

instituto
imdea
nanociencia



EXCELENCIA
SEVERO
OCHOA

nanoscience
and nanotechnology:
small is different

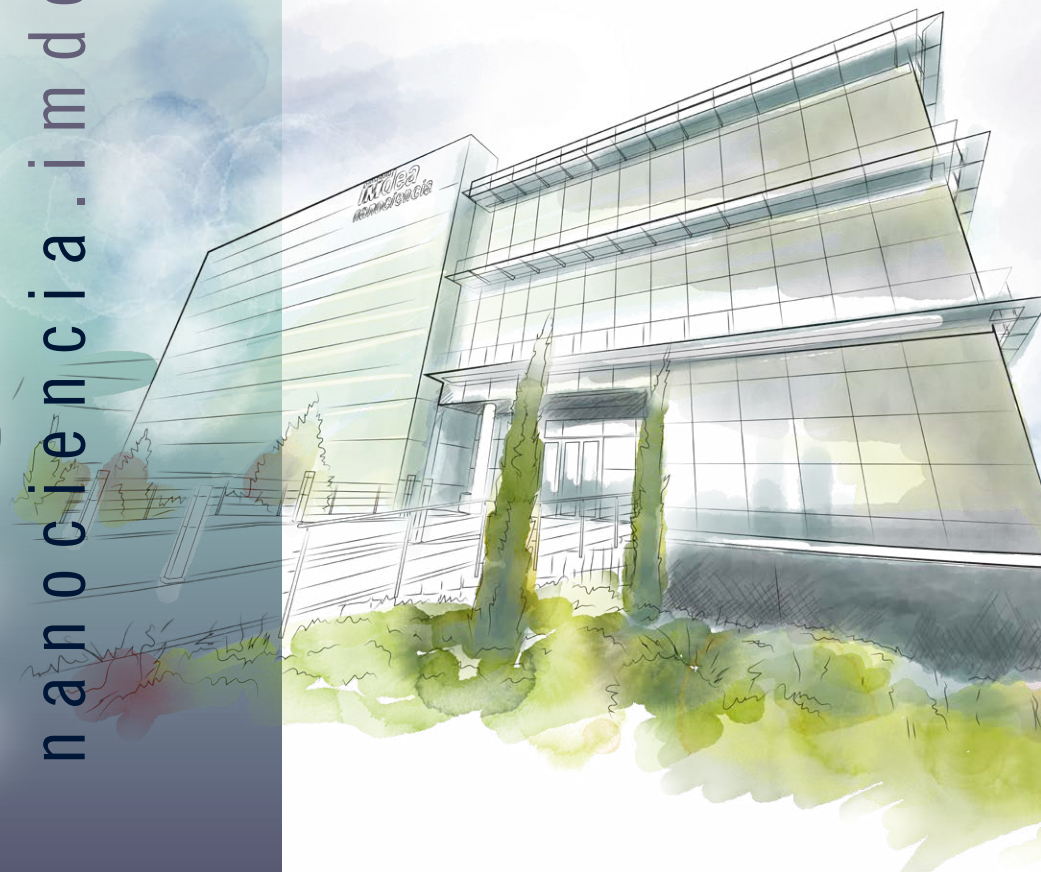
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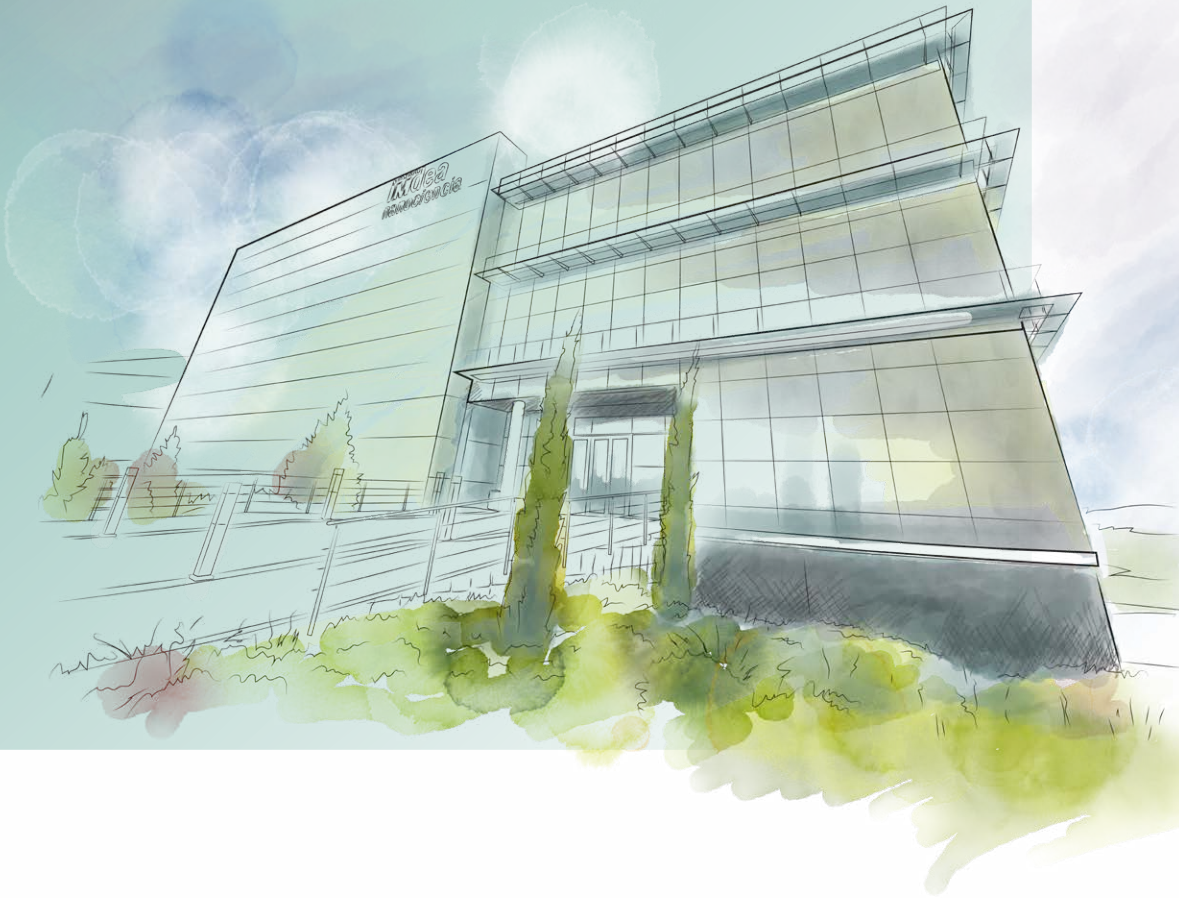
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foreword

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23





A handwritten signature in white ink that reads "Rodolfo Miranda". The signature is stylized and includes a long horizontal stroke at the end.

Rodolfo Miranda

Director, IMDEA Nanociencia Institute

June 2024

During 2023 we successfully unfolded the Research Programmes defined in the proposal that led to our second Award as a “Severo Ochoa” Center of Excellence for the period 2022-2025. We attract new talent from abroad to develop new research areas, install new labs and move forward to establish leadership in fields such as ultrafast time-resolved spectroscopies and microscopies, spin-polarized angle-resolved photoelectron spectroscopy, or nanostructured functional surfaces.

In terms of quantitative output, we have reach in 2023 a plateau in terms of number of published papers slightly below 200 papers, with more than 40% of them in D1 journals. The accumulated number of citations of the papers produced by IMDEA Nanociencia researchers has reached more than 100.000 by the end of the year. The institutional h index amounts to 138. This gives us a hint as to why IMDEA Nanociencia appears systematically among the highest-ranked research organizations in Spain.

We have maintained in 2023 the amazing figure of 75% of our budget being obtained from external, competitive sources, with only 25% coming directly from the administration. It is worth remembering that in 2012 the fraction of competitive funds

obtained was below 50%. In spite of these unusual figures, I claim that, more than ever, it is necessary to increase the basal financial support, in order to ensure the long term competitiveness of the Institute. The administration of the Madrid Regional Government should show commitment in this direction.

I feel particularly proud of the fact that in 2023 (finally) we have being able to offer stability to most of our employees, with permanent contracts with a well-balanced representation of researchers, technicians, managers and administrators, i.e. all the relevant areas of our Institute. This was very well deserved, considering the talent, dedication and strength that they have shown over the years. I am convinced that this action will be followed in years to come by new opportunities to complete the “skeleton” of our personnel of staff.

Since the creation of IMDEA Nanociencia, the commitment of everyone in the Institute is what made the Institute successful. May this continue to be true in the future. It is an immense honor for me to be still part of this incredible adventure.



IMDEA NANO



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ORISE

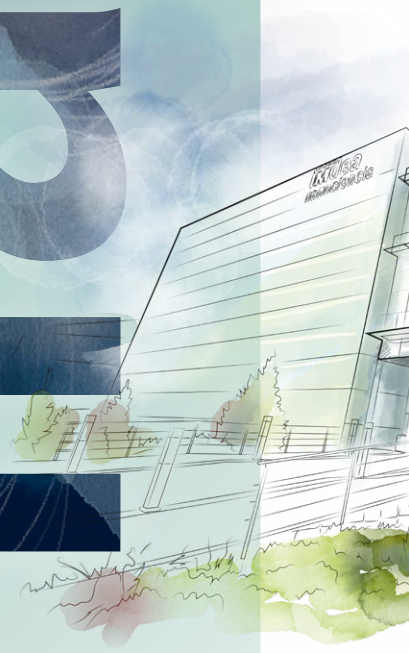
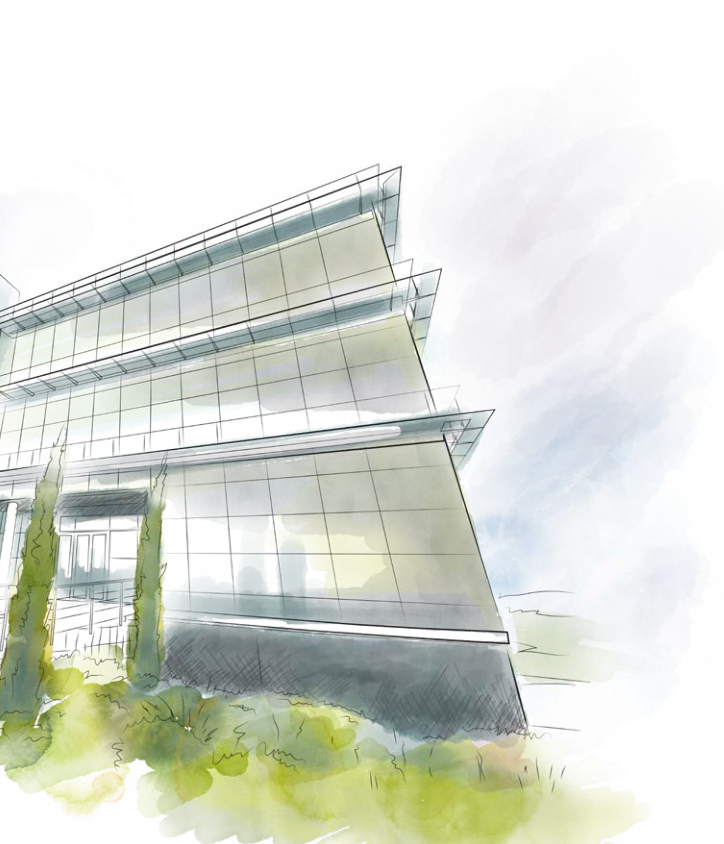


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1

overview

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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 Científicas), 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 IMDEA Nanociencia 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.

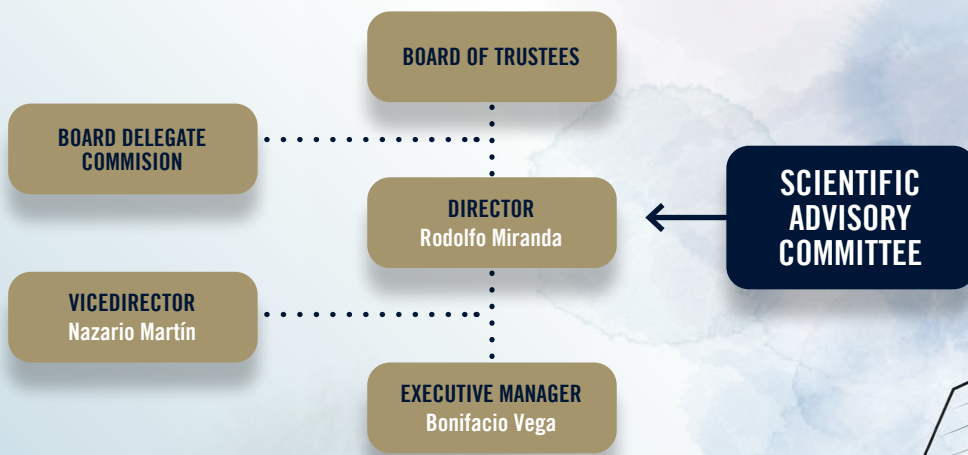
All this must be done by coordinating efforts with the groups and institutions that already exist, thanks to a flexible structure based on research programmes, which will have to undergo periodic evaluations. IMDEA Nanociencia aims at becoming an internationally recognized research centre, whilst maintaining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





3. Management Structure

LEGALLY BINDING GOVERNING STRUCTURE



INTERNAL GOVERNING STRUCTURE







4. Severo Ochoa

IMDEA Nanociencia became an accredited Severo Ochoa Centre of Excellence in 2017 (Spanish Ministry of Economy, Industry and Competitiveness) contributing towards the national and international leadership of the Institute in the areas of Nanoscience and Nanotechnology. This award is the highest national recognition for centres in Spain, granted after a rigorous evaluation process carried out by an international scientific committee.

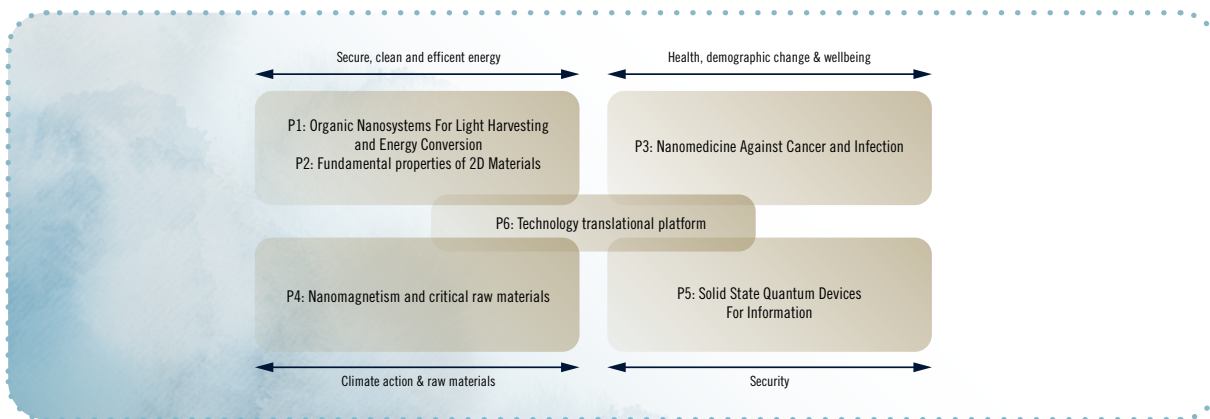
The funding provided by the Severo Ochoa award supports the strengthening of the existing interdisciplinary character of the centre and combines different types of expertise to find innovative solutions for social and economic challenges.

The focus under the Severo Ochoa programme are shown below where the research groups can make real contributions to the advancement of knowledge and technology innovation. The creation of a Translational Platform 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.

In terms of the support provided for our researchers, a key part of the project allows the strengthening of both the Competitive Projects and Dissemination and Communication offices. Additionally the opening of two new offices for Research Support and Strategic International Partnerships has greatly strengthening the Institute on an international platform.

IMDEA Nanociencia is part of the SOMM alliance (<https://www.somma.es/>) and supports its goals and objectives. The SOMMa mission is to internationally promote, strengthen and maximise the value of the groundbreaking research produced by the Spanish 'Severo Ochoa' Centres and 'María de Maeztu' Units of Excellence and the scientific, social and economic impact it generates.





