholm University, Sweden

Wednesday 27th September 2017

Nonlocal and Collective Effects in large-scale, nano-optic Applications

Dr. Christin David

IMDEA Nanociencia

Monday, 13th November 2017

Coordination chemistry materials: Simple and powerful strategies for current challenges

Prof. José Ramón Galán-Mascarós

ICIQ, Spain

Tuesday, 5th December 2017

Células transgénicas y andamios fototérmicos: ingredientes para una terapia avanzada que requiere calor

Dr. Nuria Vilaboa

Hospital Universitario La Paz-IdiPAZ & CIBER-BBN, Spain

5. Projects

5.1. International programmes

5.1.1. H2020

ELECNANO

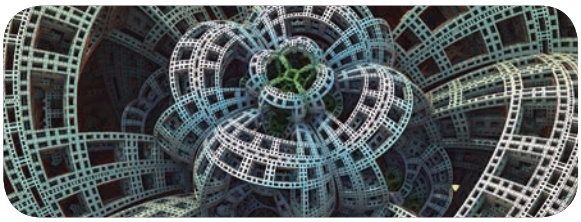
Electrically Tunable Functional Lanthanide Nanoarchitectures on Surfaces

Funding: ERC-2017-COG

Specific Agreement: no 766555

Duration: September 2018-August 2023

IMDEA Nanociencia: Dr. David Ecija



2DSPIN

2D magnetic materials for molecular SPINtronics

Funding: H2020-MSCA-IF-2016

Specific Agreement: no 746579

Duration: January 2018-December 2019

IMDEA Nanociencia: Dr.Enrique Burzuri

EVONANO

Evolvable platform for programmable nanoparticle-based cancer therapies

Funding: H2020-FETOPEN-1-2016-2017

Specific Agreement: no 696656

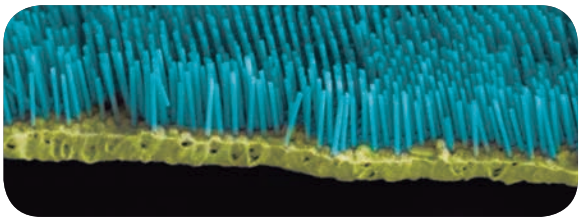
Duration: October 2018- September 2021

IMDEA Nanociencia: Prof. M. Isabel Rodriguez

ByAXON

Towards an active bypass for neural reconnection

Funding: H2020-FETOPEN-2016-2017 no 737116
Duration: 2017-2020
IMDEA Nanociencia: Prof. Rodolfo Miranda (PI), Dr. Teresa Gonzalez (PI)
http://www.byaxon-project.eu/



A-LEAF

Towards An Artificial Leaf

Funding: H2020-FETPROACT-2016-2017 no 732840 Specific Agreement: no 696656
Duration: 2017-2020
IMDEA Nanociencia: Prof. Rodolfo Miranda (PI), Dr. David Ecija (PI)
http://www.a-leaf.eu/

NOCANTHER

Nanomedicine upscaling for early clinical phases of multimodal cancer therapy"

Funding: H2020-NMP-2015-two-stage n° 685795
Duration: 2016-2020
IMDEA Nanociencia: Prof. Rodolfo Miranda (PI), Dr. Alvaro Somoza (PI)
http://www.nocanther-project.eu/

GRAPHENECORE1

Graphene-based disruptive technologies (GrapheneCore1)

Funding: H2020-FETFLAG-2014 Specific Agreement: n° 696656
Duration: 2016-2018
IMDEA Nanociencia: Prof. Rodolfo Miranda, Prof. Francisco Guinea, Dr. Andrés Castellanos

NANOLEAP

Nanocomposite for building constructions and civil infrastructures: European network pilot production line to promote industrial application case

Funding: H2020-NMP-PILOTS-2014 n° 646397
Duration: 2015-2018
IMDEA Nanociencia: Prof. Mª Isabel Rodriguez (PI)
http://www.nanoleap.eu/

nanomiR

MicroRNAs-based nanosystems for the detection and treatment of muscular diseases

Funding: ERA-Net EuroNanoMedII (ENMII) 2016 EU-Framework Programme Horizon 2020 and Ministerio de Economía y Competitividad. PCIN-2016-167
Duration: 2016-2019
IMDEA Nanociencia: Prof. Alvaro Somoza (PI)

SOGraph

Tailoring Spin-Orbit effects in graphene for spin-orbitronic applications

Funding: FLAG ERA Graphene Flagship. EUFramework Programme Horizon 2020 and Ministerio de Economía y Competitividad. PCIN-2015-111
Consortium of 4 European partners coordinated by IMDEA Nanociencia
Duration: 2015-2018
IMDEA Nanociencia: Prof. Rodolfo Miranda (PI), Prof. Francisco Guinea (PI)

MOFsENS

Synthesis of metal-organic frameworks as optical gas sensors

Funding: M-ERA.NET, EU-Framework Programme Horizon 2020 and Ministerio de Economía y Competitividad. PCIN-2015-169-C02-01
Consortium of 3 European partners coordinated by the University of Porto
Duration: 2015-2018
IMDEA Nanociencia: Dr. Juan Cabanillas-González (PI)

NEXMAG

New Exchange-Coupled Manganese-Based Magnetic Materials

Funding: M-ERA.NET, EU-Framework Programme Horizon 2020 and Ministerio de Economía y Competitividad. PCIN-2015-126

Consortium of 3 European partners coordinated by IMDEA Nanociencia

Duration: 2015-2018

IMDEA Nanociencia: Dr. Alberto Bollero (PI)

E-GRA-MONS OPTICS

Quantum Emitters to Graphene Plasmons: a new route towards fast Quantum Optics

Funding: H2020-MSCA-IF-2014 n° 660732

Duration: 2015-2017

IMDEA Nanociencia: Dr. Daniel Cano

5.1.2. Seventh Framework Programme

NOVGRAPHENE

Novel uses for graphene

Funding: ERC-2011-ADG_20110209

Duration: 2012-2017

IMDEA Nanociencia: Prof. Francisco Guinea (PI)

MOLHREOSTAT

Downhill Folding Protein Modules as conformational Rheostats: Roles in Molecular Biology and Applications in Biosensors

Funding: ERC-2012-ADG_20120314 n° 323059

Duration: 2017-2018

IMDEA Nanociencia: Prof. Víctor Muñoz

MINT

Mechanically Interlocked Carbon Nanotubes

Funding: ERC-2012-StG_20111012 nº 307609

Duration: 2012-2017

IMDEA Nanociencia: Prof. Emilio Pérez

SPINOGRAPH

Spintronics in graphene

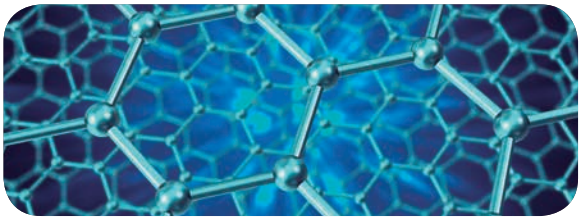
Funding: FP7-PEOPLE-2013-ITN nº 607904

Consortium of 9 European partners coordinated by the INL, Portugal

Duration: 2015-2017

IMDEA Nanociencia: Prof. Francisco Guinea (PI)

http://www.spinograph.org/



MOLESCO

MOLECULAR-SCALE ELECTRONICS: Concepts, Contacts and Stability

Funding: FP7-PEOPLE-2013-ITN nº 606728

Consortium of 10 european partners coordinated by the University of Durham, UK

Duration: 2014-2017

IMDEA Nanociencia: Prof. Nazario Martín (PI) and Prof. Nicolas Agrait (PI)

https://www.dur.ac.uk/chemistry/molesco/

MEMOTUMCELLMACH

Metallodrugs to Modulate Tumour Cell Machinery

Funding: FP7-PEOPLE-2013-CIG n° 631396

Duration: 2015-2018

PI: Dr. Ana M. Pizarro

ImaginDNA

Advanced DNA imaging: improving spatial resolution and contrast through photoswitching

Funding: FP7-PEOPLE-2011-CIG nº 303620
Duration: 2013-2017
PI: Prof. Cristina Flors

AMAROUT II-EUROPE

Funding: FP7-PEOPLE-2011_COFUND nº 291803
Duration: 2012-2017
IMDEA Nanociencia as participant

5.1.3. European Science Foundation

XLIC

XUV/X-ray light and fast ions for ultrafast chemistry

Funding: ESF. CMST COST Action CM1204
Duration: 2013-2017
Chair: Prof. Manuel Alcamí

RADIOMAG

Multifunctional Nanoparticles for Magnetic Hyperthermia and Indirect Radiation Therapy

Funding: ESF, TD Pilot COST Action TD1402
Duration: 2014-2018
IMDEA Nanociencia: Dr. Daniel Ortega (Vice Chair)
http://www.cost.eu/COST_Actions/TDP/Actions/TD1402

NanoSpectroscopy

Funding: ESF. MPNS COST Action MP1302
Duration: 2013-2017
IMDEA Nanociencia: Profs. Johannes Gierschner and Cristina Flors
http://www.cost.eu/domains_actions/mpns/Actions/MP1302

5.1.4. Chinese Scholarship Council

Organic position sensitive photodetectors

Funding: CSC Call 2011
Duration: 2012-2017
PIs: Dr. Juan Cabanillas, Dr. Feng Luo, Dr. Miguel Ángel Niño & Dr. Paolo Perna

Multilevel magnetic recording in bit patterned media for areal densities above 5 Terabit-per-square-inch

Funding: CSC Call 2011
Duration: 2012-2017
PI: Dr. Feng Luo

5.2. National programmes

Funding:

Ministerio de Economía y Competitividad

Severo Ochoa Centre of Excellence

Subprograma Estatal de Fortalecimiento Institucional 2016. SEV-2016-0686
Duration: 2017-2021
Scientific Director: Prof. Francisco Guinea

In July 2017, the Spanish State Agency of Research (Agencia Estatal de Investigación) awarded IMDEA Nanociencia with the accreditation "Severo Ochoa Centre of Excellence". The Institute will receive € 1M annually during the next four years to help consolidate the Institute as a reference centre for research both nationally, and internationally. At the moment, there are 25 centres in Spain awarded with the Severo Ochoa accreditation which is awarded in the fields of Life Science; Mathematics Experimental Sciences and Engineering; and Humanities and Social Sciences.