5. Board of Trustees

PRESIDENT OF THE BOARD OF TRUSTEES

Prof. Ivan K. Schuller

Expert on transfer of knowledge and nanotechnology. Advisor of the State of California and the National Nanotechnology Initiative, USA

PATRONOS NATOS DE LA COMUNIDAD DE MADRID

ART. 17.2 DE LOS ESTATUTOS

Mr. Emilio Viciana Duro

Vicepresidente, Consejero de Educación, Ciencia y Universidades

Ms. Ana Ramírez de Molina

Viceconsejera de Universidades, Investigación y Ciencia

Ms. Laura Gutierrez Barreno

Viceconsejera de Sanidad

Ms. Marina Villegas Gracia

Directora General de Investigación e Innovación Tecnológica

Mr. Nicolás Casas Calvo

Director General de Universidades

Ms. Bárbara Fernández-Revuelta Fernández-Durán

Subdirectora General de Investigación

Mr. José de la Sota Rius

Madri+d's Scientific-Technical Coordinator

PATRONOS NATOS NOMBRADOS POR LA SECRETARÍA DE ESTADO DE I+D+I

ART. 17.2 BIS DE LOS ESTATUTOS

Dr. Ángela Fernández Curto

Subdirección General de Grandes Instalaciones Científico Técnicas

IMDEA INSTITUTES TRUSTEES

Dr. Fernando Temprano Posada

Appointed by IMDEA Software

Dr. Jerry B. Torrance

Appointed by IMDEA Materiales

PATRONOS A PROPUESTA DE UNIVERSIDADES Y ORGANISMOS PÚBLICOS DE INVESTIGACIÓN

Prof. Ivan K. Schuller

Expert on transfer of knowledge and nanotechnology. Advisor of the State of California and the National Nanotechnology Initiative, USA

Prof. Cayetano López

CIEMAT, Madrid, Spain

Prof. Hector Abruña

Ithaca Cornell University New York, USA

Prof. Miquel Salmerón

University of California, Berkeley, USA

PATRONOS A PROPUESTA DE UNIVERSIDADES Y ORGANISMOS PÚBLICOS DE INVESTIGACIÓN

Ms. María Soledad Martín González

Consejo Superior de Investigaciones Científicas. (CSIC)

Ms. Lucía de Juan Ferré

Universidad Complutense de Madrid

Mr. Daniel Jaque Garcia

Universidad Autónoma de Madrid

Mr. Fernando Calle

Universidad Politécnica de Madrid

INDUSTRY

Mr. Emilio Ramiro Arcas

Arquimea Advanced Systems

Mr. Manuel Pérez Cortes

(substitute: Mr. Pedro Golmayor) GMV Aerospace and Defense

6. Scientific Advisory Committee

Chairman: Prof. Ivan Schuller

Center for Advanced Nanoscience, University of California-San Diego, USA

Prof. Héctor Abruña

Department of Chemistry & Chemical Biology, Baker Laboratory, Cornell University, USA

Prof. Miquel Salmerón

Department of Materials Science and Engineering, University of California, Berkeley, USA

Prof. Dr. Christoph Gerber

Department of Physics, University of Basel.

Prof. Beatriz Noheda

Zernike Institute for Advanced Materials, Director CogniGron University of Groningen

Prof. Johannes Barth

Department of Physics, Technische Universität München, Germany

Prof. Harald Brune

Institute of Physics, Ecole Polytechnique Fédérale de Lausanne

Prof. Dr. Robert H. Blick

Director del Center for Hybrid Nanostructures, University Hamburg

Prof. Silvia Marchesan

Dipartimento di Scienze Chimiche e Farmaceutiche, Università degli Studi di Trieste

Prof. Dr. Beatriz Roldán

Director Fritz Haber Institut, Max Planck Berlin

Prof. Dr. Wolfgang Kuch

Institut für Experimentalphysik, Freie Universität, Berlin Prof. Luisa de Cola, Accademia dei Lincei, Univ. Milano.

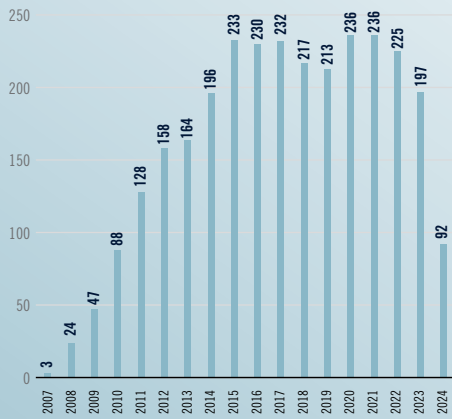


7. IMDEA Nanociencia at a Glance

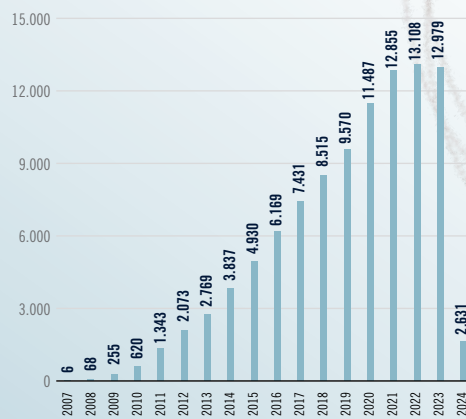
SCIENTIFIC PRODUCTION



Publications in each year



Citations in each year





HUMAN RESOURCES

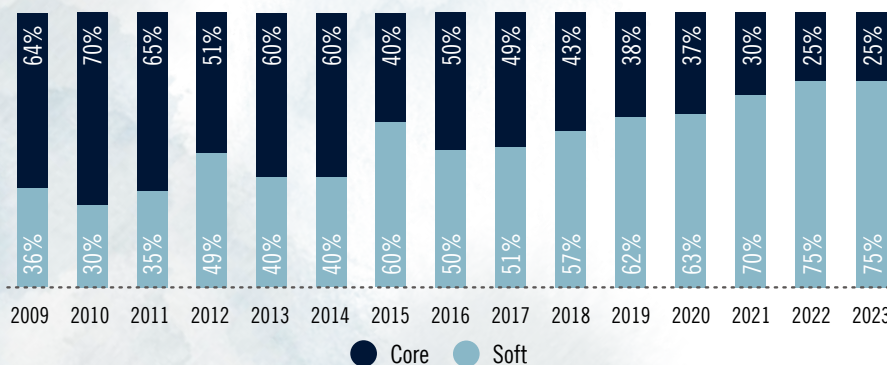


Staff: 249 Researchers: 232 Nationalities: 17 Average age: 36 Gender balance (M/F): 57/43

PERCENTAGE OF FUNDING FROM CORE VS OTHER SOFT SOURCES

CORE funding: Stable and secured yearly funds from Madrid Regional Government (Comunidad de Madrid Funds Transfer).

SOFT funding: Non-stable funds, financing and competitive grants from EU, national and regional sources, grants from private non-profits, collaboration with institutions and industry and R&D contracts.



NATURE INDEX

For a national picture, IMDEA Nanociencia is ranked fourth by Share in the Nature Index for Governmental funded (non-University) Research Institutions in Spain:

IMDEA Nanoscience Institute, Spain
 Time frame: 1 March 2022 - 29 February 2024

Research

Overall research output

	Count	Share
Overall	46	10.45

Overall Count and Share for "IMDEA Nanoscience Institute" based on the 12-month time frame mentioned above.

[View all articles >](#)

Research outputs by subject area

Subject	Count	Share
Biological sciences	2	0.49
Chemistry	35	6.57
Earth & environmental sciences	2	0.49
Health sciences	2	0.49
Physical sciences	25	6.02

Note: Some articles may be assigned to more than one subject area. Share over the donut graph to view the share for each subject.

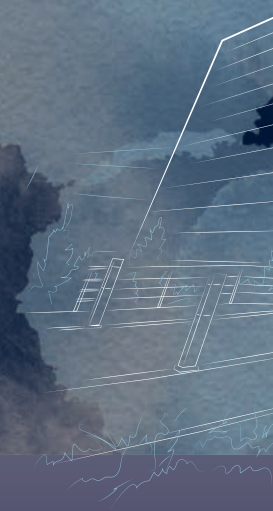
Note: The combined "IMDEA Institutes" (Count 68; Share 13.23) would rank third overall (above BRTA). IMDEA Nanociencia output counts for around 79% of the IMDEA Institutes total (by Share).

Rank	Institution	Count	Share
1	Spanish National Research Council (CSIC)	1468	186.09
2	Institute of Health Carlos III (ISCIII)	485	44.10
3	Basque Research and Technology Alliance (BRTA)	76	11.74
4	IMDEA Nanociencia	46	10.45
5	National Geographic Institute (IGN)	21	5.34
6	ALBA Synchrotron	32	5.07
7	Basque Center for Macromolecular Design and Engineering	31	4.31
8	Xunta de Galicia	80	4.27
9	National Institute for Aerospace Technology (INTA)	56	3.25
10	Centre for Energy, Environment and Technology (CIEMAT)	112	2.70

2

research programmes and scientists

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P1

**Nanotechnology
for energy
harvesting**

[16]

P2

**Quantum
materials at the
nanoscale**

[28]

P6

**Nanotechnology
for Critical Raw
Materials and
Sustainability**

[78]

**Horizontal Platform
Disruptive Innovation
and Technology**

[84]

P5

**Ultrafast
phenomena at the
nanoscale**

[66]

P3

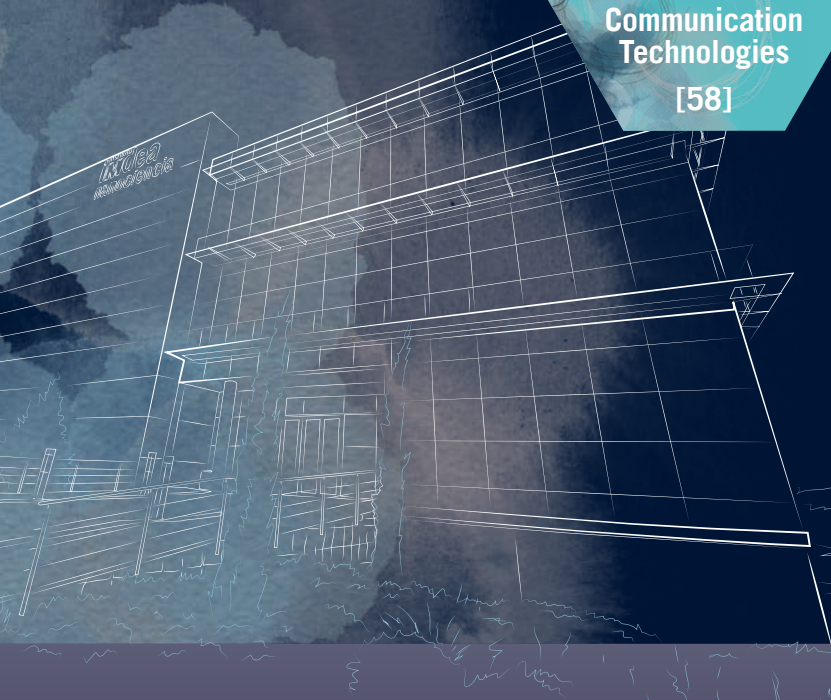
**Nanotechnology
for Health-care**

[44]

P4

**Nanomagnetism
for Information and
Communication
Technologies**

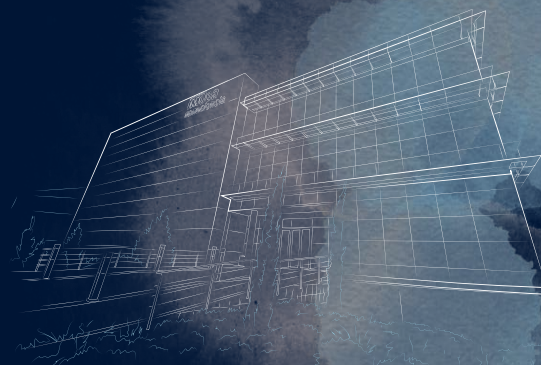
[58]



P1

programme

Nanotechnology for energy harvesting



Programme Manager: Prof. Nazario Martín

Research lines

**Nanocarbons and Organic
Photovoltaics**

Prof. Nazario Martín

**Chemistry of Low-
Dimensional Materials**

Prof. Emilio M. Pérez

Switchable Nanomaterials

Dr. José Sánchez Costa

Molecular Electronics

Dr. Edmund Leary

**Systems Chemistry
Laboratory**

Prof. Thomas Hermans

**Functional Organic
Materials**

Prof. Tomás Torres

**Electrochemical
Biosensors**

Prof. Encarnación Lorenzo

**Functional Nanoscale
Materials and Devices**

Dr. Enrique Burzuri

Biosensors

Prof. José Manuel Pingarrón



About the programme

Among the available energy harvesting techniques, and according to the outlook by the International Energy Agency, photovoltaics (PV) is considered as a mainstream technology for the next decade. Solar energy has undergone the largest growth of all renewable energies, being on track to reach the Sustainable Development Scenario level by 2030. Furthermore, future demand for ground-breaking solar technologies looks for easily accessible skin like solar cells adaptable for building integration in smart cities, cars and portable devices.

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 and the properties of (model) solar cells. The practical objective is the use of this information, if possible, for the corresponding optimization of functional organic devices, such as (prototype) organic solar cells, as well as the preparation of a variety of materials for hole and electron transport, respectively, in perovskite-based solar cells.

In the Programme we search for new nanomaterials for the clean, sustainable production and storage of energy, and for the valorisation of waste chemicals, en route to a zero-waste energy cycle. To address this ambitious goal, we will employ a judicious combination of chemical synthesis, advanced time-resolved spectroscopy (see also P5), theory and device fabrication. It is worth noting that all these issues can be addressed from resources and capabilities at IMDEA-Nano and, quite naturally, involve a close collaboration with other strategic research programmes, specifically P2, P5 and P6.

Nanocarbons and Organic Photovoltaics

Webpage: <https://nanociencia.imdea.org/nanocarbons-and-organic-photovoltaics/group-home>



Prof. Nazario Martín
Associate Research Prof.

PhD: Universidad Complutense de Madrid, Spain
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www.nazariomartingroup.com

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Durham University, UK

Dr. Inés García-Benito

Ecole polytechnique fédérale de Lausanne, Swiss

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Universidad Complutense de Madrid, Spain

Dr. Diego Jiménez

Universidad Complutense de Madrid

Dr. Estefanía Fernández

IMDEA Nanociencia, Spain

Dr. Ahmad Khan Abbas

Hanyang University, Seoul, South Korea

Dr. Sara Abdollahzadeh Ghom

Universitat de Barcelona, Spain

PhD STUDENTS

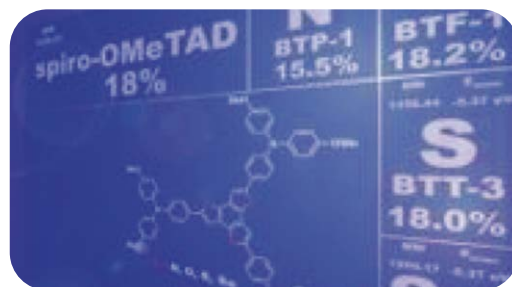
Jesús Galán

Jorge Gómez

Research lines

The Organic Molecular Materials group at the Complutense University of Madrid and IMDEA Nanociencia is led by Prof. Nazario Martín. The research activity is mainly focused on Carbon Nanostructures as materials for the preparation of photo- and electroactive Functional Organic Molecular Systems. In particular, the covalent and supramolecular chemistry of carbon nanoforms in the context of chirality and asymmetric catalysis (bottom-up nanographenes, graphene quantum dots, carbon nanodots, and pulsed laser synthesis of carbon nanoparticles), electron transfer processes, photovoltaic applications (organic and perovskite solar cells), supramolecular functional assemblies and nanoscience.

At IMDEA Nanociencia, the group is involved in two main research: (1) "on-surface" synthesis, which consists on the preparation of new type of semiconductive polymers from tailored monomers synthesized in our lab; (2) Perovskite solar cells (PSCs), one of the most highlighted technologies nowadays, based on the preparation of organic compounds for the different layer of the perovskite devices, such as hole and electron-transporting layers or organic spacers for low-dimensional perovskite materials.





Chemistry of Low-Dimensional Materials

Webpage: <http://nanociencia.imdea.org/chemistry-of-low-dimensional-materials/home>



Prof. Emilio M. Pérez
Senior Research Prof.

PhD: University of Edinburgh,
UK

Previous Position:
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University of Southampton, UK

Dr. Marina Garrido
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Dr. Gloria Tobajas
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PhD STUDENTS

Sara Moreno
Alicia Naranjo
Ion Isasti
Marisol Rivas
David Jiménez

TECHNICIANS

Dr. Silvia Miranda
Christine Marie Arenas
Sylwia Parzyszek

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 show fundamentally different properties from other types of SWNT derivatives, which might have implications in the reinforcement of polymers, 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. From these suspensions, we build functioning (opto)electronic devices using dielectrophoresis. Finally, we are interested in fundamental problems in the chemistry of 2D materials, such as chemoselectivity.
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. Optical tweezers (OT) are one of the most successful single-molecule force spectroscopy techniques, to the point of Arthur Ashkin being awarded with the Nobel Prize for Physics 2018, for their use to study biophysics. In these two papers, we use OT to study synthetic supramolecular systems for the first time.

Switchable Nanomaterials

Webpage: <http://www.nanociencia.imdea.org/switchable-nanomaterials-group/group-home>



Dr. José Sánchez Costa

Assistant Research Prof.