Thanks to this, and the funding obtained from other public and competitive sources, IMDEA Nanociencia will implement a new Strategic Plan aimed at creating new programmes for PhD students and Postdoctoral staff, developing new research-exchange programmes with other key centres of excellence in the field of nanoscience. The existing offices in research support and competitive projects funding will be restructured with dedicated staff assigned to new roles. New offices dedicated to dissemination and communication and to creating strategic partnerships with industry will be staffed.

This award also opens the door to many national initiatives solely dedicated to the Severo Ochoa Centres and Maria de Maeztu Units allowing to both fund new studentships and to promote the centre in the international field:

La Caixa InPhINIT

The "la Caixa" Foundation has created the INPhINIT programme (H2020 MSCA COFUND) to collaborate with the SO Spanish research centres. This offers prestigious open PhD positions in which INPhINIT researchers may develop their doctoral research project at a leading centre of their choice. INPhINIT recruits 57 Early-Stage Researchers per call and IMDEA Nanociencia is currently one of the highlighted centres for a call that has been launched in late 2017.

100xCiencia

100xCiencia is a series of annual meeting aimed at bringing together the vanguard of Spanish research: the Severo Ochoa and María de Maeztu centres. In November the 2017 event, held in Alicante, focused on "Co-creating Value in Scientific Research." The meeting included specialist lectures on innovation and knowledge valorisation management, as well as roundtables shared by researchers with representatives from the industry, technology transfer offices, policy and economic management.

IMDEA's Executive Manager Bonifacio Vega gave a short presentation, highlighting the success of IMDEA Nanociencia in transfer and innovation, as part of the programme presentations designed to help dialogue and exchange of experiences and good practices. The fundamental purpose of the meeting was to strengthen the capacities of knowledge transfer and enhance the social impact of the research work developed by the centres and units of excellence in our country.

Severo Ochoa and Maria de Maeztu Excellence Alliance (SOMMa)

Launched in October 2017 SOMMa is an alliance of the 41 accredited centres whose mission is to contribute to science excellence in Spain by promoting the programmes and showing its impact. Its aims to increase the national and international visibility of Spanish science; to promote the exchange of knowledge, technologies and good practices among its members and with the international scientific community; to collaborate with the other research centres in Spain to strengthen the national R&D and innovation system; and to have a voice in science policy at the national and European levels.

SOMM EXCELLENCE ALLIANCE

NEWMAG

Nueva generacion de imanes basados en MnAl mediante impresion 3D para aplicaciones energéticas

Retos. 2017. Acciones de Dinamización "Europa Investigación"
EUIN2017-88502
Duration: 2017-2019
PI: Prof. Alberto Bollero

ORGENERGY

Materiales organicos optoelectronicos para la energia

Excelencia 2016. Acciones de Dinamización "Redes de Excelencia"
CTQ2016-81911-REDT
Duration: 2017-2019
PI: Dr. Nazario Martín

Incorporación estable de Doctores

Retos. 2017. Ayudas para la Incorporación Estable de Doctores 2017.
IEDI-2017-00902
Duration: 2017-2019
PI: Prof. Johannes Grieschner

GRAPHICS

Graphene hybrid switchable materiales

Excelencia 2016. CTQ2016-80635-P
Duration: 2016-2019
PI: Dr. Jose Sanchez-Costa

mitoDNA

Single molecule characterization of the coordinated protein activity dynamics at the human mitochondrial DNA replisome

Retos 2015. BFU2015-63714-R
Duration: 2016-2018
PI: Dr. Borja Ibarra

SUPERMNAN

Micro and Nanofabrication of superconducting detectors for the Far-Mid-IR in the context of SAFARI/ SPICA and future missions

Retos 2015. ESP2015-65597-C4-3-R
Duration: 2016-2017
PI: Prof. Daniel Granados

LANTHACOOR

Lanthanide coordination chemistry on surfaces

Retos 2015. FIS2015-67287-P

Duration: 2016-2018

PIs: Drs. David Ecija and Paolo Perna

COMIC

Advanced correlative microscopy of biological particles under mechanical damage

Retos 2015. MAT2015-66605-P

Duration: 2016-2018

PI: Dr. Cristina Flors

MaNaTwee

Influence of magnetic nanoparticle heating over individual biomolecules determined by optical tweezers

Retos 2015. MAT2015-71806-R

Duration: 2016-2018

PIs: Drs.J. Ricardo Arias and Gorka Salas

CARBHOM

Homogeneous Linewidth Spectroscopy of Carbon Quantum Dots

Retos 2015. MAT2015-71879-P

Duration: 2016-2018

PI: Prof. Reinhold Wannemacher

MULTICROM

Steady-State and Time-Resolved Optical Spectroscopy of Multi-Chromophore Systems

Excelencia 2014. CTQ2014-58801

Duration: 2015-2017

IMDEA Nanociencia: Profs. Johannes Gierschner (PI) and Dr. Larry Lüer (PI). Dr. Begoña Milián- Medina (Univ. Valencia)

ACMENANOTOOLS

Activatable Metallodrugs for New Nanoinspired Anticancer Tools

Retos 2014. CTQ2014-60100-R.

Duration: 2015-2017

PI: Dr. Ana M. Pizarro

miRGold

Design and evaluation of therapeutic agents and sensors based on non-coding RNAs and nanostructures

Retos 2014. SAF2014-56763-R

Duration: 2015-2017

PI: Prof. Álvaro Somoza

MMM

Machines and Materials based on Mechanically Interlocked Nanotubes

Excelencia 2014. CTQ2014-58801

Duration: 2015-2017

PI: Prof. Emilio Pérez

CHIROSPIN

Highly Defined Supramolecular Multi-Chromophore Systems for Advanced Optoelectronics

Retos 2014. CTQ2014-58801

Duration: 2015-2017

PI: Dr. Miguel Angel Niño

LAPSEN

Chemical Sensors Based on Dye-Doped Conjugated Polymer Laser Resonators

Retos 2014. MAT2014- 57652-C2-1-R

Duration: 2015-2017

IMDEA Nanociencia: Prof. Isabel Rodríguez (PI) and Dr. Juan Cabanillas-González (PI)

ENMA

Highly Defined Supramolecular Multi-Chromophore Systems for Advanced Optoelectronics

Retos 2014, CTQ2014-58801

Duration: 2015-2017

PI: Dr. Alberto Bollero

GLIOMATHERAPY

Immunotherapy against high-grade brain tumour with monoclonal antibody

Retos - Colaboración 2015. RTC-2015-3846-1

Duration: 2015-2018

IMDEA Nanociencia: Dr. Ángel Ayuso (PI) and Dr. Aitziber López-Cortajarena

2DFlexotronics

Two-dimensional flexible and transparent optoelectronics for photovoltaic applications

Retos - Colaboración 2014. MAT2014-58399-JIN

Duration: 2015-2017

PI: Dr. Andrés Castellanos Gómez

Multifunctional Nanostructuresfor Cancer Imaging and Controlled Thermotherapy

Retos 2013. MAT2013-47395-C4-3-R

Duration: 2014-2017

PIs: Drs. Francisco Terán and Daniel Ortega

Oficina de Proyectos Europeos MADRIMASD-IMDEA

Retos - Dinamización Europa Redes de Gestores 2014.

EUC2013-C-50806

Duration: 2014-2017

IMDEA Nanociencia as Participant

5.3. Regional programmes

Funding:

Programas de Actividades de I+ D entre grupos de investigación de la Comunidad de Madrid

RENIM-CM

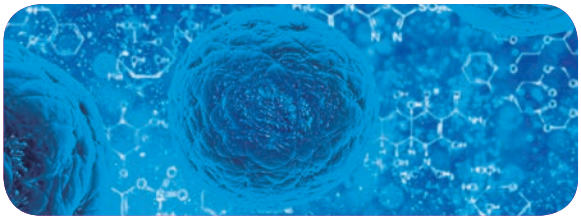
Red Madrileña de Nanomedicina en Imagen Molecular

Convocatoria BIOMEDICINA 2017. B2017/BMD-3867

Duration: 2017-2021

Coordinator: Hospital General Universitario Gregorio Marañon

IMDEA Nanociencia: Prof. Cristina Flors (PI)



NANOFRONTMAG

Nuevas fronteras del nanomagnetismo fundamental y aplicado

Convocatoria TECNOLOGÍAS 2013. S2013/MIT-2850

Duration: 2014-2017

Coordinator: Prof. Rodolfo Miranda (UAM & IMDEA Nanociencia)

IMDEA Nanociencia: Profs. Alberto Bollero and Julio Camarero

PHOTOCARBON

Materiales avanzados de carbono para fotovoltaica molecular.

Convocatoria TECNOLOGÍAS 2013. S2013/MIT-2841
Duration: 2014-2017
Coordinator: Prof. Nazario Martín (UCM & IMDEA Nanociencia)
IMDEA Nanociencia: Prof. Larry Luer

MAD2D

Propiedades fundamentales y aplicaciones del grafeno y otros materiales bidimensionales.