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1, France

Previous Position: LCC-CNRS,
Toulouse, France

ORCID:
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Research ID:
N-9085-2014

POSTDOCS

Dr. Esther Resines
IMDEA Nanociencia, Spain

Dr. Raquel Utrera
Université de Nantes, France

Dr. Rubén Turó
Instituto de Ciencia
Molecular of the Universitat
de València (ICMol-UV),
Spain

Dr. Sara Gullace
Institut de Science
et d'Ingénierie
Supramoléculaires:
Strasbourg, France

PhD STUDENTS

Ana Martínez-Martínez
Jorge Sangrador

Research lines

The Switchable NanoMaterials group (SNM) research is at the forefront of coordination chemistry, material science, crystallography and nanoscience. We have focused on innovative responsive materials for advanced applications such as:

- High performance sensors:** The responsive materials were designed to feature specific receptors that significantly enhanced the sensor's selectivity, through the following strategies: i) **switchable Fe(II) spin crossover (SCO)** materials as transducers in thermochromic materials (*Chemical Science*, 2019, doi.org/10.1039/C9SC02522G; *Advanced Science*, 2021, doi.org/10.1002/adv.202102619; *Inorg. Chem. Front.*, 2020, 10.1039/D1QI00059D) and patent PCT/EP20207074768 and US2022033525A1; ii) **3D Lanthanide MOFs** showing divergent photoluminescent variations (*JPCL*, 2020, doi.org/10.1021/acs.jpcl.0c00457) and iii) **carbon-based materials** as dynamic supramolecular fullerenes for hydrogen storage (*ACIE*, 2019, 20, doi.org/10.1002/anie.201812419 and *Chemical Science*, 2021, doi.org/10.1039/D1SC00981H; *CEJ*, 2023, 10.1002/chem.202302964)
- Energy** (Thermal regulation and energy storage): Hydrogen storage in fullerene-based materials (*ACIE*, 2019, 20, 2332; *Chemical Science*, 2021, 8682 and *CEJ*, 2023, 10.1002/chem.202302964), and thermal regulation (*Advanced Science*, 2022, 9, 2202253).
- Spintronic:** This research line is based on overcome the challenges of downscaling the SCO-based spintronic devices to the nanoscale. Two major achievements have been obtained: i) integrating SCO on matrix (*Nature Comms* 2021, 10.1038/s41467-021-21791-3), and ii) developing new conducting SCO-MOFs (*ChemMat*, 2023, doi.org/10.1021/acs.chemmater.3c01049)



Molecular Electronics

Webpage: <https://www.imdeananociencia.org/molecular-electronics/home>



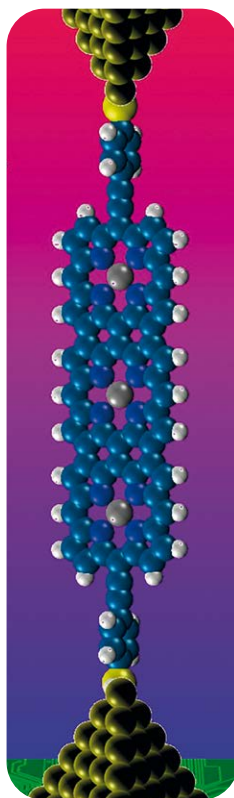
Dr. Edmund Leary
Assistant Research Prof.
(tenure track)

PhD: University of Liverpool, UK
Previous Position: University of Liverpool, UK

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0000-0001-7541-5997

Researcher ID:
L-1066-2018

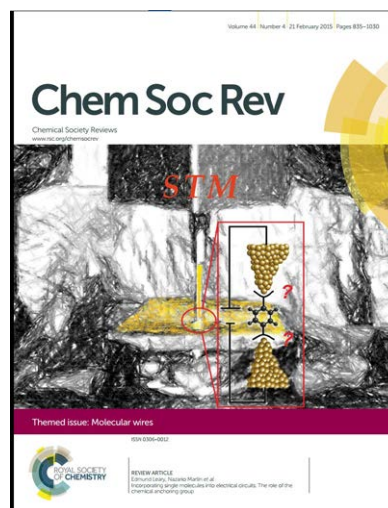
RESEARCH ASSISTANT
Lydia Abellán
José Miguel Malagón



Research lines

The molecular electronics group at IMDEA Nanociencia studies a wide variety of molecules for use in future molecule-based electronic devices. Our goal is to develop a deep understanding of electron transport at the nanoscale through individual molecules wired between a pair of electrodes. In particular, we are interested in the following areas: high-conductance molecular junctions; highly-conjugated molecular wires; thermopower at the molecular level; the role of aromaticity and antiaromaticity on electron transport; molecular spintronics; developing molecular switches; molecules under high bias voltages; chiral molecular junctions.

Cover images from: Chemical Society Reviews 21 February 2015, Issue 4 (10.1039/C4CS00264D)



Systems Chemistry Laboratory

Webpage: <https://www.imdeananociencia.org/systems-chemistry-laboratory/home>



Prof. Thomas Hermans
Senior Research Prof.

PhD: Eindhoven University of Technology, Netherlands

Previous position: University of Strasbourg, France

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Dr. Jorge Santos Valera González
University of Strasbourg,
France

Dr. Alexander Willem Peter Blokhuis
University of Strasbourg,
France

Research lines

Three lines of research exist within our team:

1. Dissipative non-equilibrium self-assembly

We aim to develop novel supramolecular materials that are kept out of their equilibrium state by continuous dissipation of chemical fuels and/or using light. Natural supramolecular polymers such as those found in the cytoskeletal network use chemical fuels such as adenosine triphosphate (ATP) to enable them to be adaptive, motile, grow or respond to external stresses. The development of artificial dissipative supramolecular polymers should therefore make it possible to create "living" materials capable of performing tasks hitherto reserved for living beings.

2. Chiral separation using fluid flows

The mechanical interactions of chiral objects with their environment are well known at the macroscopic scale, such as the propeller of an aircraft or the rudder of a boat. However, at the colloidal scale (and below), these interactions are often neglected or considered small compared to Brownian motion. We are testing high-shear environments as an alternative for chiral column chromatography.

3. Microfluidics without solid walls.

With its promise of manipulating nanoliter volumes of reagents in complex sequences, microfluidics has considerable potential in terms of chemical analysis and materials studies or discovery. However, solid walls come with limitations such as high-pressure drop at small scales and clogging of devices. Our approach is to remove the solid walls around the fluids being handled using magnetic levitation.



Functional Organic Materials

Webpage: <http://www.phthalocyanines.es>



Prof. Tomás Torres Cebada

Associate Research Prof.

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ORCID:
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Research ID:
H-9796-2014

ASSOCIATE RESEARCHER

Dr. Giovanni Bottari
Associate Researcher
PhD: University of Edinburgh, United Kingdom
Double Affiliation: Universidad Autónoma de Madrid, Spain
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Researcher ID:
A-8957-2013

Dr. José García Calvo
University of Geneva, Switzerland

PhD STUDENTS

Álvaro Corrochano
Luis M. Mateo
Miguel Martínez

TECHNICIAN

Dr. Maxence Urbani

Research lines

Our research focuses on the preparation and study of molecular materials based on porphyrinoids like phthalocyanines (Pcs), sub-phthalocyanines (SubPcs) and porphyrins (Por), among others. See for example: *Angew. Chem. Int. Ed.* **2021**, 60,1474–1481; *Coord. Chem. Rev.* **2021**, 428, 213605.

1. One research line deals with the use of porphyrinoids as active components in solar cells. See for example: *Adv. Ener. Mater.* **2021**, 2101598; *J. Mater. Chem. C*, **2021**, 9, 16298-16303
2. We are also active in the preparation of photosensitizers for photodynamic therapy of cancer. See for example: *J. Med. Chem.* **2021**, 17436-17447; *Chem. Commun.* **2022**, 58, 669-672.
3. Finally our group is researching on the use of porphyrinoids in "On-surface synthesis". See for example: *Angew. Chem. Int. Ed.* **2021**, 60, 16208-16214; *Adv. Sci.* **2022**, 2105906.

Electrochemical Nanobiosensors

Webpage: <https://nanociencia.imdea.org/home-en/people/item/maria-encarnacion-lorenzo>



**Prof. María
Encarnación Lorenzo
Abad**

Associate Research Prof.

PhD: Universidad Autónoma
de Madrid, Spain

Double Affiliation: Univer-
sidad Autónoma de Madrid,
Spain

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Researcher ID:
K-9825-2014

PhD STUDENT
Estefanía Enebral

Research lines

The Chemical Sensors and Biosensors Group of the Department of Analytical Chemistry and Instrumental Analysis at UAM is a consolidated research group whose research focuses on the design, construction, characterization and validation of electrochemical sensing platforms, based on efficient, reliable, low cost and easily transferable to the productive sector for direct application in clinical, environmental and food analysis. Currently, the nano-analytical area is a priority line in the group that focuses on the incorporation of low-dimensional nanomaterials for the development of new, improved and highly efficient (bio)sensors of the sample to result type.



Functional Nanoscale Materials and Devices

Webpage: <http://nanociencia.imdea.org/functional-nanoscale-materials-and-devices/home>



Dr. Enrique Burzurí
Associate Research Prof.

Double Affiliation: Universidad
Autónoma de Madrid, Spain

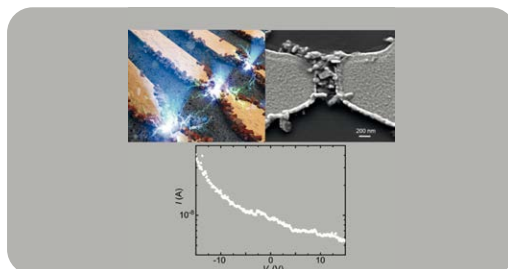
ORCID:
0000-0001-7906-7192

Researcher ID:
M-3501-2015

PhD STUDENTS Lucía Martín

Research lines

- 2D and 1D materials:** We are interested in the fundamental properties of 2D materials and their integration into (opto) electronics and spintronics devices. We have assembled scalable nano-transistors based on frackeite heterostructures obtained by liquid-phase exfoliation. We are also involved in the controlled positioning of 1D SWNTs in complex devices. We have fabricated Physically Unclonable Functions (PUFS) and field-effect transistors with chemically modified SWNTs selectively positioned by dielectrophoresis.
- Magnetism of molecular materials:** We are also very interested in fundamental studies of the magnetism of molecules and other nanoscale materials (coordination polymers, 2D materials, mechanically interlocked magnetic molecules). For example, we have studied the magnetism of cylindrite van der Waals heterostructures down to the 2D limit. We have also studied the magneto-electronic response of Fe-based coordination polymers to volatile organic molecules.
- Molecular spin QBits:** Finally, we are exploring the incorporation of SWNT-magnetic molecule hybrids into superconducting circuits as spin QBits for quantum computation.





Biosensors

Webpage: <http://www.imdeananociencia.org/home-en/people/item/dr-jose-manuel-pingarron>



**Prof. José Manuel
Pingarrón**
Associate Research Prof.

PhD: Universidad
Complutense
de Madrid, Spain

Double Affiliation: Universidad
Complutense de Madrid, Spain

ORCID:
0000-0003-2271-1383

Researcher ID:
M-9402-2014

Scopus Author ID:
7005489861

Research lines

- 1. Fundamental Research:** Synthesis, characterization and application of latest generation nanomaterials, redox polymers/electronic conductors and modern electroanalytical techniques in electrochemical (bio)sensing.
- 2. 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.

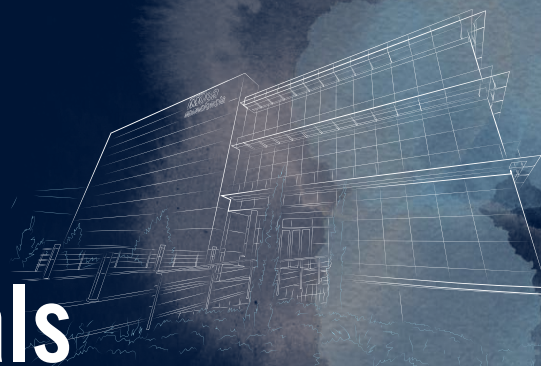
The background of the page is a vibrant green watercolor wash with organic, overlapping shapes in various shades of green, from light lime to deep forest green.

programme
**Nanotechnology
for energy harvesting**

P2

programme

Quantum materials at the nanoscale



Programme Manager: Prof. Rodolfo Miranda

Research lines

**Scanning Probe
Microscopies and
Surfaces**

Prof. Rodolfo Miranda

Theoretical Modelling

Prof. Francisco Guinea

**Quantum Devices
and Photonics**

Dr. Daniel Granados

**Nanoarchitectures
at Surfaces**

Dr. David Écija

Spin-Polarized low T STM

Dr. Fabián Calleja

**Topological Surfaces
States in Quantum
Materials**

Dr. Manuela Garnica

**On surface Synthesis
of Carbon based
Nanostructures**

Dr. J. Ignacio Urgel

Applied Nanoelectronics

Dr. Ramón Bernardo

**Topological Surfaces
States in Quantum
Materials**

Dr. José Ángel Silva

Imaging of 2D Materials

Prof. Amadeo L.
Vázquez de Parga

Photonic STM

Dr. Roberto Otero

Transport in 2D Systems

Prof. José Luis Vicent

**Thermopower
at the Nanoscale**

Prof. Nicolas Agrait

**Theoretical Study of
Molecules on Surfaces**

Prof. Manuel Alcamí



About the programme

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Quantum Technologies play a cornerstone role in the future European economy and competitiveness. They will impact security, counterfeit prevention, drug discovery, material sciences, complex-network optimisation, information storage, artificial intelligence, sensing, weather or stock market forecasts, or metrology.

The programme combines advanced microscopies and spectroscopies with atomic resolution -essential to characterize matter at the nanoscale- with multi-scale theoretical modelling to design, synthesize and characterize quantum materials. With our expertise in scanning probe microscopies we visualize exotic quantum states and build a theoretical framework to correlate structural properties and quantum behaviour. This enable us to design materials ad-hoc, optimized for specific functionality. In-house access to nanofabrication tools will empower us to manufacture devices exploiting these quantum phenomena.

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. This programme is in close collaboration with research programmes P1 and P4.



Scanning Probe Microscopies and Surfaces

Webpage: <http://nanociencia.imdea.org/rodolfomiranda/index.php/en>



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Associate Research
Professor

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Double Affiliation: Universidad
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Researcher ID:
7102041777

EMERITUS

Prof. Juan M. Rojo
Universidad Complutense de
Madrid, Spain

RESEARCHER

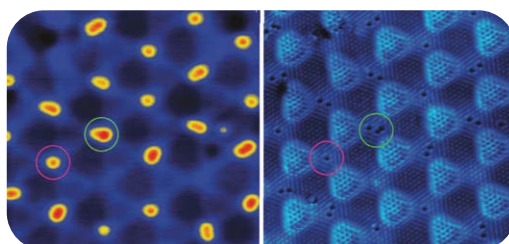
**Dr. Jaime
Sanchez-Barriga**
Helmholtz-Zentrum Berlin
(HZB), Germany

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.





Theoretical Modelling

Webpage: <http://www.imdeananociencia.org/graphene/group-home>



Prof. Francisco Guinea

Senior Research Prof.

PhD: Universidad Autónoma de Madrid

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

Researcher ID:
A-7122-2008

POSTDOCS

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KTH Royal Institute of Technology, Stockholm, Sweden

Dr. Pierre A. Pantaleón

University of Manchester, UK

Dr. Adrián Ceferino

University of Manchester, Great Britain

Dr. Zhan Zhen

Wuhan University, China

PhD STUDENTS

Alejandro Jimeno

Héctor Sainz

VISITORS

Ziyan Li

Wuhan University

Min Long

Wuhan University

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.

Quantum Devices and Photonics

Webpage: <http://www.nanoscience.imdea.org/quantum-nanodevices/group-home>



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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Researcher ID:
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Scopus Author ID:
55911667100

POSTDOC

Dr. Jorge Trasobares
National University of Singapore

PhD STUDENTS

Julia García

Cristina García
(co-supervised with Dr. Ramón Bernardo)

Gabriel Caballero
(co-supervised with Dr. Mariela Menghini)

RESEARCH ASSISTANT

Juan Anastasio Martín

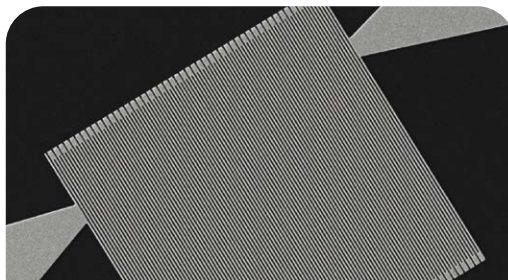
TECHNICIAN

Patricia Cancho

Superconducting nanowire single-photon detector made of NbTiN manufactured at IMDEA-Nanociencia quantum nanodevices group in collaboration with the Superconducting technologies group of the CAB

Research lines

The information society is experiencing a global challenge, with the amount of information to be stored, transmitted or processed growing continuously every year. Quantum technologies are expected to become crucial to address this challenge, with the second quantum revolution blasting off. The Quantum nano-Devices Group (QnDG) was created in 2015 with the purpose of contributing to this revolution. It 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) and physically unclonable functions (PUFs). The Quantum Nano Devices Group also collaborates tightly with the Centre of Astrobiology (CAB-INTA-CSIC) in the development of Kinetic Inductance Superconducting Detectors (KIDs) for space exploration. KIDs are expected to become the next generation technologies for the forthcoming missions in the GHz to THz bands. Recently (2018) we have also started working together on the development of hybrid superconducting devices for quantum technologies mixing traditional superconductors with low dimensional quantum confined materials. The group has a long tradition on the development of novel micro and nanofabrication techniques, with emphasis on the tailoring and engineering of low dimensional material via direct nano-patterning methods.





Nanoarchitectures at Surfaces

Webpage: <https://nanociencia.imdea.org/nanoarchitectonics-on-surfaces/group-home>



Dr. David Écija
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Previous Position: Technical University of Munich, Germany

Researcher ID:
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<http://ecijalab.com>

RESEARCHERS

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Universidade Federal de Minas Gerais, Brazil

Dr. Koen Lauwaet
Researcher
ICMM-CSIC, Spain

POSTDOCS

Dr. Ana Isabel Barragán
Centro de Física de Materiales, CFM / Donostia, Spain

Dr. María Tenorio
ICN2, Spain

Dr. Aurelio Gallardo
Czech Academy of Sciences, Prague, Czech Republic

Dr. Kalyan Biswas
IMDEA Nanociencia, Spain

PhD STUDENTS

Kotapalayam Mathialagan Shanmugasibi

Elena Pérez Elvira
(co-supervised with Dr. J.I. Urgel)

Lenka Cerna

VISITOR

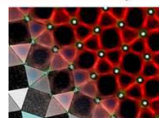
Dr. José María Gallego
ICMM-CSIC, Spain

Research lines

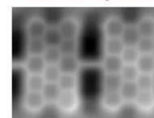
Our group is focused on the design of organic products and nanomaterials on surfaces, including three main lines of research:

- 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.** We focus on the design of unprecedented organic complexes and nanomaterials, paving the way for modern organic optoelectronics, nanomagnetism and non-trivial quantum phases of matter.
- 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.

Coordination chemistry on surfaces



On-surface synthesis



Chemistry at Surfaces



On-surface model oxide catalysts





Spin-Polarized low T STM

Webpage: <http://www.imdeananociencia.org/nanoscale-imaging-of-2d-materials/group-home>



Dr. Fabián Calleja
Assistant Research Prof.

PhD: Universidad Autónoma de Madrid, Spain

Previous Position: Ecole Polytechnique Federale de Lausanne (EPFL), Switzerland

Researcher ID:
I-7964-2012

PhD STUDENT

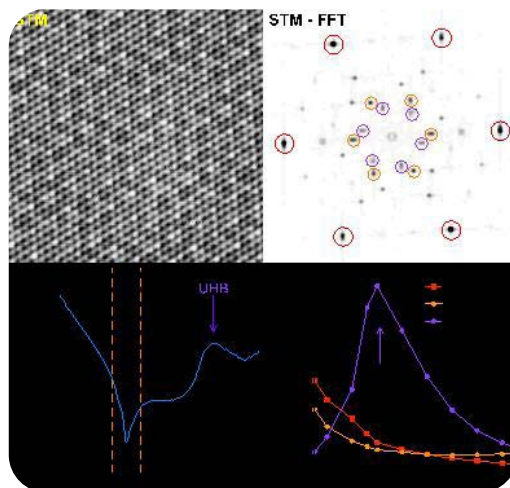
Ivan Martínez

(co-supervised with
Dr. A. L.Vazquez de Parga)

Research lines

1. Electronic and magnetic properties of graphene-based systems at the atomic level.
2. Modification, functionalization and development of chemical reactions on graphene.
3. Electronic correlation effects on transition metal dichalcogenide 2D systems.

The transparency effect in 1H/1T TaS₂, by which the charge density wave (CDW) of the underlying 1T layer appears overimposed on the 1H surface, has intrigued the scientific community since it was first reported in the 90s. In this work we quantify this effect by following the relative intensities of both CDWs (2H in orange and 1T in purple) as a function of the STM bias voltage and we trace back its origin to the upper Hubbard band (UHB) of the underlying 1T layer.





Topological Surface States in Quantum Materials

Webpage: <http://nanociencia.imdea.org/nanoscale-imaging-of-2d-materials/group-home>



Dr. Manuela Garnica

Assistant Research Prof.
(tenure track)

PhD: Universidad Autónoma
de Madrid, Spain

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University of Munich, Germany

ORCID:

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Researcher ID:

AAG-8254-2019

PHD STUDENTS

Joan Ripoll

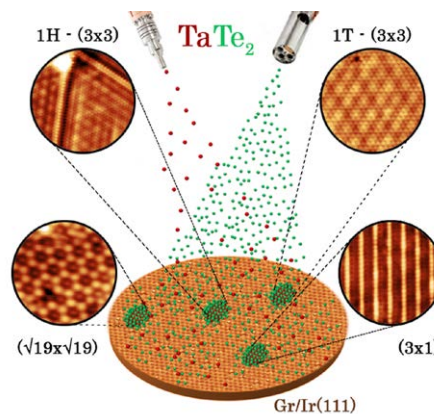
Alireza Amiri

Research lines

Our research interests deal with quantum materials and new topological states of matter. In recent years, quantum materials have attracted a wide range of attention not only for the possibility to study many aspects of fundamental physics but also because of their potential applications.

- Epitaxial growth of 2D quantum materials
- Phase engineering of transition metal dichalcogenides (TMDs)
- Correlation of the crystalline, electronic and topological structure of quantum materials at atomic scale to macroscopic properties

I. Di Bernardo*, J. Ripoll-Sau, J.A. Silva-Guillén, F. Calleja, C.G. Ayani, R. Miranda, E. Canadell, M. Garnica*, A. L. Vázquez de Parga. **Metastable Polymorphic Phases in Monolayer TaTe₂**. *Small*, 19, 2300262. (2023) (<https://doi.org/10.1002/sml.202300262>)





On-surface Synthesis of Carbon-based Nanostructures

Webpage: <https://www.imdeananociencia.org/home-en/people/item/urgel-tendero>



Prof. José Ignacio Urgel Tendero

Assistant Research Prof.
(tenure track)

PhD: PhD: Technical University of Munich (TUM), Germany

Previous Position: Swiss Federal Laboratories for Materials Science and Technology, Switzerland

ORCID:
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POSTDOCS

Dr. Ana Isabel Barragán

Centro de Física de Materiales, CFM / Donostia, Spain

Dr. Kalyan Biswas

IMDEA Nanociencia, Spain

Dr. Aurelio Gallardo

Czech Academy of Sciences, Prague, Czech Republic

PhD STUDENTS:

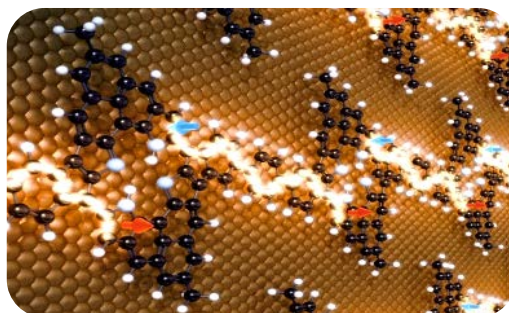
Elena Pérez Elvira

(co-supervised with Dr. David Écija)

Research lines

Our lab is focused in the on-surface synthesis of atomically precise synthetic carbon-based nanostructures (SCNs). More specifically, the investigation of novel nanographenes (NGs) and covalently linked organic polymers (CPs), with prospects in organic electronics. The fabrication and characterization of such SCNs on surfaces, often hampered under conventional solution chemistry due to their low solubility and high reactivity, provide a novel route to study their unique structural, electronic and magnetic properties, enabling completely new functionalities.

1. On-surface synthesis of carbon-based nanostructures on metal substrates. Study of the chemical stability and the transfer of such SCNs from the necessary metallic substrate to a technologically relevant one.
2. Light-induced chemical reactions on decoupling layers.
3. On-surface synthesis of carbon-based nanostructures on oxide substrates.





Applied Nanoelectronics

Webpage: <https://nanociencia.imdea.org/quantum-nanodevices/group-home>



Prof. Ramón Bernardo

Assistant Research Prof.
(tenure track)

PhD: Universidad Autónoma
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Previous Position: Lancaster
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ORCID:
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<https://rbgavito.tech/>

PHD STUDENTS

Cristina García

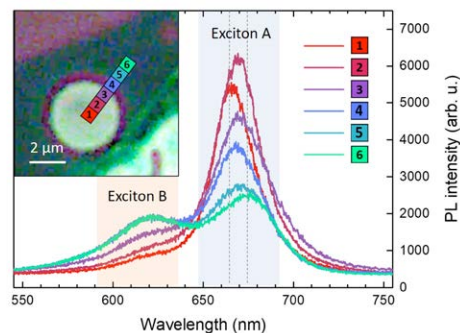
(co-supervised with
Dr. D. Daniel Granados)

Julieta Baciredo

(co-supervised with
Dr. M. Milagros Castellanos)

Research lines

1. We are focused on the development of practical electronic and optical devices by exploring new routes to exploit physical phenomena traditionally difficult to harness.
2. Physical cryptoprimitives from non-linear electronic devices. Information security is crucial in an interconnected society. We are developing cryptographic primitives based on the atomic imperfections in the interfaces of semiconductor devices for unique identification in local and network authentication schemes.
3. Lateral two-dimensional and hybrid devices. We are working on band-gap engineering via high-vacuum chemical etching of two dimensional materials to fabricate in-plane junction field effect transistors and designing hybrid tunneling devices combining 2D semiconductors with the quantum confined electronic structures of colloidal nanocrystals.
4. Two-dimensional optomechanical resonators. We are fabricating single- and few-layer electro-mechanical resonators from two-dimensional semiconductors to obtain tunable and spatially modulated light emitters.





Topological Surface States in Quantum Materials

Webpage: <https://nanociencia.imdea.org/first-principles-modelling-for-quantum-materials/home>



Dr. José Ángel Silva Guillén

Assistant Research Prof.
(Tenure track).

PhD: Universitat
Autònoma de Barcelona, Spain.

Previous position: Wuhan
University, China.

ORCID:
ORCID: 0000-0002-0483-5334

Researcher ID:
J-8636-2017

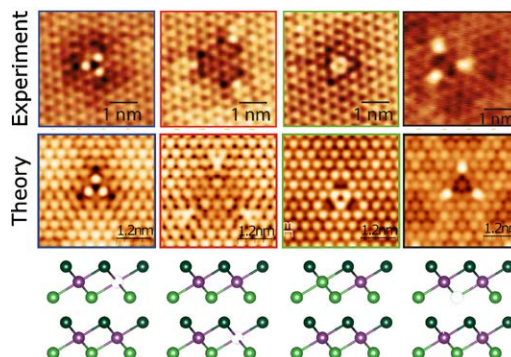
PHD STUDENT
Guillermo Parra

RESEARCH ASSISTANT
Long Min

Research lines

We are interested in the electronic properties of different two-dimensional materials. Our goal is to understand their structural and electronic properties from a fundamental point of view so we can tune those properties in a desired way by applying different stimuli to the materials, for example, by changing the number of layers, applying strain or twist. To achieve this, we mainly use first-principles calculations. We also work closely with experimental colleagues.

Defects on the 1T-PtTe₂ surface. Top row: Experimental STM images of different defects found in the sample. Middle row: Simulated STM images for a Pt vacancy in the first layer, a Pt vacancy in the second layer, a substitutional Te of a Pt of the first layer and a Te bottom vacancy in the first layer. Bottom row: Model of the identified defects.





Imaging of 2D Materials

Webpage: <http://www.imdeananociencia.org/nanoscale-imaging-of-2d-materials/group-home>



Prof. Amadeo L. Vázquez de Parga
Associate Research Prof.

PhD: Universidad Autónoma de Madrid, Spain

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Researcher ID:
L-2418-2013

POSTDOCS

Dr. Marc G. Cuxart

Technical University of Munich, Germany

Dr. Iolanda di Bernardo

Monash University, Australia

PHD STUDENT

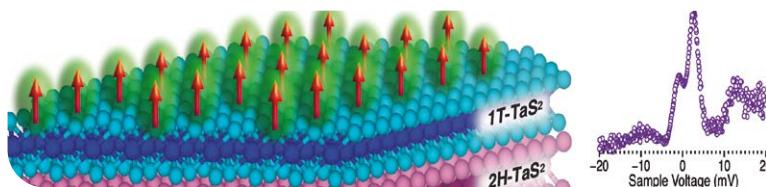
Iván Martínez

(co-supervised with Dr. F. Calleja)

Research lines

1. Electronic structure of 2D materials.
2. Chemical functionalization of 2D materials.
3. Highly correlated electrons.
4. Superconductivity in low dimensions

A 2D Kondo lattice is detected in a 1T/2H-TaS₂ polymorphic heterostructure by means of low temperature STM-STS. The resulting quantum-coherent electronic state is demonstrated by the appearance of a gap-like structure within a Kondo resonance below a characteristic temperature lower than the Kondo temperature of the system.





Photonic STM

Webpage: <http://www.imdeananociencia.org/home-en/people/item/roberto-otero-martin>



Prof. Roberto Otero
Associate Research Prof.

PhD: Universidad Autónoma de Madrid, Spain

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Researcher ID:
E-4516-2011

POSTDOC

Dr. Alberto Martín

Max Planck Institute for Solid State Research in Stuttgart, Germany

PhD STUDENT

David Mateos

Miguel Varea

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:

1. 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.
2. 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.
3. 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.



Transport in 2D Systems

Webpage: <http://www.imdeananociencia.org/home-en/people/item/jose-luis-vicent-lopez>



Prof. José Luis Vicent
Associate Research Prof.

Double Affiliation: Universidad Complutense de Madrid

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Researcher ID:
7006735519

ASSOCIATED RESEARCHERS

Prof. Elvira M. González

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Dr. Alicia Gómez

PhD: Universidad Complutense de Madrid
Double Affiliation: CSIC-INTA, Torrejón de Ardoz

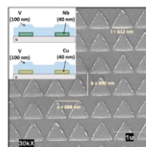
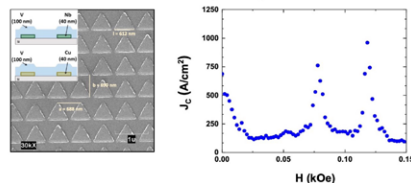
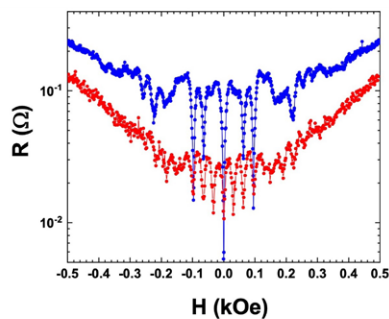
Dr. Álvaro Muñoz

PhD: Universidad Autónoma de Madrid, Spain
Double Affiliation: Universidad Complutense de Madrid
ORCID: 0000-0003-3236-5509

Research lines

1. Nanostructured superconductor-ferromagnetic hybrid systems and superconductor-2D heterostructures.
2. Quantum Hall effect in graphene-based devices and resistive switching phenomena in 2D materials.
3. Metal-insulator transition in strongly correlated materials.

Vortex dynamics controlled by local superconducting enhancement; *New J. Phys.* 21, 113059 (2019); <https://doi.org/10.1088/1367-2630/ab5994>; Open Access



Thermopower at the Nanoscale

Webpage: <http://www.nanociencia.imdea.org/home-en/people/item/nicolas-agrait-de-la-puente>



Prof. Nicolás Agrait
Associate Research Prof.

PhD: UNED, Spain

Double Affiliation: Universidad
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ORCID ID:
0000-0001-8177-7919

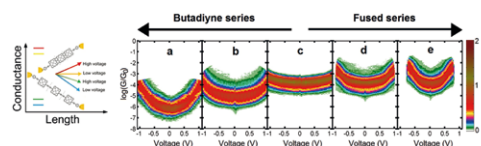
Researcher ID:
I-2207-2012

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:

1. Electrical properties of organic molecule families: oligo(phenyl ethynylene)s, oligoynes, phthalocyanines, porphyrins... (*JACS* **2013**, *JACS* **2014**, *JACS* **2015**, *JACS* **2018**).
2. 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**).
3. 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**).
4. Graphene-like molecules containing non-hexagonal rings (*Chem. Sci.* **2017**).
5. Other electrode materials different from gold.





Theoretical Study of Molecules on Surfaces

Webpage: <http://www.imdeananociencia.org/home-en/people/item/manuel-alcami-pertejo>



Prof. Manuel Alcamí
Associate Research Prof.

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.