Convocatoria TECNOLOGÍAS 2013. S2013/MIT-3007
Duration: 2014-2017
Coordinator: ICMM-CSIC
IMDEA Nanociencia: Profs. Francisco Guinea, Daniel Granados and Reinhold Wannemacher

5.4. Foundation programmes

AECC

Nanomedicine for the treatment of uveal melanoma

Funding: Asociación Española Contra el Cáncer (AECC)
Duration: 2014-2017
PI: Prof. Álvaro Somoza

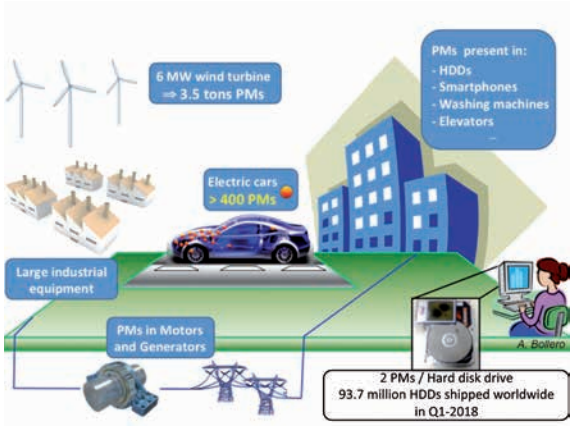
5.5. Industrial projects

GAMMA

IMDEA Nanociencia and the world-leading manufacturer of metal powders, Höganäs AB (Sweden), have joined efforts to work in the development of a next-generation of permanent magnets. The combination of manganese and aluminium, widely available in Europe, together with latest advances in nanotechnology, will make possible the design of magnets avoiding critical raw elements and with application in nowadays technologies (cars, renewable energy technologies, motors, loudspeakers…).

A controlled nanostructuring and phase transformation of gas-atomized MnAl powder post-processed by the self-developed "ultrafast-milling" method have allowed achieving permanent magnet properties in unprecedented milling times of 30 – 90 seconds, by comparison with typically tens of hours. These results have been obtained in the frame of the project *NEXMAG*, coordinated by the Group of Permanent Magnets at IMDEA, and recognized by the M-ERA.NET Network as a *Success Project Case* in 2018. These achievements drove to the company Höganäs to search for the expertise and capabilities that IMDEA makes available to companies searching for scientific-technological solutions and/or willing to innovate in their respective application areas. Sectors as relevant as energy, transport, electronics or aerospace will profit of the acquired knowledge and advances from *GAMMA*, making possible a natural connection between fundamental and applied research.

The *GAMMA* initiative adds to the on-going industrial collaborations that the Group of Permanent Magnets at IMDEA has with IMA S.L. (Barcelona), through the funding of an industrial PhD position, and RAMEM S.A. (Madrid) within an Innovation Fund provided by the Regional Government. Research on advanced 3D-printing of magnets and alloys defines a new technological horizon that count already with the collaboration of these three companies.



6. Fellowships and Internships

6.1. Fellowships

Marie Skłodowska-Curie Actions

E-GRA-MONS OPTICS (H2020-MSCA-IF-2014 no 660732)
Dr. Daniel Cano

MOLESCO (FP7-PEOPLE-2013-ITN-no 606728)
Valentina Sacchetti, Simon Svatec

SPINOGRAPH (FP7-PEOPLE-2013-ITN-no 607904)
Francesca Finocchiaro, Luis Gonzalez Arraga

AMAROUT II (PCOFUND-GA-2011-291803)

Incoming Fellowships

Call 2017
Dr. Enrique Burzuri, Dr. Christin David

Call 2014
Dr. Alberto Rodriguez Pulido, Dr. Paramjyothi C. Nandajan, Dr. Emerson Giovanelli

Reintegration Fellowships

Call 2014
Dr. Agustin Molina

The Netherlands Organization for Scientific Research (NWO)

RUBICON fellowship
Dr. Riccardo Frisenda

Ministry of Economy, Industry and Competitiveness

Ramon y Cajal Programme

Call 2015
Dr. Andres Castellanos-Gomez, Dr. Jose Sánchez Costa

Call 2013
Dr. David Ecija, Dr. Luo Feng, Dr. Daniel Granados, Dr. Ana Pizarro

Call 2011
Dr. Cristina Flors, Dr. Begona Sot, Dr. Francisco Terán

Juan de la Cierva Programme

Call 2016
Dr. Belen Nieto, Dr. Amalia Rapakousiou

Formacion Posdoctoral Programme

Call 2013
Dr. Eva Cespedes

FPI Programme

Call 2016
Patricia Bondía

Call 2015
Sofia Mena

Technical Support Specialist Programme

Call 2016
Isabel Ortiz

Programa de Ayudas para la Promocion de Empleo Joven e implantación de la Garantía Juvenil en I+D+i

Call 2015
Diego Ruiz, Noelia Lopez, Sergio de las Heras

Spanish Ministry of Education, Culture and Sport

FPU Programme. Predoctoral Grant

Call 2013

Leyre de Juan

Madrid Regional Government Department for Education, Youth and Sports

Programa de Ayudas destinadas a la atracción de talento investigador para su incorporación a grupos de investigación de la Comunidad de Madrid. Programa de cátedras de Excelencia

Call 2016.

Prof. Herre S. J. van der Zant Delft University of Technology, The Netherlands

Prof. Habtemariam, Abraha, University of Warwick, UK

Programa de Ayudas para la contratación de investigadores predoctorales e investigadores posdoctorales. Fondo Social Europeo y la Iniciativa de Empleo Juvenil (YEI) de la Comunidad de Madrid.

Call 2016

Sofía Infante, Ana Sánchez, Adrián Valle, David Garcia, Eduardo Garcia, Carlos Rodriguez-Pulido, María Teresa Alameda , Jennifer Sánchez

Programa de Ayudas para la contratación de ayudantes de investigación y técnicos de laboratorio. Fondo Social Europeo y la Iniciativa de Empleo Juvenil (YEI) de la Comunidad de Madrid.

Call 2016

Javier de Vicente

Call 2015

Alejandra Jacobo

Chinese Scholarship Council

Call 2015

Dong Niu. *Xi'an Jiaotong University.* One year secondment. PhD fellowship. Supervisor: F. Luo

Liu Zhao. *China Building Materials Academy.* Four years PhD fellowship. Supervisor: F. Luo

Yue Niu. *Harbin Institute of Technology.* One year secondment. PhD fellowship. Supervisor: A. Castellanos

Chen Sun. *Beijing Normal University.* Four years PhD fellowship. Supervisor: J. Cabanillas

Call 2012

Junqing Shi. *Beijing Normal University.* Four years PhD fellowship. Supervisor: J. Gierschner

Call 2011

Longfei Wu. *Beijing Normal University.* Four years PhD fellowship. Supervisor: J. Cabanillas

6.2. Visiting students

High School Students

Comunidad de Madrid Program for training stays in companies (ESO + Empresa Program)

Liceo Francés, Madrid. 1 week in June 2017.
Student: Elena Garcia Hernandez
Supervisor: Dr. J. Mertens

IES Ramiro Maeztu, Madrid. 1 week in Abril 2017.
Students: Nicholas Cimadevila, Blanca Rascon, Gabriela Izquierdo
Supervisors: Drs. F. Terán, Isabel Rodriguez, Cristina Navío

IES San Isidro, Madrid. 1 week in Abril 2017.
Students: Carlos Bueno, David Cornejo, Alberto Buceta, Jose Pablo Kozaki
Supervisors: Drs. Cristina Flors, Ana Pizarro, Borja Ibarra, Jose Sánchez Costa

7. Academic Activities

7.1. PhD Thesis

Friday 20th January 2017
Alejandro Lopez
Pyrene Derivatives for the Mechanical Interlocking of SWNTs: Synthesis, Properties, and Potential Application
Supervisor: Emilio. M. Pérez
Universidad Autónoma de Madrid

Friday 10th February 2017
Leonor de la Cueva
Synthesis and Characterization of CdSe and Au-CdSe Hybrid Nanoparticles
Supervisor: Beatriz H. Juarez
Universidad Autónoma de Madrid

Friday 24th February 2017
Angel Gutierrez
Light-matter collective modes and orbital magnetic susceptibility in novel materials
Supervisor: Francisco Guinea
Universidad Autónoma de Madrid

Friday 24th February 2017
Noemí García
Utilización del contenido de Vesículas Extracelulares circulantes en sangre periférica para el manejo clínico de pacientes con gliomas
Supervisor: Angel Ayuso
Universidad Autónoma de Madrid

Wednesday 1st March 2017
Eveline van de Winckel
Design, synthesis and in vitro evaluation of novel (sub)phthalocyanine-based photosensitizers for photodynamic therapy
Supervisors: Tomás Torres, Andres de la Escosura
Universidad Autónoma de Madrid

Friday 17th March 2017
Abasi Abudulimu
Chirality Sorted SWNTs and Their Effect on the Performance of Organic Solar Cells
Supervisor: Larry Luer

Friday 17th March 2017
Alberto de Juan
Mechanically interlocked derivatives of single walled carbon nanotubes
Supervisor: Emilio. M. Pérez
Universidad Complutense de Madrid

Friday 24th March 2017
Patricia Pedraz
AFM investigation of rippled structures in friction, wear and adhesion on the nanoscale
Supervisor: Enrico Gnecco. Universidad Autónoma de Madrid