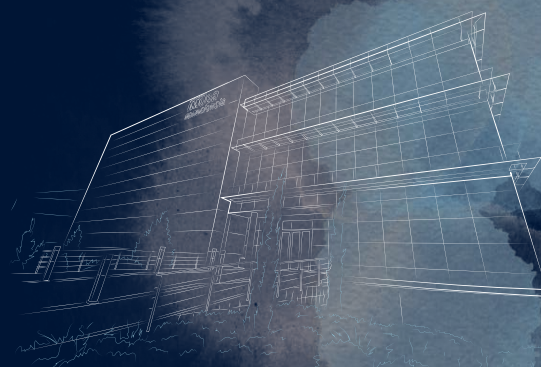
His current research lines are:

1. 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.
2. 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.
3. 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.

P3

programme

Nanotechnology for Health-care



Programme Manager: Prof. Rodolfo Miranda

Research lines

**Nucleic Acids
and Nanoparticles
in Nanomedicine**

Prof. Álvaro Somoza

**Advanced Fluorescence
Nanoscopy**

Dr. Cristina Flors

**Molecular Motors
Manipulation Lab**

Dr. Borja Ibarra

Metallodrugs

Dr. Ana Pizarro

Magnetic Nanoparticles

Dr. Gorka Salas

Neural Interfaces

Dr. M^a Teresa González

**Mechanical Properties
of Biostructures**

Dr. Johann Mertens

**Intracellular Temperature
Measurements**

Dr. S. Thompson

**Biosensors
in Neuroscience**

Dr. Valle Palomo

**Nanobiosystems for
Diagnosis and Treatment**

Dr. Milagros Castellanos

Protein Engineering

Dr. Begoña Sot

**Magnetic Nanoparticles
in Biomedicine.
Cell-particle Interactions**

Prof. Ángeles Villanueva



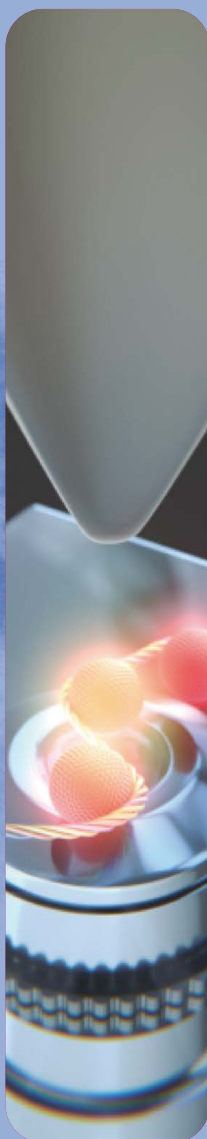
About the programme

This programme is focused on the development of novel nanotechnologies for medical applications on three different areas: NanoOncology (Translational developments for cancer treatment and diagnosis), NanoDiagnosis (development of new colorimetric tests for biological threats), and NanoNeurology (Nanotech-based developments for neurodegenerative diseases). The programme is highly multi- and interdisciplinary character, combining the concerted effort of biologists, chemists, physicists and medical doctors pursuing a common objective, which is only possible in few places worldwide, among them IMDEA Nano. We build on the translational aspects of some of our technologies to bring them closer to the clinic with the aim for better, more efficient, and cost-effective therapeutic and diagnostic tools. The programme is in close collaboration with research programmes P1 and P4.

One of the important areas is the preparation and use of multifunctional nanoparticles (NPs) in Oncology, in particular for cancer treatment and diagnosis. Magnetic NPs selectively target tumours for multimodal treatment as drug nanocarriers and heating inductors. In search of efficiency in the fight against cancer, the need to reduce toxic side effects associated with cancer therapies is investigated by 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.

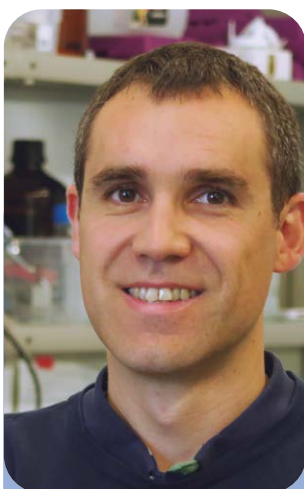
The generation of sensors based on nanoparticles for detection of targets of medical interest aims to exploit the higher sensitivity and specificity of nanostructure-based diagnostics platforms for Biological Threats (including emergent viruses). One example is the use of nucleic acid conjugated gold nanoparticles to detect different biomarkers involved in diseases such as uveal melanoma, pancreatic cancer, Duchenne muscular dystrophy, and virus SARS COV-2. Another area of interest is the use of nanotechnology-based solutions to the growing problem of antibiotic-resistant bacteria. Nanostructures and NPs 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.

NanoNeurology investigations face the challenges related to neurological disorders from two fundamental complementary approaches: pharmacological and technological, with a special focus on the advantages of nanoscopic systems and nanodevice fabrication in the search for solutions that help understand, alleviate and/or prevent these disorders. The activities are basis on the development of sensors for the precise measurement of pharmacological action of tailored multi-target compounds as well as on the development of neural interfaces based on nanotechnology that allow monitoring and stimulating the activity of the nervous tissue. We focus in particular on neurodegenerative diseases, which are increasingly prevalent in developed countries due to increased life expectancy.



Nucleic Acids and Nanoparticles in Nanomedicine

Webpage: <https://nanociencia.imdea.org/nanobiotechnology/group-home>



Prof. Álvaro Somoza
Senior Research Prof.

PhD: Universidad Autónoma de Madrid, Spain

Previous Position: Instituto de Investigación Biomédica Barcelona (IRB Barcelona), Barcelona, Spain

Orcid
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POSTDOC

Dr. Luis Alberto Campos
CNB-CSIC, Spain

Dr. Mario Martínez
Universidad Autónoma de Madrid, Spain

Dr. Nuria Lafuente
IMDEA Nanociencia, Spain

Dr. Paula Milán
IMDEA Nanociencia, Spain

Dr. Demian Pardo
IMDEA Nanociencia, Spain

PHD STUDENTS

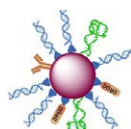
Catarina Castanheira
Irene Pardo
Sergio Ruiz

RESEARCH ASSISTANTS

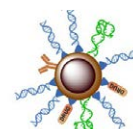
Irene de la Iglesia
Eva Mar López
Guillermo Gutiérrez

Research lines

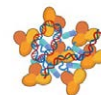
Our research group employs modified oligonucleotides and drugs to develop nanostructures for pancreatic cancer, uveal melanoma, COVID-19, and Duchenne muscular dystrophy. We utilize nanoparticles like albumin, gold, and iron oxide for therapeutic and diagnostic purposes. Oligonucleotides are designed to mimic or inhibit mRNA, miRNAs, and lncRNAs, to reprogram the target cells. These molecules are conjugated to nanoparticles using cleavage linkers to better control their release. Our interdisciplinary approach aims to personalize medicine and advance precise therapeutics and diagnostics.



NON
TOXIC



EASY
SYNTHESIS



EASY
FUNCTIONALIZATION

Temperatura de los lisosomas para el diagnóstico y tratamiento del cáncer.



Advanced Fluorescence Nanoscopy

Webpage: <https://nanociencia.imdea.org/advanced-fluorescence-nanoscopy/group-home>



Prof. Cristina Flors
Senior Research Prof.

PhD: Institut Quimic de Sarria,
Spain

Previous Position: University
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Researcher ID:
C-2123-2017

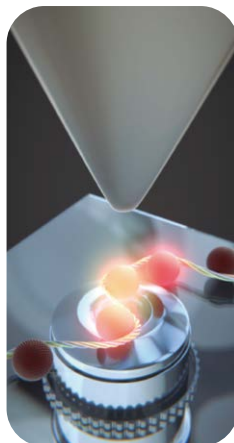
<https://imdeananotools.wixsite.com/flors>

POSTDOCS

Dr. Felipe Viela
UC Lovain, Belgium
(co-supervised with
Dr. A. Pizarro)

PhD STUDENTS

Ingrid Ortega
Alexandru Hrehoret
Mar Alcaraz



Research lines

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

1. Novel methods for super-resolution fluorescence 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. Currently, we use correlative super-resolution fluorescence imaging and atomic force microscopy (AFM) to develop and validate novel labelling methods in super-resolution microscopy, most recently for amyloids.

2. Single-cell real-time imaging of bacterial death processes:

We are also interested in using advanced microscopy to study bacterial death processes at the single-cell level and with temporal resolution. We have developed labelling strategies to follow the effects of antimicrobial treatments in bacteria in real-time. Moreover, using combined fluorescence and AFM, we have studied mechanically-induced bacterial death, which is relevant in the context of mechano-bactericidal nanomaterials, and quantified the forces involved in this process. The mechanistic understanding provided by these advanced microscopy methods may help in the design and implementation of improved bactericidal strategies.



Molecular Motors Nanomanipulation Lab

Webpage: <https://nanociencia.imdea.org/molecular-motors-manipulations-lab/group-home>



Dr. Borja Ibarra
Assistant Research Prof.

PhD: Universidad Autónoma Madrid

Previous Position: UC Berkeley, USA

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Researcher ID:
H-5840-2015

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ASSOCIATE RESEARCHER

Dr. Francisco Javier Cao

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PHD STUDENTS

Ismael Plaza

María Ortiz

RESEARCH ASSISTANT

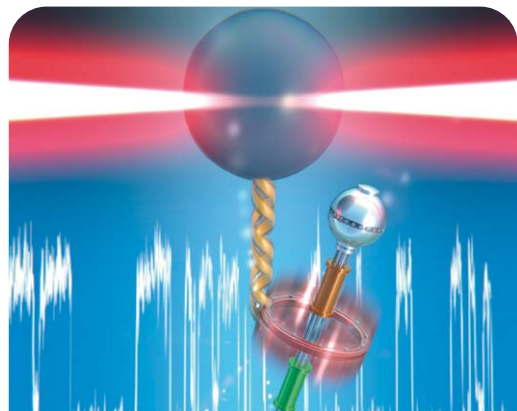
Elías Faro

Beatriz de Vicente

Lyra Zumeta

Research lines

- 1. Biological machinery involved in nucleic acids metabolism.** We are measuring the operational dynamics of the biological machinery involved in: i) mitochondrial DNA replication (*NAR* 2020; *NAR* 2019; *NAR* 2017) and ii) transcription of Influenza A viral genome.
- 2. Cell membrane nanomechanics.** We have developed a single-molecule method to measure the dynamics of motor proteins involved in remodeling of cell membranes (*Nature Comms* 2019).
- 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 (*Nature Comms* 2018).
- 4. Technology development.** We are working to combine optical manipulation with RAMAN (TERS). This exciting marriage of techniques will open up a wealth of new promising applications.





Metallodrugs

Webpage: <http://nanociencia.imdea.org/metallodrugs-to-modulate-cancer-cell-machinery/group-home>



Dr. Ana M. Pizarro
Assistant Research Prof.

PhD: Universidad Autónoma de Madrid, Spain

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ORCID:
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Researcher ID:
L-8348-2014

POSTDOC

Dr. Felipe Viela
UC Lovain, Belgium
(co-supervised with Dr. C. Flors)

PhD STUDENTS

Arturo Villechenous
Claudia Pierina Cardozo
Alejandro Martín Hoyas

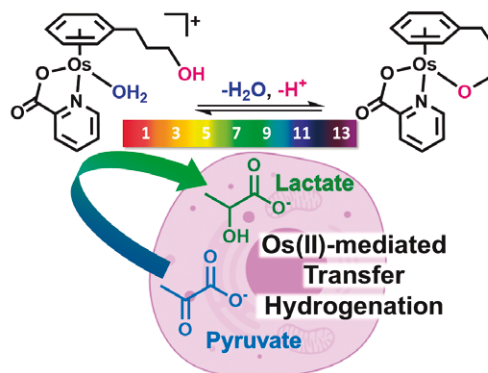
TECHNICIANS

Catarina Leis
Sergio Millán
Ainhoa González

Research lines

1. Exploit metal coordination and organometallic chemistry principles to design potent metallodrugs.
2. Organometallic and coordination chemistry inside the human cell.
3. Transition metal chemistry to interfere mitochondrial function.
4. Nanoimaging of location and chemical reactivity of metallodrugs inside cells.

Metallodrug aqueous-speciation drives the chemistry of transition metals inside the cancer cell. Osmium(II) complexes bearing labile ligands are prone to produce inert species due to the high acidity of the resulting Os-aqua adducts. Furnishing the complexes with a tethered alcohol group inhibits the formation of inert species, resulting in Os-complexes unexpectedly reactive in water, and strikingly, also inside the tumour cell. See: **Osmium(II) Tethered Half-Sandwich Complexes: pH-dependent Aqueous Speciation and Transfer Hydrogenation in Cells.** *Chem. Sci.* **2021**, *12*, 9287–9297.



Magnetic Nanoparticles

Webpage: <http://www.imdeananociencia.org/magnetic-nanoparticles/group-home>



Dr. Gorka Salas
Assistant Research Prof.

PhD: Universidad de Valladolid, Spain
Previous Position: CNRS, France

ORCID:
0000-0002-1196-8813
Researcher ID:
F-6503-2011

POSTDOC

Dr. Ana Rodríguez
IDIVAL, Instituto de Investigación Valdecilla, Spain

RESEARCH ASSISTANTS

Nadia Pastor
Lucía María Pardinás

TECHNICIAN

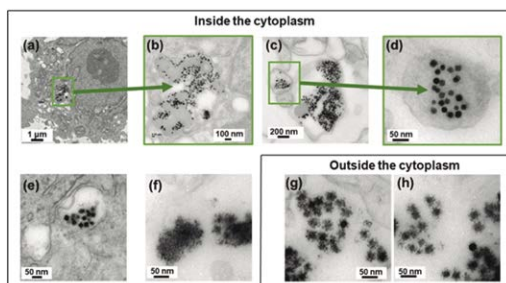
Monica Dhanjani

Research lines

Our research deals with the preparation of magnetic hybrid nanostructures for biomedicine and other technologically relevant applications. Magnetic nanoparticles can be used for medical imaging and treatment of different diseases. Many intrinsic and extrinsic factors (e. g. size, crystallinity, magnetism, aggregation, colloidal stability, dispersion medium, applied field, interactions with biological media) can influence the efficiency of nanoparticles and they can be designed to respond to different stimuli.

Stimuli-responsive nanomaterials are very attractive for biomedical applications. They can be activated through external stimuli or by the physico-chemical conditions present in cells or tissues. Iron oxide-manganese oxide core-satellite shell nanostructures that change their contrast mode in magnetic resonance imaging (MRI) from T2 to T1, after being internalized by cells. This occurs by the dissolution of the MnO₂ of the shell, preserving intact the iron oxide at the core.

García-Soriano, D. et al. *J. Colloid Interface Sci.* **2022**, 613, -460. <https://doi.org/10.1016/j.jcis.2022.01.070>





Neural Interfaces

Webpage: <http://nanociencia.imdea.org/molecular-electronics-laboratory/group-home>



Dr. M. Teresa González
Assistant Research Prof.

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Previous position: Basel University

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Researcher ID:
H-5527-2012

POSTDOC

Dr. Beatriz Rodilla
IMDEA Nanociencia

PHD STUDENTS

Noelia Rodríguez
Ana Arché
Arturo Vera
Luis Alberto Cobas
Raquel Calvo

Research lines

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

1. Electrical electrodes covered by vertical metallic nanowires:

We fabricate improved electrodes to be used for **neural electrical stimulation**. By giving nanostructure to the electrodes, we aim to achieve reduced impedance and enhanced biocompatibility.

- Using template-assisted electrochemical deposition, we explore different materials to prepare conductive electrodes covered by vertical nanowires.
- Using IMDEA-Nanociencia clean room facilities, we pattern electrode heads to prepare ready-to-use electrodes whose biocompatibility and performance can then be tested by our collaborators.

2. Sensors of neural activity based on magnetoresistive materials:

We aim to demonstrate that anisotropic magnetoresistive materials can be used to **sense neural activity** at body temperature.

- Starting from LSMO thin films grown over vicinal substrates and lithographed into Wheatstone-bridges by our colleagues at CNRS-GREYC, we characterize their detectivity at temperatures in the range of the body temperature.
- We develop a differential architecture to test the sensing ability of our devices in vitro and in vivo.



Mechanical Properties of Biostructures

Webpage: <http://www.imdeananociencia.org/home-en/people/item/johann-mertens>



Dr. Johann Mertens
Assistant Research Prof.
(tenure track)

PhD: University of Burgundy,
France

Previous Position: Madrid
Microelectronics Institute,
Spain

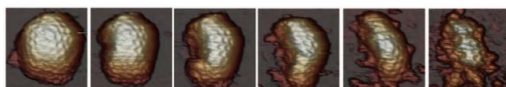
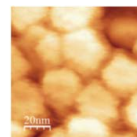
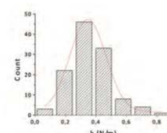
ORCID:
0000-0002-1312-8914

Researcher ID:
I-4208-2015

Research lines

The group has varied interests in the mechanical properties of macromolecular assembly of proteins.

1. We have implemented Atomic Force Microscopy (AFM) measurements in physiological conditions to study both structural and mechanical properties of individual viral particles. We have recently showed that ribonucleoprotein complexes establish strong interactions with the inner surface of the viral shell in IBDV mature virions (Scientific Reports 2015). We are also developing news tools for the combined study of the nano-mechanical properties of biomolecules using atomic force microscopy and spectroscopy.
2. We use microcantilevers as tools in biomedical applications of biosensor technology or molecular biophysics. In relation with our previous work in the field, we are developing a line related to protein and DNA biosensors as well as the study of mechanical properties 2D-systems (Nature Nanotechnology 2008, Nanotechnology 2012).





Intracellular Temperature Measurements



Dr. Sebastian A. Thompson
Assistant Research Prof.
(tenure track)

PhD: City University of New York,
USA

Previous Position: Marie
Curie Fellow, CNC, Coimbra,
Portugal

ORCID:
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Scopus Author ID:
55937663100

Researcher ID:
P-4606-2017

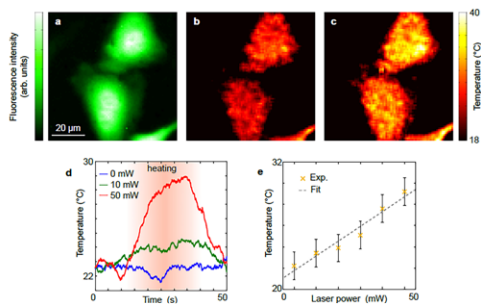
www.thompson-lab.net

RESEARCH ASSISTANT
Cristina Sánchez

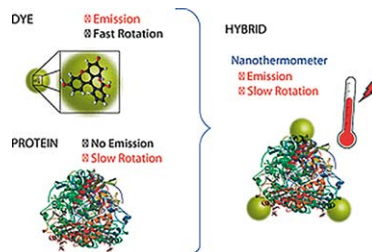
Research lines

1. Intracellular temperature measurements for cancer theranostics.
2. Next-generation of nanothermometers.
3. Photothermal & Photodynamic therapies.

Mapping Intracellular Temperature Using Green Fluorescent Protein Nano Letters. *American Chemical Society*, 2012, 12, pp.2107 - 2111.



Plug and play anisotropy-based nanothermometers. *ACS Photonics* 2018, 5, 7, 2676–2681.



Biosensors in Neuroscience

Webpage: <https://nanociencia.imdea.org/research/research-programs>



Dr. Valle Palomo

Assistant Research Prof.
(tenure track)

Previous position: Centro de
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Margarita Salas CSIC

ORCID:

0000-0002-1473-4086

Researcher ID:

N-2932-2016

PhD STUDENTS

Carlota Tosat
Rebeca París
Paula Fernández
Carmen Pérez
Alejandro Bueso
Marion Le Meur

Research lines

Our lab is focused in discovering new drugs for neurodegenerative diseases and unveil their mechanism of action and potential in modifying or reversing the progression of the pathology. We focus in three different research lines:

- **Quantum Dots for the Understanding of Neurodegenerative Diseases.** We are working in establishing a semiconductor Quantum Dot (QD) platform to study neurodegenerative diseases in human models. We work with conjugates of QD and monoclonal antibodies and with dynamic sensor to monitor key enzymes in living cells.
- **Design and Discovery of New Drugs for Neurodegenerative Diseases.** We use the combination of biosensors and nanotechnological tools to select and optimize drug candidates, or to select drugs with fewer neurological side effects. We also develop multitarget compounds with synergistic activities towards the treatment of these diseases.
- **Study of extracellular vesicles and their role in disease.** We characterize the extracellular vesicles of our human models of disease and develop tools to phenotype them and quantify their molecular cargo.

From Kinase Inhibitors to Multitarget Ligands as Powerful Drug Leads for Alzheimer's Disease using Protein-Templated Synthesis. Nozal V, García-Rubia A, Cuevas EP, Pérez C, Tosat-Bitrián C, Bartolomé F, Carro E, Ramírez D, Palomo V*, Martínez A*. *Angew Chem Int Ed Engl.* **2021**, 60, 19344-19354.

CdSe Quantum Dots in Human Models Derived from ALS Patients: Characterization, Nuclear Penetration Studies and Multiplexing. Tosat-Bitrián C, Avis-Bodas A, Porras G, Borrego-Hernández D, García-Redondo A, Martín-Quero A, Palomo V. *Nanomaterials* **2021**, 11, 671



Nanobiosystems for Diagnosis and Treatment

Webpage: <https://nanociencia.imdea.org/Nanobiosystems-for-Diagnosis-and-Treatment/home>



Milagros Castellanos

Assistant Researcher
(tenure track)

PhD: Universidad Autónoma
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Previous position: IMDEA
Nanociencia

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PhD STUDENTS

Julieta L. Baciredo

(co-supervised with
Dr. R. Bernardo)

Guillermo González

Research lines

In our group, we use a multidisciplinary approach, combining molecular tools, nanotechnology, and biophysics. Collaborating with academia and hospitals, we develop innovative diagnostic and treatment strategies based on nanotechnology.

In our group, we have diverse interests, but these are the two main lines of research:

1. **Development of novel nanostructures for targeted delivery of immunotherapeutic microRNAs to T lymphocytes.** This project aims to develop nanoformulations that enhance immunity in diseases where the immune system is compromised (e.g. cancer or infections), evaluating their effectiveness in pre-clinical mouse models.
2. **Development of new methodologies based on SPR for the detection of High-risk HPV in liquid biopsies.** Currently, there are no early-detection methods for HPV-related head and neck cancers, often diagnosed at advanced stages. We propose a non-invasive, real-time detection test using HPV-DNA and specific oncoproteins in saliva and plasma, validated with clinical samples.



Protein Engineering

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



Dr. Begoña Sot
Associate Researcher

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Double Affiliation: CIEMAT, Madrid, Spain

Researcher ID:
H-2882-2015

POSTDOC

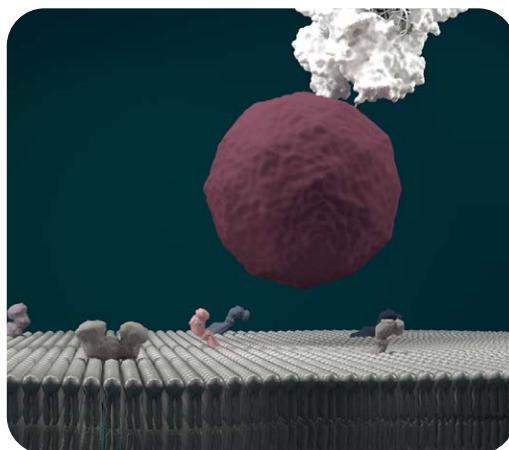
Dr. Hernán Alarcón
Universidad Autónoma de Madrid, Spain

PhD STUDENT

Carmen Escalona
María López Valls

Research lines

1. The design of new strategies for an efficient delivery of CRISPR proteins. CRISPR/Cas system is a promising therapeutic tool. But its efficient delivery is a bottle neck of this strategy. We combine protein engineering and nanotechnology to deliver CRISPR proteins (Cpf1, Cas9 or Cas13) to specific tissues.
2. Antibacterial activity of Ag-Fe inorganic nanoparticles. The bacterial antibiotic resistance makes essential the design of new bactericides.
3. Characterization of α -synuclein amyloid assembly, responsible of Parkinson's Disease.





Magnetic Nanoparticles In Biomedicine. Cell-Particle Interactions

Webpage: <http://www.imdeananociencia.org/home-en/people/item/angeles-villanueva>



Prof. Ángeles Villanueva

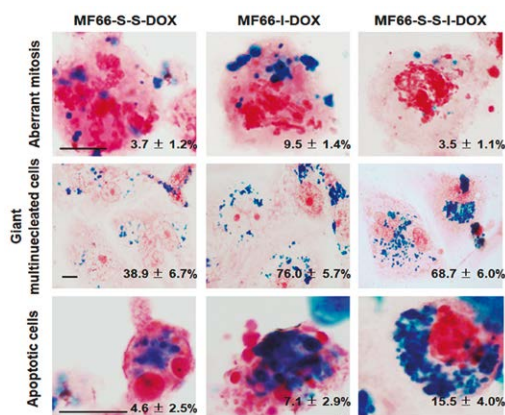
Associate Research Prof.

PhD: Universidad Autónoma
de Madrid, Spain

Double Affiliation: Universidad
Autónoma de Madrid, Spain

Research lines

1. Medical applications of nanoparticles. Cell cultures.
2. Biocompatibility of magnetic nanoparticles.
3. Mechanisms of cell death.
4. Alterations in adhesion and cytoskeletal proteins.
5. Liposomal drug delivery.
6. Evaluation in cell cultures and in vivo experimental models of new antitumor agents.
7. Signaling pathways involved in cell death.



Efficient uptake and morphological effects in MDA-MB-231 cells analysed by Prussian blue staining. Scale bar: 10 μ m. Percentages included are the mitosis, number of giant multinucleated cells or apoptosis over the total number of cells. *Tailored Functionalized Magnetic Nanoparticles to Target Breast Cancer Cells Including Cancer Stem-Like Cells*. *Cancers* 2020, 12(6), 1397.

P4

programme

Nanomagnetism for Information and Communication Technologies



Programme Manager: Prof. Julio Camarero

Research lines

**Advanced
Magneto-Optics**
Prof. Julio Camarero

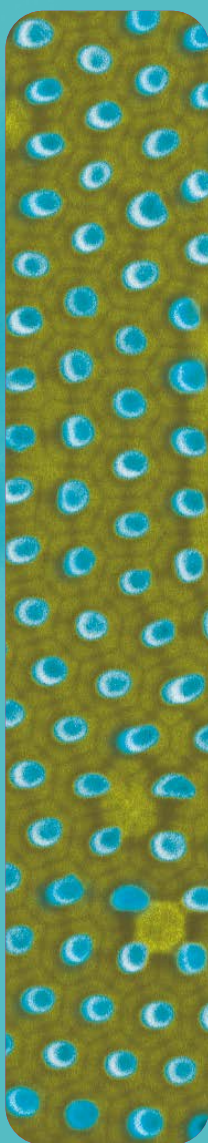
**Technological
and Biomedical
Applications of Magnetic
Nanoparticles**
Dr. Francisco Terán

SpinOrbitronics
Dr. Paolo Perna

**Transport in Quantum
Materials**
Dr. Mariela Menghini

Spin-resolved ARPES
Dr. Miguel Ángel Valbuena

3D Nanomagnetism
Dr. Lucas Pérez



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. The programme addresses important and interrelated societal challenges: a) Reducing energy consumption by exploiting spin-orbitronic systems in the information era; b) Developing efficient, spintronic-based, hardware brains, or neuro-inspired circuits; c) Developing efficient, magnetic-based, devices for bioapplications. This programme is in close collaboration with research programmes P2, P3, and P6.

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), their magnetoresistance responses, and their spin-resolved band structures (spin-ARPES). 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 materials and 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

Webpage: <http://www.nanociencia.imdea.org/research/research-programs/nanomagnetism/group-of-advanced-magneto-optics>



Prof. Julio Camarero
Associate Research Prof.

PhD: Universidad Autónoma de Madrid, Spain

Double Affiliation: Universidad Autónoma de Madrid, Spain

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EMERITUS

Prof. Antonio Hernando
Universidad Complutense de Madrid, Spain

Dr. Adrian Gudin
IMDEA Nanociencia, Spain

PHD STUDENTS

Alejandro López
Rosalía López

RESEARCH ASSISTANT

Guillermo de Arana
(co-supervised with Dr. L. Pérez)

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 magnetoresistive 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.



Technological and Biomedical Applications of Magnetic Nanoparticles

Webpage: <http://www.nanociencia.imdea.org/nanomagnetics-for-biomedical-and-tecnological-applications/group-home>



Dr. Francisco J. Terán
Assistant Research Prof.

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PHD STUDENTS

Claudia Lozano

**Shams Mohamed
Mamdouh Mohamed
Hussein**

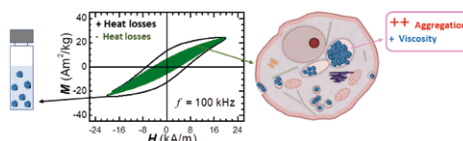
Alejandro Venegas

RESEARCH ASSISTANT

**Pablo Palacios
María Jesús Valle**

Research lines

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 losses 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.



Spinorbitronics

Webpage: <http://nanociencia.imdea.org/spinorbitronics/group-home>



Dr. Paolo Perna
Assistant Research Prof.

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Basse-Normandie, France &
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Previous Position: CNR-SPIN, Italy

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RESEARCHER

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Dr. Pablo Olleros
IMDEA Nanociencia, Spain

Dr. Adrián Gudin
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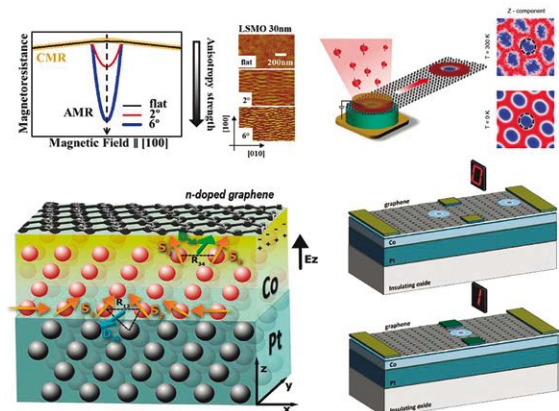
PHD STUDENT

Raúl Solís
(co-supervised with Prof Stéphane Flament de Université de Normandie ENSICAEN - GREYC UMR 6072)

Alba Guio

Research lines

1. The group explores novel concepts in spintronics based on spin-dependent transport in low dimensional magnetic materials in which spin-orbit coupling plays an important role. These include thin films and multilayer stacks, combining ferromagnetic (FM), antiferromagnetic (AFM), perovskite oxides and 2D materials.
2. We resort to epitaxial growth, surface/interface and magneto-transport (including synchrotron-based) investigations, as well as nanofabrication, to engineer, characterize and design novel architectures and merge in a single device the functionalities of their individual constituents.





Transport in Quantum Materials

Webpage: <https://nanociencia.imdea.org/transport-in-quantum-materials/home>



Dr. Mariela Menghini
Assistant Research Prof.
(tenure track)

PhD: Instituto Balseiro, Universidad Nacional de Cuyo, Argentina

Previous position: Department of Physics and Astronomy, KU Leuven, Leuven, Belgium

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ASSOCIATED RESEARCHERS

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Universidad Complutense de Madrid

Prof. Jose L. Vicent
Universidad Complutense de Madrid

Dr. Álvaro Muñoz
Universidad Complutense de Madrid

PHD STUDENTS

Ignacio Figueruelo

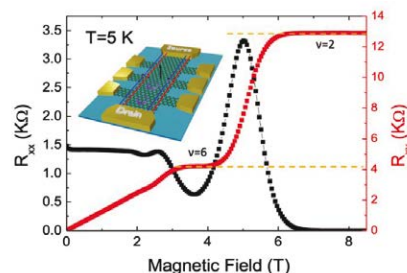
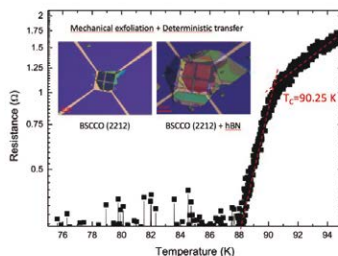
Gabriel Caballero
(cosupervised with Prof. D. Daniel Granados)

Sandra Martínez
(co-supervised with Dr. E. Cánovas)

Research lines

Quantum materials are in the spotlight of condensed matter physics research as they offer an exceptional venue to uncover the role of interactions associated with spin, charge, lattice and orbital degrees of freedom and their effect in macroscopic properties. The Transport in Quantum Materials group focuses on studying:

1. Vortex dynamics and magneto-transport in nanostructured superconductor-ferromagnetic systems.
2. Novel phenomena in superconductor-2D materials heterostructures.
3. Quantum Hall effect in graphene-based devices.
4. Memristors based on 2D materials.
5. Metal-insulator transition in strongly correlated materials using synchrotron-based techniques.