Thursday 20th April 2017
Hua Yu Feng
Magnetoplasmonic Nanorings: Novel Architectures with Tunable Magneto-optical Activity in Wide Wavelength Ranges
Supervisors: Luo Feng and Rodolfo Miranda
Universidad Autónoma de Madrid

Wednesday 3rd May 2017
Cinthya Yamila Véliz Montes
Phthalocyanine-fullerene dyads and DNA interstrand cross-linking on surface
Supervisors: Tomás Torres, Olga Trukhina
Universidad Autónoma de Madrid and Technische Universität Berlin

Friday 16th June 2017
Rafael Sandoval Torrientes
Design and synthesis of small molecules for photovoltaics.
Supervisor: Nazario Martin
Universidad Complutense Madrid

Friday 23th June 2017
Ines Garcia
Ingeniería molecular de materiales transportadores de huecos o electrones para células solares de perovskita.
Supervisors: Nazario Martín, Agustín Molina, Juan Luis Delgado
Universidad Complutense de Madrid

Thursday 30th June 2017
Sofia Leret
New Avenues for the chemical modification of 1D and 2D nanomaterials
Supervisor: Emilio. M. Pérez
Universidad Autónoma de Madrid

Monday 3rd July 2017
Lara Tejerina González
"Synthesis and properties of alpha-substituted Phthalocyanines and subphthalocyanines. Applications in Molecular photovoltaics
Supervisors: Tomás Torres and M. Victoria Martinez Diaz
Universidad Autónoma de Madrid

Joana Teles Ferreira
Ruthenium Phthalocyanines as Potential Photosensitizers for Singlet Oxygen Generation
Supervisors: Tomás Torres, M. Salome Rodriguez-Morgade and Joao Tomé
Universidade de Aveiro and Universidad Autónoma de Madrid

Friday 14th July 2017
Fernando Galvez
Dos casos paradigmáticos en la banda de conducción: Monocristales superconductores y nanoestructuras plasmónicas
Supervisors: J. L. Vicent; M. A. Garcia; D. Perez de Lara
Universidad Complutense de Madrid

Friday 1st September 2017
Wioleta Borzcka
Synthesis of novel photosensitizer-silica nanoparticle hybrids for controlled 1O2 release in cancer photodynamic therapy
Supervisors: Tomás Torres, Joao Tome and Tito Trinidade
Universidade de Aveiro and Universidad Autónoma de Madrid

Eva M. Llamas Garcinuño
Development of photosensitiser conjugates for furan-oxidation based interstrand crosslinking to nucleic acids
Supervisors: Tomás Torres and Annemieke Madder
Ghent University y Universidad Autónoma de Madrid

Monday 18th September 2017
Andrés Black
Fabrication and Characterization of Hybrid Graphene Devices
Supervisors: Daniel Granados and Amadeo L. Vazquez de Parga
Universidad Autónoma de Madrid

Irene Gutierrez
The folding complexity of TERRA G-quadruplex unveiled at the single-molecule level
Supervisor: Ricardo Arias
Universidad Autónoma de Madrid

Tuesday 19th September 2017
María Acebrón
CdSe-based Semiconductor Nanocrystals: Synthesis, Characterization, and Applications
Supervisor: Beatriz H. Juarez
Universidad Autónoma de Madrid

Thursday 21st September 2017
J.L. Fernandez Cuñado
Dynamical effects in magnetic nanostructures
Supervisor: Julio Camarero
Universidad Autónoma de Madrid

Carlos A. Marante Valdes
Photoionization of strongly correlated many-electron atoms and molecules
Supervisors: F. Martín; L. Argenti
Universidad Autónoma de Madrid

Friday 22nd September 2017
Ana Lázaro
Analysis of combined therapies using nanoplatformas: a novel strategy for cancer treatment.
Supervisor: Angeles Villanueva
Universidad Autónoma de Madrid

Fernando Ajejas
Symmetry breaking effects in spin(orbit)tronic systems: from universality of anisotropic magnetoresistance in in-plane anisotropy systems to chiral Dzyaloshinskii-Moriya interaction effects in epitaxial metallic and graphene-based perpendicular anisotropy systems
Supervisor: Julio Camarero and Paolo Perna
Universidad Autónoma de Madrid

Friday 22nd September 2017
Rajendra Sharma
Computational Approaches to Investigate Folding-Unfolding Coupled to Binding and Assembly
Supervisor: Victor Muñoz
Universidad Autónoma de Madrid

Tuesday 26th September 2017
Felipe Viela
Nano-engineering polymer topographies for biological response manipulation of stem cells and bacteria
Supervisor: Mª Isabel Rodríguez
Universidad Autónoma de Madrid

Friday 27th September 2017
Markus Klinker
Ultrafast processes in N2 photoionization
Supervisors: F. Martín; J. Gonzalez-Vazquez
Universidad Autónoma de Madrid

Tuesday 17th October 2017
Roger Y. Bello
Imaging ultrafast electron and nuclear dynamics in hydrogenic molecules
Supervisors: F. Martín; A. Palacios
Universidad Autónoma de Madrid

Thursday 26th October 2017
Iria Bravo Segura
Interacción de nanoestructuras de carbono o metálicas con (bio) moléculas y su aplicación al desarrollo de sensores
Supervisor: Mª Encarnación Lorenzo
Universidad Autónoma de Madrid

Friday 27th October 2017
Simon Svatek
Adsorbate-induced stiffening, quantum thermopower and photoresponse intwo-dimensional materials
Supervisor: Nicolas Agrait
Universidad Autónoma de Madrid

Tuesday 19th December 2017

Francisco Javier Pedrosa

Towards ferrite based rare-earth free permanent magnets: from model systems to new technological applications

Supervisors: Julio Camarero and Alberto Bollero

Universidad Autónoma de Madrid

Denis Jelovina

A full dimensional discrete variable representation of H2+ and H2 photoionization

Supervisors: F. Martín; A. Palacios

Universidad Autónoma de Madrid

7.2. External Courses and Seminars

Participation in Master´s Degrees

Universidad Autonoma de Madrid

- Master's Degree in Molecular Nanoscience and Nanotechnology[1]
- Master in Condensed Matter Physics and Nanoscience[2]
- Master´s Degree in Biophysics
- Master´s Degree in Biomolecules and Cell Dynamics
- Master's Degree in Biotechnology
- Master´s Degree in Advanced Materials
- Master´s Degree in Applied Chemistry

Universidad Complutense de Madrid

- Master's Degree in Nanophysics and Advanced Materials
- Erasmus Mundus en Molecular nano-and biophotonics for telecommunications and biotechnologies (MONABIPHOT)

Universidad Carlos III de Madrid

- Master's Degree in Nanobiotechnology

1. Joint title: Universidad Autonoma de Madrid, Universidad de Valencia, Universidad de Alicante, Universidad de Valladolid, Universidad de Castilla-La Mancha, Universidad de La Laguna y Universidad Miguel Hernandez de Elche.
2. Joint title: Universidad Autonoma de Madrid, Universidad de Murcia and Universidad de Oviedo.

External Courses and Seminars

16th January 2017

ICMM CSIC, Madrid, Spain

Celebrating the Nobel Prize in Chemistry 2016. Mechanically Interlocked Molecules, Molecular Machines and Carbon Nanotubes

E.M.Pérez

15th-19th January 2017

COST Training School on Photophysics of Hybrid Interfaces, Ambroz pod Krvavcem, Slowenia

Organic Charge-Transfer Materials for Optoelectronics

J. Gierschner

25th January 2017

Institut de Science et d'Ingénierie Supramoléculaires, Strasbourg, France

Glycofullerenes as Efficient Inhibitors for Ebola Virus Infection

N. Martin

26th January 2017

Technical University of Munich, Munich, Germany

Lanthanide nanoarchitectures on surfaces

D. Écija

Université de Strasbourg, Strasbourg, France

Concave-convex Supramolecular Chemistry in Carbon Nanoforms

N. Martin

University of Salamanca, Salamanca, Spain

2D Materials & Devices

A. Castellanos-Gomez

2nd February 2017

Instituto de Óptica Daza de Valdés, CSIC, Madrid, Spain

Microscopía de Súper-Resolución. Curso sobre procesado imagen microscopia en biomedicina

C. Flors

NanoWorld Cancer Day Barcelona Spain

Nanomedicines against Cancer: From Basic Research to Clinical Applications

A. Somoza

11th February 2017

Umbra Group Firenze Italy

Magnetic properties of MnAl and perspectives of technological applications

A.Bollero

27th February 2017

Institute for Organic Chemistry, University of Wurzburg, Wurzburg Germany

Controlled Light Emission in Organic Single Crystals for Optoelectronic Applications

J. Gierschner

28th February - 3rd March 2017

Institute for Physical and Theoretical Chemistry, University of Tübingen

Optical Spectroscopy of Conjugated Organic Materials: Chromophores in Solution (Lecture Series)

J. Gierschner (adjunct Prof.)

1st March 2017

KAUST Solar Center, King Abdullah University of Science & Technology, Thuwal, Arabia Saudi

Subphthalocyanines: Singular aromatic non-planar molecules. Synthesis, supramolecular organization and applications in solar cells

T. Torres

Instituto de Química Física Rocasolano, CSIC, Madrid, Spain

Nanotomografía con rayos X blandos: Un enfoque correlativo para explorar la estructura celular y la caracterización química a nivel nanométrico.

Jose L. Carrascosa

2nd March 2017

RTWH Aachen, Aachen, Germany

Correlative super-resolution fluorescence imaging and AFM to study (bio)materials at the nanoscale

C. Flors

6th March 2017

Kuwait University, Kuwait City, Kuwait

Phthalocyanines: Old Dyes, New Molecular Materials

T. Torres

19th-28th March 2017

Winter School of ITN network, Granada, Spain

Thermoelectricity in 2D semiconductors and hybrid 2D semiconductor / molecular devices

A.Castellanos-Gomez

20th-30th March 2017

Jamia Millia Islamia University

Visiting Professor under Global Initiative for Academic Networks (GIAN)

E.M.Pérez

22nd March 2017

International School on Quantum Electronics: `The Frontiers of Attosecond and Ultrafast X-ray Science, Erice, Italy

Ultrafast X-ray Science Attosecond dynamics through Fano resonances

F. Martín

Kyoto University, Kyoto, Japan

Phthalocyanines: Old Dyes, New Molecular Materials

T. Torres

26th March 2017

Czech Academy of Sciences, Prague, Czech Republic

Lanthanide nanoarchitectures on surfaces

D. Écija

27th March 2017

Real Academia de Ciencias Exactas, Físicas y Naturales (RAC), Spain

Nobel Prize in Chemistry 2016

N. Martin

27th-31st March 2017

Universidad de Sevilla

Visitor at Prof. D. Frustaglia´s group

L. Chirolli

31st March 2017

Kyushu University, Fukuoka, Japan

Subphthalocyanines: Supramolecular Organization and Self-assembling Properties

T. Torres

5th-8th April 2017
University of Amsterdam, The Netherlands
L. Chirolli
Visitor at Prof. J. van Wezel´s group

12th April 2017
Tokyo University, Tokyo, Japan
Conductive Coordination Polymers at the Nanoscale: from metallic nanostructures to potential novel memristors
F. Zamora

17th April 2017
Beijing Normal University, Beijing, China
From Molecules to Polymers and from Molecules to Crystals Understanding Materials for Optoelectronics
J. Gierschner

11th April 2017
Escuola Normale Superiore, Pisa, Italy
Time-reversal and rotation symmetry breaking superconductivity in Dirac materials
L. Chirolli

4th May 2017
University of Manchester. School of Chemistry. (Prof. David Leigh)
Glycofullerenes for Ebola Virus Infection
N. Martín

6th May 2017
Instituto Cervantes, Manchester, UK
Seminar V Anniversary SRUK. Tiny science: The science and applications behind nanotechnology "Fullerene's Sugar nanoballs for Ebola Virus Infection
N. Martín

12th May 2017
Höganäs AB, Höganäs, Sweden
Gas atomization and flash milling of MnAl particles
A .Bollero

19th May 2017
Ciclo de Conferencias y Seminarios del Departamento de Química Inorgánica (UAM) Madrid Spain
Metallodrugs: Mechanism of action and activation strategies
A. M. Pizarro

24th May 2017
King's College London, London, UK
Novel correlative microscopy tools to study biology and materials at the nanoscale
C. Flors

29th May 2017
University of Tulane, New Orleans, USA
Subphthalocyanines: Supramolecular Organization and Self-assembling Properties
T. Torres

13th June 2017
International School on Nanoscale Optical Microscopy, Istituto Veneto di Scienze, Lettere e d'Arti, Venize, Italy
Fluorescence labelling for super-resolution microscopy
C. Flors

Simon Fraser University, Vancouver, Canada
Subphthalocyanines: Supramolecular Organization and Self-assembling Properties
T. Torres

15th June 2017
Real Academia de Ciencias Exactas, Físicas y Naturales (RAC), Campus de Montegancedo. Universidad Politécnica de Madrid
Síntesis de nanoestructuras de carbono glicosiladas: inhibidores multivalentes de la infección del virus del Ébola
N. Martín

5th July 2017
5th Hellenic Forum for Science, Technology & Innovation - Ministry of Foreign Affairs, NCSR Demokritos. Athens, Greece
In silico testing methods for assessing magnetic hyperthermia
D. Ortega

6th July 2017
Institute for Molecular Science, Université de Bordeaux, Bordeaux, France
Solid State Luminescence Enhancement in Organic Materials: a Case Study on Cyano-Substituted Distyrylbenzenes
J. Gierschner

9th August 2017

University of Kyoto. Kyoto, Japan

Novel correlative microscopy tools to study biology and biomaterials at the nanoscale

C. Flors

10th August 2017

University of Tokyo, Tokyo, Japan

Novel correlative microscopy tools to study biology and biomaterials at the nanoscale

C. Flors

14th August 2017

University of California, Los Angeles (UCLA), Los Angeles, USA

Subphthalocyanines and Phthalocyanines for Molecular Photovoltaics

T. Torres

13th September 2017

Instituto de Nanociencia de Aragón, INA Zaragoza Spain

Magnetic nanoparticles against cancer. Wish you were here.

G. Salas

24th September 2017

World Cancer Research Day, Madrid, Spain

Herramientas de investigación en Cáncer: Nanomedicina

A. Somoza

26th September 2017

12th International Course of the European Master in Theoretical Chemistry and Computational Modelling (IIC-EMTCCM), Univ. Valencia

Excited States in Conjugated Organic Materials: Solid State

J. Gierschner

29th September 2017

Centro Nacional de Biotecnología-SCIS, Madrid, Spain

Attosecond science: the superslow-motion camera of physics, chemistry and ... biology?

F. Martín

5th October 2017

Universidad de Zaragoza, RSEQ Sección Territorial de Aragón

Celebrando el Premio Nobel en Química 2016: nanotubos de carbono y rotaxanos.

E.M.Pérez

9th-13th October 2017

Institute for Physical and Theoretical Chemistry, University of Tübingen, Tübingen, Germany

Optical Spectroscopy of Conjugated Organic Materials: Solid State (Lecture Series)

J. Gierschner

16th October 2017

Institute for Physics, University of Bayreuth, Bayreuth, Germany

Solid State Luminescence Enhancement in Organic Materials: Unraveling the Mechanism beyond AIE/AIEE

J. Gierschner

18th October 2017

Institute for Materials Science, University of Jena, Jena, Germany

Towards Controlled Light Emission in Organic Solids

J. Gierschner

2nd November 2017

University of Bologna, Italy

Time-reversal and rotation symmetry breaking superconductivity in Dirac materials

L. Chirolli

9th November 2017

Seminar organized by the NUI Galway Chemical Society (NUI) Galway, Galway, Ireland

Metallodrugs: Mechanism of action and activation strategies

A. M. Pizarro

12th November 2017

Dynamical effects in magnetic nanostructures - Model systems investigations with Variable Temperature-Full Angular Range v-MOKE

J. Camarero

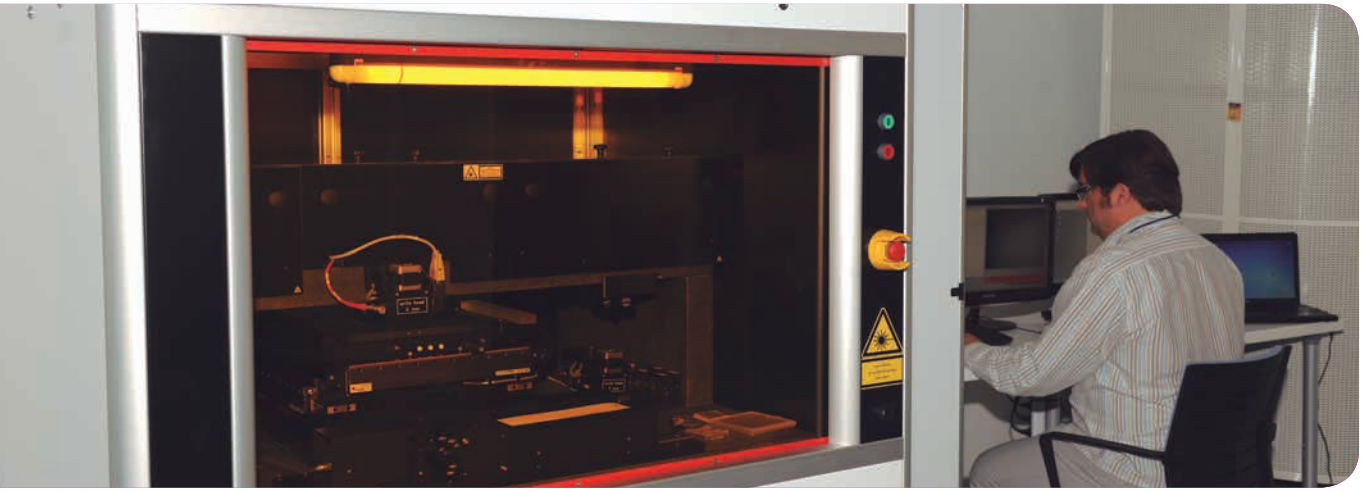
MIT Francis Bitter Magnet Laboratory FBML,, Boston, Massachusetts, USA

13th November 2017

Plasma Science and Fusion Center (PSFC), Boston, Massachusetts, USA

Nanomagentism research for fusion applications at CIEMAT

J. L. F. Cuñado, P. Muñoz, E.R. Hodgson, M. Malo , A. Moroño, M.González, T. Hernández, García-Cortés, F.J. Sánchez and J. Camarero



CSOM, Department of Materials Science and Engineering, Seoul National University, Seoul, Korea
Solid State Luminescence Enhancement in Organic Materials: Unraveling the Mechanism beyond AIE/AIEE
J. Gierschner

15th November 2017
CSOM, Department of Materials Science and Engineering, Seoul National University Seoul, Korea
Photophysics of Functional Conjugated Organic Materials: Research Overview 2017
J. Gierschner

16th November 2017
Massachusetts General Hospital (MGH) and Wellman Center for Photomedicine, Boston, Massachusetts, USA
Nanomedicine at IMDEA Nanociencia – Multidisciplinary aspects of nanomagnetism
J. Camarero

17th November 2017
CSOM, Department of Materials Science and Engineering, Seoul National University, Seoul, Korea
Spectral Analysis (Tutorial)
J. Gierschner (visiting Prof.)