Spin-Resolved ARPES

Webpage: <https://nanociencia.imdea.org/es/spin-arpes/home>



Dr. Miguel Ángel Valbuena

Assistant Research Prof.
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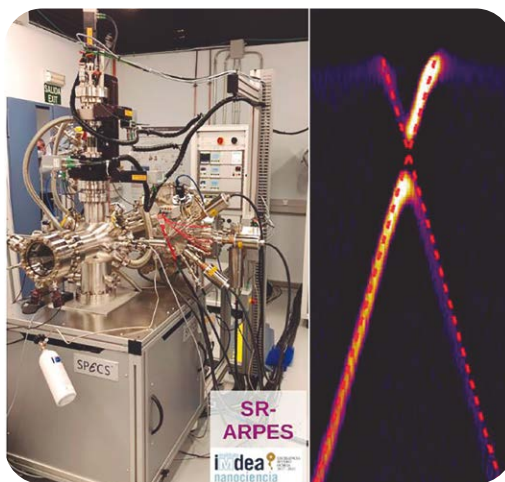
Researcher ID:
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Scopus Author ID:
12785881400

PhD STUDENT
Beatriz Muñiz

Research lines

The new Spin and Angle Resolved Photoemission Spectroscopy (SR-ARPES) setup is dedicated to the study of the electronic structure of two-dimensional materials, with special interest in the study on new emergent phenomena based on the reduced dimensionality and spin-orbit coupling which may result in exotic phases of matter as quantum topological phases. This instrument was installed and put into operation during the first semester of 2021 and it is currently operating at 100% of its capacities, being the first operative system of this kind in Spain.



SR-ARPES setup at IMDEA Nanociencia. Band-gap opening at the Dirac point of Graphene/Tellurium heterostructure.



3D Nanomagnetism

Webpage: <http://nanociencia.imdea.org/electrodeposited-nanowires/group-home>



Dr. Lucas Pérez
Associate Research Prof.

PhD: Universidad
Complutense de Madrid
Previous Position:
Paul-Drude-Institut für
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PhD STUDENT
Laura Álvaro

RESEARCH ASSISTANT
Lucía Gómez
Guillermo de Arana
(co-supervised with
Dr. J. Camarero)

Research lines

We have interests in three main research lines, mainly focused on the study of the fundamental properties and applications of electrodeposited nanowires.

- 1. Domain wall spintronics.** We study the domain wall structure and the magnetization processes of low dimensional systems – mainly cylindrical nanowires. We are interested in stabilizing domain walls in artificially created defects and in controlling the depinning of the different domain walls, induced by magnetic fields and by spin-polarized currents. Understanding the dynamics of the domain walls in individual nanowires as well as the global magnetization dynamics in arrays of nanowires would allow us to incorporate these nanostructures in spintronics devices. Part of this research is carried out in synchrotron radiation facilities.
- 2. Transport properties of Bi-based materials.** Bi-based metallic nanowires provide an attractive scenario for fundamental investigation of finite-size effects due to the unusual electronic structure of Bi and the large spin-orbit coupling of Bi atoms. We have already synthesized single-crystal Bi nanowires and reported weak antilocalization effects in the magnetotransport properties. Now, we focus our interest on the synthesis of Bi-doped metallic nanowires. This system is expected to show large spin mixing conductance, as we have already reported in thin films.
- 3. Nanowires for applications.** We prepare nanowires in solution for different applications, from chemical sensors to biomedical applications. We are also developing arrays of metallic nanowires that can be used as active part of nanostructured electrodes in neural interfaces.

P5

programme

Ultrafast phenomena at the nanoscale

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

Nanooptics
and Nanoacoustics

Prof. Reinhold Wannemacher

Nanostructured
Photovoltaics

Dr. Enrique Cánovas

Ultrafast Science
of Quantum Materials

Dr. Allan Johnson

Bio-engineered
Nanophotonics

Dr. Sara Hernández

X-ray Wave-mixing
Spectroscopies
(X-WaveS)

Dr. Cristian Svetina

Modelling Physical
Properties of
Nanostructures

Prof. Fernando Martín

Femtochemistry

Prof. Luis Bañares

Ultrafast X-ray Science

Prof. Wojciech Gawelda



About the programme

Photoinduced Exciton and Charge Transport (ET and CT) controls fundamental processes occurring in plants and bacteria, such as photosynthesis, photo-oxidation, electronic transport and molecular damage. They are also at the heart of emerging technologies, such as those based on photovoltaic and optoelectronic devices, molecular wires, molecular junctions, polymer-based transistors, photocatalysis and artificial photosynthesis, all of them the object of thorough investigations at IMDEA Nano. The common denominator for ET/CT processes is the absorption of light, which produces electron-hole pairs (or excitons) that can separate along the material, thus generating an electric current. The initial electron-hole dynamics is very fast: it occurs on a time scale ranging from hundreds of attoseconds to a few femtoseconds. At longer times, from several tens of fs to picoseconds or even nanoseconds, the coupling with nuclear motion can substantially alter the generated electric current and even suppress it due to decoherence effects.

The Programme focuses on the study of ultrafast phenomena with simultaneous high temporal and spatial resolutions. This is achieved by the combination of in-house scanning tunnelling microscopes, transient absorption set ups, and femto-chemistry using ultrashort pulses with extend theoretical tools (to interpret and guide the new experiments). Additionally, extremely intense X-ray flashes at European XFEL are used to elucidate some fundamental aspects. This programme is in close collaboration with research programmes P1,P2, and P4. Our goal is to understand the mechanisms of ET/CT and eventually control them, tracking electronic motion from the very first femtosecond to the picosecond, and this with, ideally, subfemtosecond time resolution. The access to both the nanometer length scale – small enough to see the motion of small molecules – and the femtosecond time scale – fast enough to resolve the vibration of molecular bonds- be able to watch structural changes and electronic energy shifts, as chemical reactions take place in solution or on catalytic surfaces, resulting in the long-sought 'molecular movie'.



Photophysics of Organic & Hybrid Supramolecular Nanosystems

Webpage: <http://www.nanociencia.imdea.org/photophysics-of-organic-and-hybrid-supramolecular-nanosystems/group-home>



**Prof. Johannes
Gierschner**
Senior Research Prof.

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VISITING RESEARCHER

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POSTDOC

**Dr. Indranil
Bhattacharjee**
The University of Electro-
Communications, Japan PhD

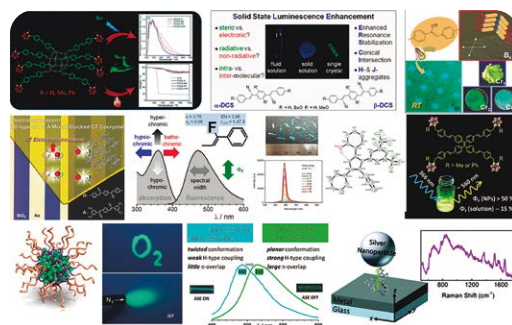
STUDENTS

Liangxuan Wang
(co-supervised with Prof.
Alfred Meixner, University of
Tübingen)

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 life 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.

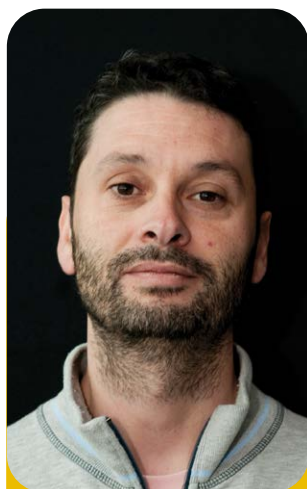
- 1. Energy Conversion:** The use of organics in solar cells and as photocatalysts for water-splitting or polymerization reactions requires a profound understanding of the generation and fate of excited states; i.e. singlet and triplet state manifolds, charge transfer and localized excitons.
- 2. Luminescent 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.
- 3. Artificial Light-Harvesting** in Supramolecular Polymers for light harvesting applications requires understanding and control of molecular localized and charge-transfer excitons and their dynamics, in particular investigated by polarized techniques.





Pump-probe Photoinduced Absorption Spectroscopy

Webpage: <http://nanociencia.imdea.org/organic-photophysics-and-photonics/group-home>



Dr. Juan Cabanillas Gonzalez

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POSTDOCS

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PhD STUDENTS

Alejandro M. Merinero

Saúl García

RESEARCH ASSISTANT

Sebastián Mesa

(co-supervised with
S. Hernández)

TECHNICIANS

Luis Colmenar

Alejandro Martin

(co-supervised with
Dr. A. Bollero)

Research lines

- 1. Organic lasers.** We study optical gain and stimulated emission properties of conjugated polymers with femtosecond transient absorption spectroscopy (TAS) to understand the relation between chemical structure and exciton dynamics. Based on this information, we develop optically-pumped laser cavities by soft-nanoimprint lithography, or by polymer self-assembly into optical microresonators.
- 2. Photophysics of light emitting nanomaterials.** We perform variable temperature TAS and time-resolved photoluminescence on thermally activated delayed fluorescence complexes or luminescent nanographenes. We are also interested in few atoms metal nanoclusters (MNCs) (< 2 nm size), which possess a molecular-like electronic structure with discrete levels arising from strong quantum confinement. These levels are optically coupled and can be exploited for bioimaging or photocatalysis.
- 3. Photophysics of luminescent metal-organic frameworks (MOFs).** We investigate the nature of excited-state interactions in MOFs in the presence of different gas analytes and explore their potential as transduction signal for specific chemosensing.



Nanooptics and Nanoacoustics

Webpage: <http://www.imdeananociencia.org/home-en/people/item/reinhold-wannemacher>



Prof. Reinhold Wannemacher
Senior Research Prof.

PhD: University of Darmstadt, Germany

Previous Position: University of Leipzig, Germany

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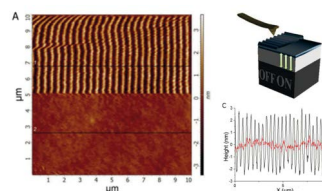
Researcher ID:
F-7108-2011

PhD STUDENT
Dr. Santhosh Kumar Karurakaran
Instituto de Ciencia Molecular of the Universitat de València (ICMol-UV), Spain

Research lines

1. We are studying the photocatalytic, charge and energy transfer properties of carbon-based nanomaterials (carbon dots, nanographenes, graphene) in close collaboration with the groups of Isabel Rodriguez, Feng Luo, Johannes Gierschner and Nazario Martin, IMDEA Nanociencia
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 organic/inorganic materials in close collaboration with the groups of Juan Cabanillas, José Sánchez Costa 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





Nanostructured Photovoltaics

Webpage: <https://nanociencia.imdea.org/nanostructured-photovoltaics/group-home>



Dr. Enrique Cánovas

Assistant Research Prof.
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PhD: Universidad Politécnica de Madrid (UPM)

Previous Position: Group Leader at Max Planck for Polymer Research (MPIP).

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Miguel Ángel Pulido

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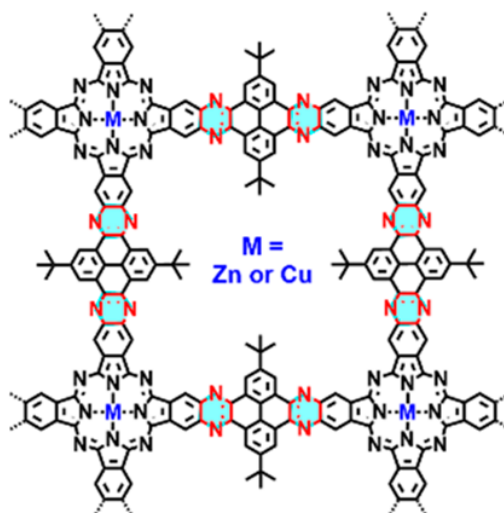
(co-supervised with Dr. M. Menghini)

Christiansen Rocha

Research lines

1. Charge carrier dynamics in bulk materials and at interfaces.
2. Charge transport in organic, inorganic and hybrid materials.
3. Time resolved THz spectroscopy.
4. Solar energy conversion: photovoltaics and photocatalysis.
5. Nanoscience and nanotechnology.

Unveiling Electronic Properties in Metal-Phthalocyanine-Based Pyrazine-Linked Conjugated Two-Dimensional Covalent Organic Frameworks.
J. Am. Chem. Soc. **2019**, 141, 42, 16810–16816, <https://pubs.acs.org/doi/abs/10.1021/jacs.9b07644>





Ultrafast Science of Quantum Materials

Webpage: <https://www.nanociencia.imdea.org/ultrafast-science-of-quantum-materials/home>



Dr. Allan Johnson
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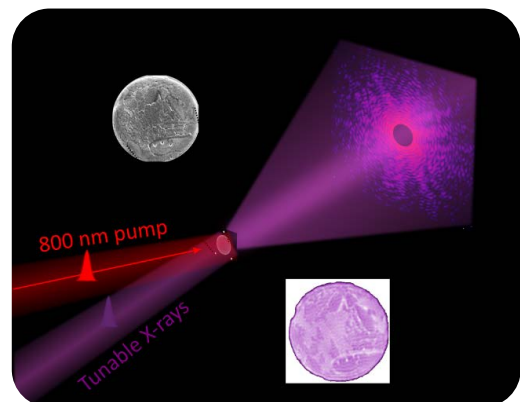
PhD STUDENT

Shreya Bvahcgi
Pondicherry University, India

Research lines

The USQM group uses ultrafast intense laser pulses to drive quantum materials strongly-out-of-equilibrium in order to both understand the origin of their quantum properties and to create new states of matter. We are particularly interested in:

- Ultrafast X-ray imaging of nanoscale phase transitions at the sub-picosecond timescales
- Optical seeding for more efficiency switching in phase-change materials
- Using quantum materials for novel nonlinear optical devices
- New methods for probing quantum materials near to the attosecond timescale"
- Please find attached an appropriate image. If a caption is needed "Schematic of ultrafast coherent X-ray imaging of light-induced phase transitions. A.S. Johnson et al., Nature Physics 19 (2), 215-220 (2023)





Bio-engineered Nanophotonics

Webpage: <https://www.nanociencia.imdea.org/es/bio-engineered-nanophotonics/home>



Dr. Sara Hernández Mejías

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PhD: University of the Basque
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Researcher ID:
ABG-4909-2020

POSTDOCS

Angelo Alonzo Beratto
Universidad de Concepción,
Chile

PhD STUDENTS

Claudia Flórez
Gonzalo Pérez
Alejandro Venegas
(Co-supervised with
Dr. Fran Terán)

Sebastián Mesa
(co-supervised with
Victor Vega)

Research lines

Our mission is overcoming current challenges in developing efficient photosystems by setting up new methods to control exciton decay mechanisms based on engineered interactions between proteins and chromophores. To achieve our goal, we have structured our research into three distinct lines, each focusing on elucidating different aspects of the intricate functioning of engineered photosystems:

- 1. Designed structure modulators for studying photosystem's conformational dynamics.** We evaluate the impact of key amino acids in the bio-hybrid conformation by assessing their effect at different levels, including folding landscape, photoactive molecule's rotational freedom, and protein backbone dynamics. Using this information, we develop biophysical models that inform the structural modulator's action mechanism and their role in the chromophore function modulation.
- 2. Engineered protein environments for exploring molecular exciton modulation.** We engineer bio-hybrids with pockets designed to decouple exciton decay pathways to obtain mechanistic information on the amino acids' effect in the chromophore's energy pattern modification.
- 3. Selective light conversion for applications.** We optimize bio-hybrids to develop materials with improved light conversion properties and show the potential of bio-engineered light conversion in applications like photocatalysis, emissive device generation, or magnetic tracker development.



X-ray Wave-mixing Spectroscopies (X-WaveS)

Webpage: <https://www.imdeananociencia.org/x-ray-wave-mixing-spectroscopies-x-waves/home>



Prof. Cristian Svetina
Assistant Research Prof.

PhD: Università degli Studi di Trieste, Italy

Previous position: Athos, SwissFEL

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Research lines

The key to advance towards new materials with extraordinary properties lies in understanding their transport properties at the nano-ultrafast scales. The research line of X-WaveS (X-ray Wave-mixing Spectroscopy) group is focused on the development of EUV and X-ray wave-mixing methodologies at Free Electron Lasers (FELs) and High Harmonic Generation (HHG) table-top sources and their application to condensed matter systems with particular emphasis on novel nano-technologies employing 2D materials, quantum materials, nano-magnetic systems, semiconductors and materials for light harvesting and efficient energy storage and conversion.

Complementary investigation with optical tools such as table-top Four Wave Mixing techniques (Transient Grating - TG, Coherent Anti-Stokes Raman Scattering - CARS, etc.) is also part of the X-WaveS' activities.



Modelling Physical Properties of Nanostructures

Webpage: <http://nanociencia.imdea.org/fernando-martin-s-group/group-home>



Prof. Fernando Martín
Associate Research Prof.

PhD: Universidad Autónoma de Madrid, Spain

Double affiliation: Universidad Autónoma de Madrid, Spain

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Germany

Dr. Bruno Nunes

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Universitet: Lyngby, DK

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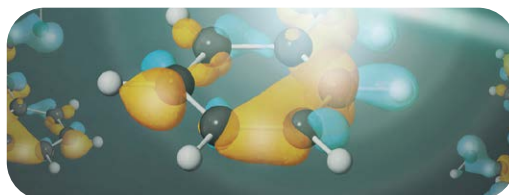
Pranjal Prateek

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.
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.