20th November 2017
UNIST, Ulsan, Korea
Photophysics of Conjugated Organic Materials: Chromophores in Solution (Lecture Series)
J. Gierschner (visiting Prof.)

21st November 2017
Universitat Bern, Bern, Schweiz
Phthalocyanines: Old Dyes, New Molecular Materials for Molecular Photovoltaics
T. Torres

College de France. RESPORE Network, Paris, France
Opportunities for Covalent Organic Frameworks based on Schiff-base Chemistry. Synthesis, Properties and Potential Applications
F. Zamora

5th December 2017
Instituto Universitario de Ciencia de los Materiales, Valencia, Spain
Towards Controlled Light Emission in Organic Solids
J. Gierschner

8. Honours

2017-2020

IMDEA Nanociencia

Distintivo Centro de Excelencia Severo Ochoa

Agencia Estatal de Investigación

http://nanociencia.imdea.org/home-en/news/item/imdea-nanociencia-recibira-5-millones-de-euros-del-estado-para-reforzar-su-excelencia-cientifica

1st May 2017

T. Torres

Fellow of the European Academy of Sciences

European Academy of Sciences

http://www.eurasc.org/news/news_members.asp

2nd May 2017

F. Guinea elected as a National Academy of Science (NAS) Foreign Associate

http://www.nasonline.org/news-and-multimedia/news/may-2-2017-NAS-Election.html

5th June 2017

F. Martín García

Premio Rey Jaime I de Investigación Básica 2017

Generalitat Valenciana y la Fundación Valenciana de Estudios Avanzados

http://www.fprj.es/es/investigacion-basica/fernando-martin-garcia

https://www.youtube.com/watch?v=bhLYbzlRmeU

20th June 2017

F. J. Pedrosa

VIII-Pr. Santander Yuzz UAM Jóvenes Emprendedores

Banco Santander - Universidad Autónoma de Madrid

http://www.uam.es/UAM/Yuzz-4_7/1446746794195.htm?language=es&pid=1242649910548

2nd September 2017

F. J. Pedrosa

XIV Edición Premio Emprendedor CIADE- UAM

Universidad Autónoma de Madrid

http://www.uam.es/UAM/Premio-emprendedor-14_2/1446726592990.htm?language=es&pid=1242649910548

1st November 2017

T. Torres

Miguel Catalan Prize

Comunidad de Madrid

http://www.uam.es/UAM/Tom%C3%A1s-Torres-4_12/1446754753931.htm?language=es&pid=1242649910548

9. Outreach Activities

2nd February 2017

Juan M. Rojo en el XIII Ciclo de Conferencias de Divulgación Científica en la Real Academia de Ciencias

Espectros (de luz o electrones): el código de barras del sistema periódico y algo más

http://www.rac.es/7/7_1_2.php?id=313&idOrg=1.

2nd February 2017

Alvaro Somoza in the Nano World Cancer Day

8th March 2017

VII Jornadas Con Ciencia en la Escuela

15th May 2017

Pint of Science 2017 Guadalajara

Pint of Science is a science festival that aims to communicate contemporary scientific developments to the public in an interesting, engaging and approachable way by bringing scientists to the pub.

https://pintofscience.es/event/atomosygalaxias

7th June 2017

COST Get Together event "Sanpshots of EU research", Brussels

Multifunctional nanoparticles for magnetic hyperthermia and indirect radiation therapy

7th September 2017

Rodolfo Miranda, speaker at Future Port Prague

https://www.futureportprague.com/speakers/

29th September 2017

European researcher's night

A Europe-wide public event dedicated to popular science and fun learning.

http://www.madrimasd.org/lanochedelosinvestigadores/actividad/imdea-csi-investigando-en-la-escena-del-crimen

29th September 2017

La Noche Europea de los Investigadores

Fundación IMDEA

Semana de la Ciencia 2017

6th-17th November 2017

Semana de la Ciencia

The most important event on science dissemination in Europe.

http://www.madrimasd.org/semanaciencia/actividad/acercate-la-nano-ciencia-lo-pequeno-es-diferente

14th November 2017

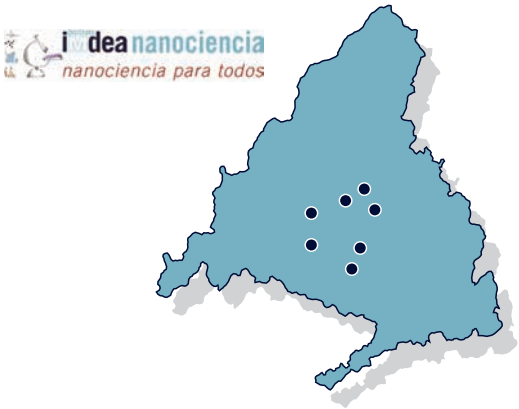
Lo pequeño es diferente

E. M. Pérez y A. M. Pizarro

Semana de la Ciencia 2017

9.1. Nanociencia para todos

Nanociencia para Todos is an outreach program arisen in response to the demand on popular science activities from the citizens of Madrid, a demand that we noticed trough the overwhelming attention of our proposals in the *Semana de la Ciencia de Madrid*. We believe that one of our duties is contributing to the creation of links between Science and Society in our region. *Nanociencia para Todos* is a monthly "Open Days" activity in which we receive mainly students from the last years of high school. In 2017 we received over **250 students**, teachers and citizens.



31.05.2017
Universidad de Mayores UCM.
+65

06.10.2017
Colegio Sagrada Familia (Pinto).
2° ESO

31.10.2017
IES Amor de Dios (Madrid).
1° Bachillerato

07.11.2017
Colegio Aristos (Getafe). 3° ESO

14.11.2017
Colegio Virgen de Europa (Boadilla). Bachillerato

14.11.2017
IES San Blas (Madrid). Ciclos Formativos

14.11.2017
IES Manuel de Falla (Mostoles).
4° ESO y Bachillerato

Some of our activities:

- Learn about IMDEA Nanociencia's microscopes
- Nanostructure is key
- Nanoparticles
- New Permanent Magnets

10. In the media

2nd February 2017

Espectros (de luz o electrones): el código de barras del sistema periódico y algo más

J. M. Rojo

XIII Ciclo de conferencias de divulgación científica en la Real Academia de Ciencias

8th February 2017

Así lucha contra el cáncer la elite de la nanotecnología

Álvaro Somoza

El Mundo

EM Economía INnovadores

NANOTECNOLOGÍA

Así lucha contra el cáncer la elite de la nanotecnología

Comentar noticia

Imagen a nanoescala tomada en la Universidad de Georgia. / ROBERT PETERSON / FLICKR

LIZZIA MONTES | Barcelona

08/02/2017 12:42

Con motivo del **Día Mundial del Cáncer**, diferentes ciudades del mundo han concurrido para presentar **los avances que la nanotecnología le brinda a la medicina** en la lucha contra esta enfermedad. En Barcelona, el escenario del Nano World Cancer Day ha sido el Vall d'Hebron Institut d'Oncología, cuyo director, **Josep Tabernero**, sostiene que, si bien se han dedicado muchos recursos a entender el cáncer, se ha dado una visión simplista de la enfermedad, «como si el comportamiento viniera dado sólo por las células malignas. La nanotecnología nos permite entender su dinámica y evolución».

La nanotecnología aplica escalas muy pequeñas: entre uno y cien nanómetros que es el tamaño de las moléculas, los virus y las mismas proteínas: «**nos permite interaccionar con ellas dentro de la célula**», introduce **Josep Samitier**, coordinador Científico de **NanomedSpain**. A menudo, se recurre al símil de los robots inteligentes que van directos a la célula para explicar cómo el nanofármaco se

7th March 2017

VII Jornadas con Ciencia en la Escuela

IMDEA Nanociencia

Circulo de Bellas Artes

9th April 2017

Un futuro by-pass para lesiones medulares

ByAxon project

Heraldo de Aragón

17th May 2017

IMDEA Nanociencia y la empresa Höganäs se alían para crear los imanes del futuro

A. Bollero

madrid.org - Comunidad de Madrid

18th May 2017

La naturaleza ofrece nuevas claves para fabricar materiales a medida

IMDEA Nanociencia

Agencia SINC

2nd June 2017

Conversatorios en Casa de América

R. Miranda y J. R. Castro

RTVE 24h

Conversatorios en Casa de América

Sábados a las 20:30 horas

24h

Conversatorios en Casa de América - Rodolfo Miranda Soriano y José Raúl Castro

7th June 2017

Multifunctional nanoparticles for magnetic hyperthermia and indirect radiation therapy

D. Ortega

COST Get Together event "Sanpshots of EU research", Brussels

15th June 2017

Un catedrático de la UAM recibe el Premio Rey Jaime I de Investigación básica

F. Martín

La Vanguardia

Un catedrático de la UAM recibe el Premio Rey Jaime I de Investigación básica

F. Martín

Diario Vasco

22nd June 2017

Interview

J. Pedrosa

7.7 Radio

27th June 2017

Preparando en Europa la próxima generación de imanes permanentes: sentido común, sostenibilidad, innovación y cooperación, ingredientes fundamentales

A. Bollero

Madri+d

Celebración del segundo taller Nanoparticles for Biomedical Applications

G. Salas

Nanomed Spain

28th June 2017

IMDEA Nanociencia proyecta los imanes ecológicos del futuro

A. Bollero

InnovaSpain

Fernando Martín recibe el Premio Jaime I a la Investigación Básica

F. Martín

Boletín de la Real Sociedad Española de Química

IMDEA Nanociencia proyecta los imanes ecológicos del futuro

IMDEA Nanociencia

InnovaSpain

1st July 2017

Fernando Martín García, Premio Rey Jaime I en Investigación Básica, 2017

M. Yañez

Anales de Química

4th July 2017

Lab24 - Exploradores de la Nanoescala

R. Miranda, T. Rodríguez, A. Somoza, A. Bollero, J. Cabanillas,F. Calleja

RTVE Canal 24h

6th July 2017

Nacimiento de la química ultrarrápida: la attoquímica

F. Martín

Universidad Autonoma de Madrid

Nacimiento de la química ultrarrápida: la attoquímica

F. Martín

Notiweb Madrimasd

10th July 2017

Nace la attoquímica, la química ultrarrápida

F. Martín

Agencia SINC

12th July 2017

Appearance of Fernando Martin in a radio program

F. Martín

RNE-Radio-5 - Program: El Laboratorio de JAL

13th July 2017

Interview to Fernando Martín

F. Martín

RNE – R1 - Program: España Vuelta y Vuelta

14th July 2017

Interview to Fernando Martín

F. Martín

Radio Euskadi - Program: La mecánica del caracol

15th July 2017

Nace la attoquímica, la química ultrarrápida

F. Martín

Cuatro

12th August 2017

Rodolfo Miranda: "Los plásticos de invernaderos podrían generar energía solar"

R. Miranda

La Voz de Almería

8th September 2017

Cuando el grafeno se casa con la nanofibra

R. Miranda

Radio Praha

14th September 2017

La Noche Europea de los Investigadores

Álvaro Somoza

Gestiona Radio

24th September 2017

Nanomedicina Contra el Cancer

Álvaro Somoza

TVE1

Nanomedicina Contra el Cancer

Álvaro Somoza

Europa Press

25th September 2017

Alvaro Somoza in the World Cancer Research Day, covered by RTVE

11th October 2017

Madri+d premia los proyectos tecnológicos más innovadores de la región

NoCanTher project

Con Salud

23rd October 2017

Retransmisión del acto de entrega Premios Rey Jaime I 2017

F. Martín

Canal YouTube Fundación Premios Rey Jaime I

Breve entrevista a Fernando Martín Premio Investigación Básica 2017

F. Martín

Canal YouTube Fundación Premios Rey Jaime I

25th October 2017

Conoce a los galardonados con los premios Jaime I

F. Martín

LEVANTE-EMV

26th October 2017

Entrevistas a los ganadores de los premios Rey Jaime I 2017

F. Martín

SER VALENCIA

27th October 2017

Los Premios Rey Jaime I 2017 critican la "falta de interés" que hay por la Ciencia en España

F. Martín

Fundación Premios Rey Jaime I

Los Premios Jaime I advierten de que "ya hay una generación perdida" y exigen más y mejor gestión de la financiación

F. Martín

Europa Press, Comunidad Valenciana

30th October 2017

Entrega de la 29ª edición de los "Premios Rey Jaime I"

F. Martín

Web de La Casa Real

31st October 2017

Entrevista a Fernando Martín, catedrático de la Universidad Autónoma de Madrid

F. Martín

Onda Cero - Madrid Norte - Program: Madrid Norte en la Onda

24th November 2017

Tomás Torres, elegido nuevo miembro de la Academia Europea de Ciencias

T. Torres

La Vanguardia

5th December 2017

El catedrático de UAM Torres Cebada, Premio de Investigación de la Comunidad

T. Torres

La Vanguardia

13th December 2017

Begoña Sot Sanz / Bioquímica. IMDEA Nanociencia

B. Sot Sanz

Blog de la Sociedad de Estudios Vascos

30th December 2017

Appearance of F. Marin giving his point of view on the relativity of time and explaining the findings of the research he has conducted, which focuses on processes that occurs in the attosecond timescale

F. Martín

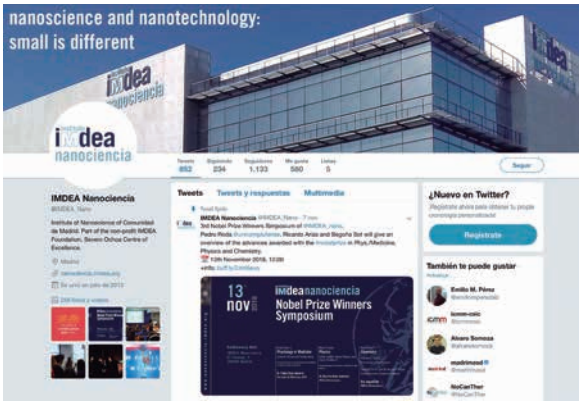
TeleMadrid - ConCiencia outreach program (A matter of time)

11. Social networking

Twitter

Reaching this year more than 600 followers, the oficial Twitter account of IMDEA Nanociencia has received 587 likes (3845 clics) in 2017.

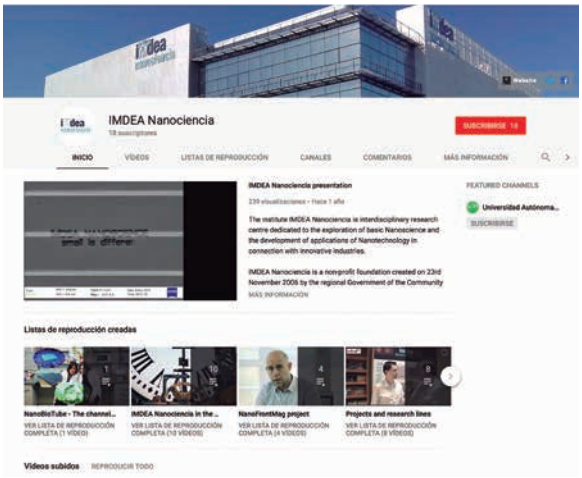
https://twitter.com/IMDEA_Nano



Youtube

IMDEA Nanociencia has re-launched its oficial Youtube account. Projects, research lines and publications explained in brief videos.

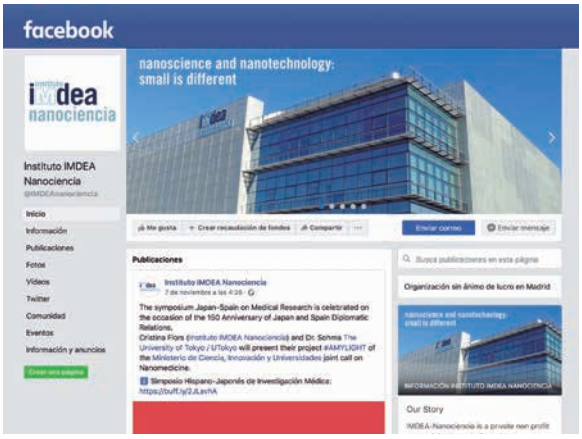
https://www.youtube.com/channel/UCyL-J_nvT6Um1-xvRPpg3oA



Facebook

The official page of IMDEA Nanociencia keeps its subscribers updated with the latests news of our institute.

https://www.facebook.com/IMDEAnanociencia/



4

research focus

2017
annual report

1. Severo Ochoa Programme

In July 2017 IMDEA Nanociencia was awarded the Severo Ochoa (SO) Centre of Excellence accreditation, by the Spanish State Agency of Research (Agencia Estatal de Investigación). The Institute will receive € 1M annually for the period 2017-2021 to help consolidate its position as a reference centre for research both nationally, and internationally.

EXCELENCIA SEVERO OCHOA 2017-2021

The strategic vision of the SO programme is to strengthen the existing interdisciplinary character of the centre, boosting the synergies of the research programmes that can combine different types of expertise to help address scientific problems relevant for societal challenges -aligned to those of the EU Research and Innovation programme Horizon 2020.

The SO actions are chosen to consolidate the international leadership of the Institute in the following fields:

1. Organic nanosystems for light harvesting and energy conversion
2. Fundamental properties of 2D Materials
3. Nanomedicine against cancer and infection
4. Nanomagnetism and Critical Raw Materials
5. Solid state quantum devices for information technologies

A new Translational Platform will be created to encourage cross-programme collaboration for prototyping, proof-of-concept testing, scaling-up and implementation of technologies developed in order to bridge the gap between our labs and society.

The creation of new programmes for PhD students and Postdoctoral staff in Nanoscience is another key action. A new transferable skills course will be added to our existing scientific training programme. These along with the reinforcement of existing, and development of new research-exchange programmes will ensure our graduate and post graduate professionals are provided with the cutting edge education and training in Nanoscience.

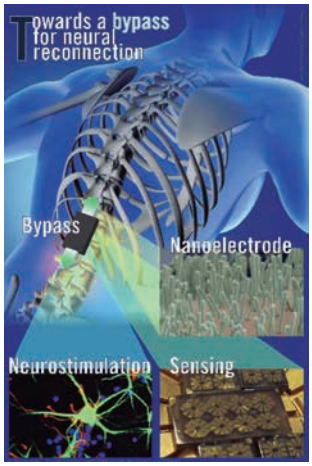
The strengthening of the existing research support and competitive projects offices will help in search for both national and international sources of funding. The exploitation and diffusion of the research outcomes from the centre will be ensured by the creation of the IMDEA Nano communication office, which will develop an Outreach and Communication plan, and the launch of the Strategic International Partnerships Office.

2. ByAxon

Towards an active bypass for neural reconnection

Funding: H2020-FETOPEN-1-2016-2017 nº 737116
Duration: 2017-2020
IMDEA Research Team: Prof. Rodolfo Miranda (PI), Dr. Teresa González (PI), Prof. Julio Camarero
http://www.byaxon-project.eu/

Brain-machine interfaces are devices that establish a direct communication between the brain and an external device, for example, a computer. They can be useful to people with spinal cord injury to regain some functions, such as the ability to grab and manipulate objects. However, current brain-machine interfaces have important drawbacks regarding the large number of cables and electrodes required.

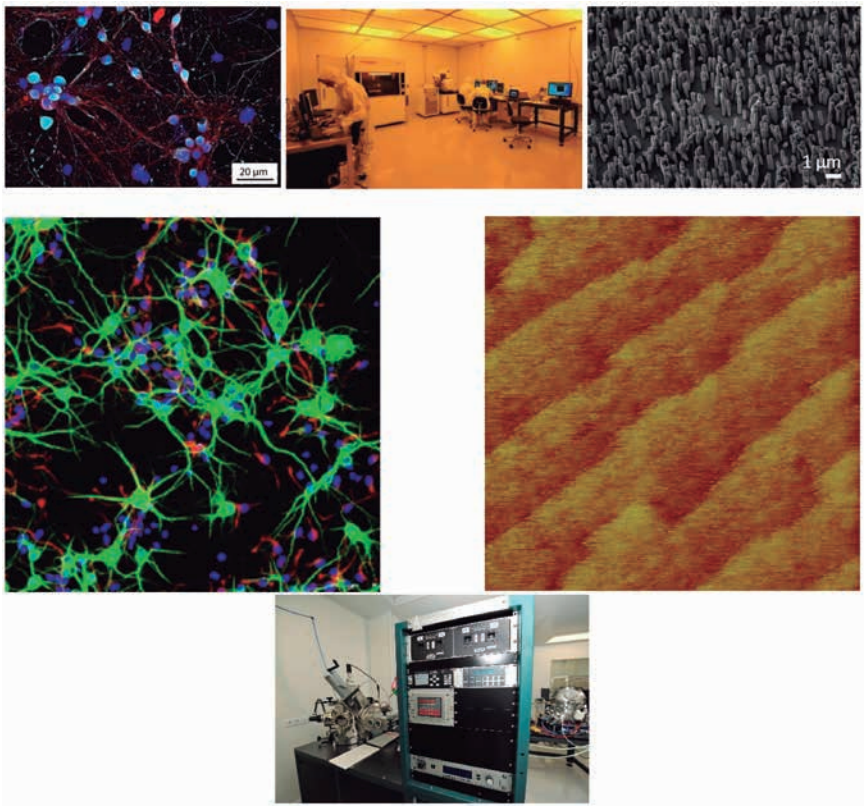


Magnetoencephalography offers an alternative: recording wirelessly magnetic field pulses generated by the brain. However, this technique requires very low temperatures, meaning the use of bulky devices, which are not suitable for portable applications.

The ByAxon project aims to build a prototype of an implant capable of working directly at the spinal cord level -reading the magnetic signals of the neural activity and passing them over the spinal cord injury in the form of electrical impulses. For this purpose, scientists from four different countries have joined together to work on this exciting project. The compact bypass implant will consist of a minimally invasive soft neural

interface coupled with extremely sensitive sensors and actuators based on nanotechnology to replace the present rigid metallic plates used in chronic implants.

In particular, IMDEA Nanociencia will contribute with the participation of the groups of Prof. Rodolfo Miranda and Dr. Teresa Rodríguez. Our aim is to fabricate improved neural electrodes to be used for electrical stimulation of the neural activity. By giving nanostructure to the electrodes, we aim to achieve enhance biocompatibility and efficiency. Hereby, we will benefit from world-class equipment at the center such as the clean-room facilities. We aim to demonstrate that magnetoresistive materials can be used to sense the neural activity without the use of cryogenic liquids (as SQUIDs detectors need).



ByAxon is an European research and innovation project funded by the Horizon 2020 program and under Future and Emerging Technologies frame. Future and Emerging Technologies (FET) actions are projects funded by the European's Union research and innovation programme, with a very concrete mission: turn Europe's excellent science base into a competitive advantage. FET actions are expected to initiate radically new lines of technology through unexplored collaborations between advanced multidisciplinary science and cutting-edge engineering. ByAxon is part

of the Open Research Data pilot, a preliminary trial of the Open Access to research data and publications policy of the European Commission.

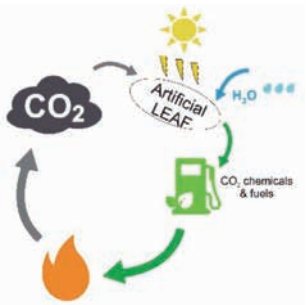
The consortium is composed of 6 partners from different European countries: IMDEA Nanociencia (Spain), Scuola Internazionale Superiore di Studi Avanzati de Trieste SISSA (Italy), Servicio de Salud de Castilla La Mancha SESCAM and Hospital Nacional de Parapléjicos de Toledo (Spain), Instituto de Ciencia de Materiales de Madrid ICMM-CSIC (Spain), Centre National de la Recherche Scientifique CNRS-GREYC (France) and mfd-Diagnostics (Germany).

3. A-LEAF

An Artificial Leaf: a photo-electro-catalytic cell from earth-abundant materials for sustainable solar production of CO2-based chemicals and fuels

Funding: FETPROACT-01-2016-nº 732840
Duration: 2017-2020
IMDEA Research Team: Prof. Rodolfo Miranda (PI), Dr. David Écija (PI)
http://www.a-leaf.eu/project/

Europe needs to act now, together, to deliver sustainable, secure and competitive energy according to the European Strategic Energy Technology Plan. To this aim it is urgent to accelerate knowledge at the frontiers of science and develop new technologies to be transferred and up-taken by society.



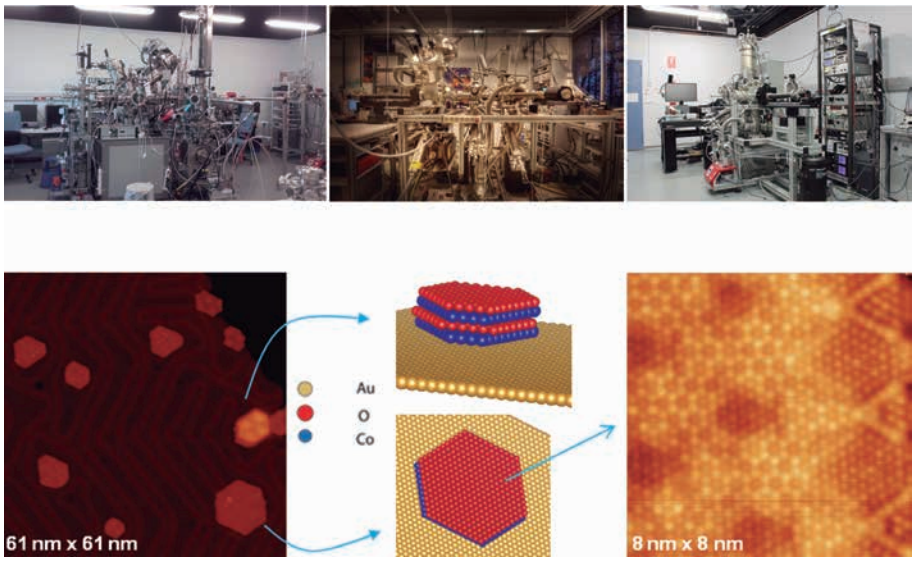
Currently, the majority of energy sources are based on fossil fuels, whose retrieval and use have a deleterious impact on the environment. The combustion of fossil fuels (coal, oil and gas) and large-scale deforestation are causing emissions of large amounts of "greenhouse gases" (GHGs) to the atmosphere, provoking global warming and climate change.

As alternative, solar fuels obtained from direct conversion of solar energy into chemical energy are becoming one of the key technologies enabling a sustainable future. The goal of this project is to design an operative device that is able to act as an artificial leave, i.e. capable of collecting sunlight to transform water and carbon dioxide into useful chemicals/fuels while improving the low efficiency, fragility and limited activity of natural photosynthetic systems.

To this aim, the A-LEAF multidisciplinary international consortium brings the needed expertise in each material, process, and device structure to create a novel photoelectrochemical cell concept. This design will include ion exchange membranes and gas diffusion electrodes for product separation. Performance will be validated in real working conditions under sun irradiation to assess the technological and industrial relevance of the A-LEAF cell.

In particular, IMDEA Nanoscience will contribute with the participation of the groups of Prof. Rodolfo Miranda and Dr. David Écija. Our mission will be to design model oxide systems on noble metals to study at the atomic level the process of water splitting, specifically the oxygen evolution reaction, one of the key chemical reactions within the artificial leaf device. Hereby, we will benefit from state-of-the-art scanning probe microscopies and spectroscopies available at the center,

complemented by synchrotron campaigns. We aim to develop a fundamental understanding of the surface chemistry of the selected oxides, discriminating and scrutinizing the active sites of these materials. Our results will provide new routes to synthesize more efficient, durable and affordable catalysts for water splitting.



The consortium is composed of 13 partners from different European countries: IMDEA Nanociencia (Spain), Institut Catalá d'Investigació Química (Spain), ETH Zürich (Switzerland), EPFL (Switzerland), Universiteit Leiden (The Netherlands), Vienna University of Technology (TU Wien), University Jaume I of Castelló (Spain), Imperial College London (United Kingdom), Technische Universität Darmstadt (Germany), Forschungszentrum Jülich (Germany), Université Montpellier (France), the National Interuniversity Consortium of Material Science and Technology (Italy), and Covestro AG (Germany).

editor
imdea nanoscience institute

graphic design
www.loveodesign.es

D.L.
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