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





Femtochemistry

Webpage: <http://webs.ucm.es/info/dinalaser>



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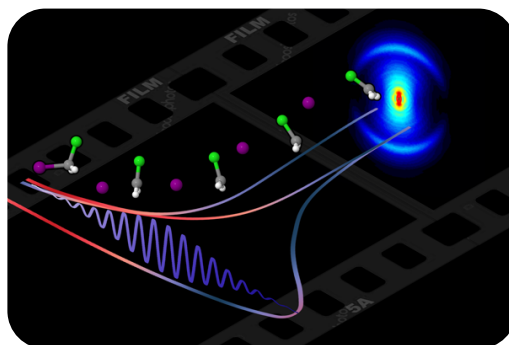
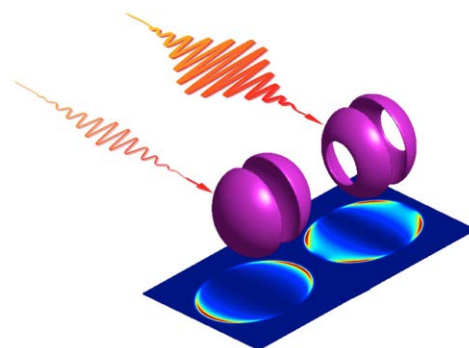
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Research lines

1. Dynamics of Photodissociation of Molecules and Radicals.
2. Femtosecond Time-resolved Photodissociation Dynamics.
3. Imaging of Chemical Reactions.
4. Strong Laser Field Control of Reaction Dynamics.





Ultrafast X-Ray Science

Webpage: <http://www.nanociencia.imdea.org/ultrafast-xray-science/home>



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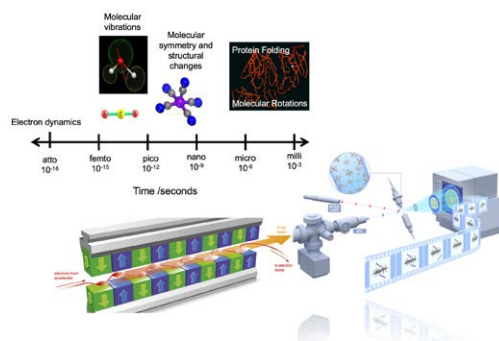
Tae Kyu Choi
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Juan Francisco Hidalgo

Research lines

The Ultrafast X-ray Science (UXS) group focuses its research on the applications of advanced ultrafast X-ray techniques, in combination with femtosecond optical spectroscopies, to study photoinduced structural dynamics in condensed-phase systems. The combined optical and X-ray pump-probe methodologies utilize the state-of-the-art X-ray free electron lasers (XFELs), such as European XFEL (Germany), SACLA (Japan) or LCLS (USA), which are the world’s brightest and most powerful sources of pulsed X-rays.

Among diverse research activities within the UXS, we can highlight 3 main targeted science areas:

1. Mechanistic understanding of the excited-state chemical reaction dynamics in functional molecular assemblies, e.g. light-harvesting photosensitizers, photocatalytic assemblies, MOFs, etc.
2. Disentangling the coupled electronic and molecular dynamics in liquid-phase molecular systems, including the role of the local environment (solvation dynamics)
3. Understanding and controlling excited-state charge carrier dynamics in semiconductor and metallic colloidal nanoparticles



P6

programme

Nanotechnology for Critical Raw Materials and Sustainability

Programme Manager: Prof. Alberto Bollero

Research lines

Permanent Magnets
and Applications
Prof. Alberto Bollero

Functional Surfaces
Prof. Isabel Rodríguez



About the programme

This Programme addresses key challenges indicated by the European Commission on climate actions, environment, resource efficiency and raw materials. Critical Raw Materials (CRMs) are used in environmental technologies, consumer electronics, health, defense, space exploration, aviation... these materials are not only “critical” for key industry sectors and future applications, but also for the sustainable functioning of the European economy. For instance, the EU estimates that the demand for rare-earths (over 90% controlled by China) will rise ten-fold by 2050, boosted by the needs of key industries (energy, transport, aerospace).

The activities of this new programme are fostered toward the development of alternatives based on elements widely available in Europe and it has been created with two specific scientific lines: a) the development of advanced and novel permanent magnets; b) the development of (smart) bioinspired functional surfaces. All under premises of sustainability and reduced CO₂ emissions to achieve the European Green Deal objectives. This programme is in close collaboration with all research programmes.

A top priority for Europe is to develop permanent magnets free of rare earths. We fill the enormous performance gap

existing between ferrites and NdFeB magnets. Among them, we are exploring: a) Improved nanostructured ferrites for electromobility; b) Novel manganese-based nanostructures combining physics, chemistry and metallurgy to synthesize engineered L10-MnAlC; c) synthesis of record magnets inspired by findings in meteorites: creation of the L10-FeNi phase. In addition, we explore additive manufacturing and 4D printing of multimaterials with new properties/functionalities, which permits the fabrication of objects with no restriction in shape, allowing for highly efficient devices and minimizing the use of critical raw materials.

In a transition towards a sustainable production, the demands on efficient surfaces treatments are increasing, specifically targeting and enabling end-products with the purpose of reducing the end-products' energy usage and/or environmental footprint. Our activities on Functional Surfaces take advantage on nanofabrication technologies and particularly emphasizes on cost-effective scalable process to develop surface structured materials with new functionalities or with improved ones. Much of the work in the program is inspired on natural functional surface structures. The special competencies of the program include surface patterning techniques such as nano-imprint lithography, soft lithography and molecular patterning.

Permanent Magnets and Applications

Webpage: <http://nanociencia.imdea.org/division-permanent-magnets-applications>



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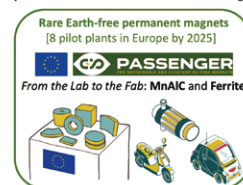
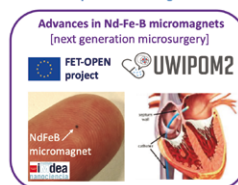
(co-supervised with
Dr. J. Cabanillas)

Research lines

1. Fundamental and applied aspects of permanent magnets (PMs): rare earth-based (Nd-Fe-B and Pr-Fe-B) and rare earth-free (MnAlC, MnBi, L10-FeNi, ferrites).
 - Industrial collaborations: Höganäs (Sweden), IMA (Barcelona), RAMEM (Madrid)...
 - Projects under international Calls: H2020 Innovation Action, H2020 FET-OPEN, M-ERA.NET.
2. Nanostructured PMs (powders and bulk).
3. Additive manufacturing of PMs.
4. Growth of magnetic thin films.
5. Nanoparticle engineering, and electrochemical synthesis of PM nanostructures.
6. Development of micromagnets for microdevices (e.g., micro-robots in microsurgery).
7. Recycling and sustainability of PMs.

Development of advanced and novel permanent magnets under premises of sustainability and reduced CO2 emissions to achieve the European Green Deal objectives: EU H2020 project "PASSENGER" (20 partners; 13 industry partners; 8 European countries. Coordinated by IMDEA Nanociencia).

Sustainable permanent magnets: From disruptive science to innovation in technology





Nanostructured Functional Surfaces

Webpage: <http://nanociencia.imdea.org/nanostructured-functional-surfaces-program/group-home>



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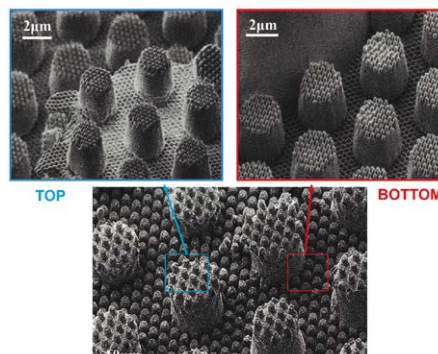
Research lines

The Nanostructured Functional Surfaces group leverages on nanofabrication technologies and particularly emphasizes on cost-effective scalable process to develop surface structured materials with new functionalities or with improved ones. Much of the work in the group is inspired on natural functional surface structures.

The special competencies of the group include surface patterning techniques such as nano-imprint lithography, soft lithography and molecular patterning.

Presently the group is active on the following research areas:

1. Nano-engineering functional surfaces for biomedical applications.
2. Development of tumor-on-a-chip microfluidic devices.
3. Nanoimprinting multifunctional biomimetic surfaces and process up-scaling using roll to roll technology.
4. Polymer nanoimprinting for optical applications such as antireflective surfaces and Fresnel lenses in collaboration with other groups.





Horizontal Platform Disruptive Innovation and Technology

Dr. Mark William Davies
Industrial Liaison

Dr. Héctor Guerrero
Strategic Industrial Partnerships

The objective of the **Horizontal Platform** is to foster disruptive innovation from nanoscience and nanotechnology to boost industrial developments. This initiative is an evolution of the Translational Technology Platform established under the previous SO Programme. The new focus has gained momentum thanks to the European Innovation Council (EIC) leadership.

According to the European Commission the EIC aims to identify and scale-up breakthrough and disruptive innovation. IMDEA Nano is working at the frontier of knowledge, in cutting-edge research that will allow in a natural way the connection with relevant industries for achieving disruptive innovations based on nanotechnology solutions.



About the Horizontal Platform

IMDEA Nanociencia foundational goals include the service to Society and the support to the Industry. Reaching final applications from interdisciplinary frontier research takes a long way, normally in connection with other academic, institutional and business actors. By its very nature, research at the nanoscale is consubstantial with the generation of disruptive innovation, something that cannot be anticipated but can be propitiated through an instrument conceived at IMDEA Nanociencia to advance in areas with potential to generate disruptive applications.

The Horizontal Platform provides the specialized framework for the development of new proof-of-concept applications and products based on the cutting-edge research from all Scientific Programmes. The understanding, analysis and

manipulation of nanoscale physical, chemical and biological phenomena, challenged from the six priority Scientific Programmes, will bring to new developments and advanced applications of nanotechnology for key sectors of the economy. We taking advantage of the advanced research services as well as the possibility of directly developing for companies systems and applications focused on the challenges. In parallel, we multiply efforts and increase critical mass at all stages of the value chain, from research to final application establishing strategic alliances with complementary public institutions, close to technology and/or end users designing a suitable path, establishing a common language and, without a doubt, choosing the best travel companions.



Services

RMN and Mass Spec. Services



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Optical Tweezers



Dr. Rebeca Bocanegra

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AFM Service



Dr. Patricia Pedraz

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Advanced Optical Microscopy Service



Dr. Cintia Vequi-Suplicy

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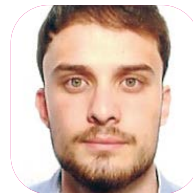
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Mr. Juan Martín
Account Technician



Ms. Paloma Castillo
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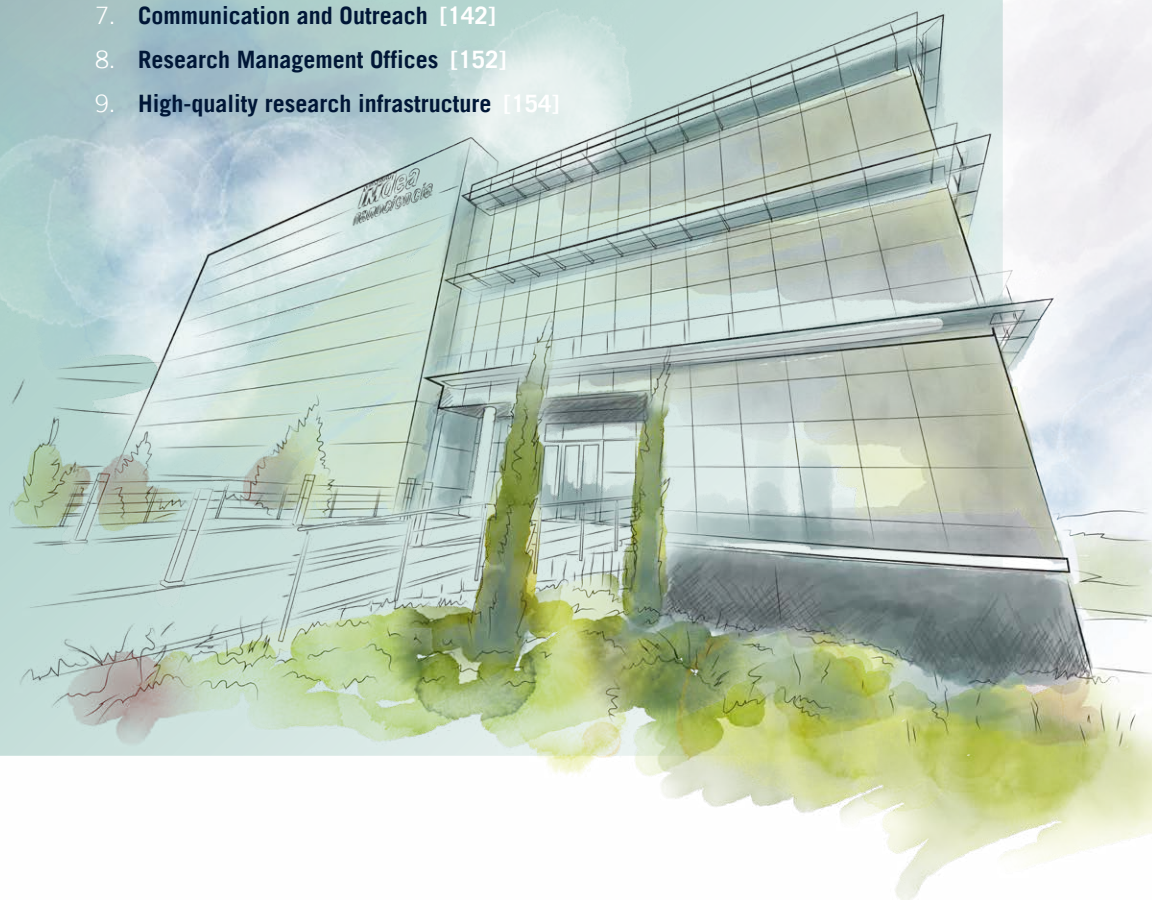
Mr. Gonzalo Hidalgo
Network and Systems
Technician

3

scientific report

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annual
report
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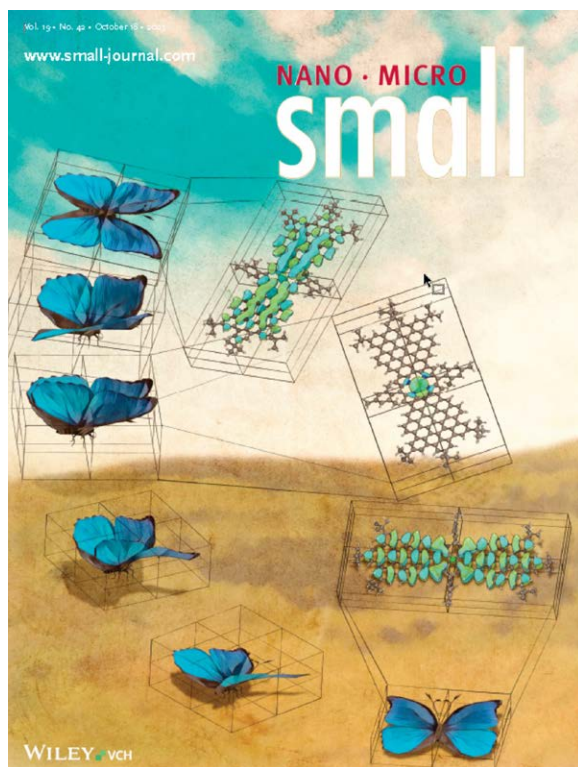




1. Publications (as of 23-05-2024)

- 1. Exciton formation dynamics at the SiO₂/Si interface;** Revuelta S., Cánovas E.; *Commun. Mater.*; 2023; **4**, 1, 97; DOI: [10.1038/s43246-023-00427-7](https://doi.org/10.1038/s43246-023-00427-7)
- 2. Design and evaluation of multi-core raspberry-like platinum nanoparticles for enhanced photothermal treatment;** Guénin E., Fromain A., Serrano A., Gropplero G., Lalatonne Y., Espinosa A., Wilhelm C.; *Commun. Mater.*; 2023; **4**, 1, 84; DOI: [10.1038/s43246-023-00411-1](https://doi.org/10.1038/s43246-023-00411-1)
- 3. Multifunctional magnetic nanoparticles elicit anti-tumor immunity in a mouse melanoma model;** Lafuente-Gómez N., de Lázaro I., Dhanjani M., García-Soriano D., Sobral M.C., Salas G., Mooney D.J., Somoza Á.; *Mater. Today Bio.*; 2023; **23**, 100817; DOI: [10.1016/j.mtbio.2023.100817](https://doi.org/10.1016/j.mtbio.2023.100817)
- 4. Synergistic enhancement of electrochemiluminescence through hybridization of -Ge nanolayers and gold nanoparticles for highly sensitive detection of tyramine;** Guerrero-Esteban T., Sánchez B.L., Expósito L., Rodríguez-San-Miguel D., Zamora F., Pariente F., Gutiérrez-Sánchez C., Lorenzo E.; *Sens Actuators B Chem*; 2023; **396**, 134649; DOI: [10.1016/j.snb.2023.134649](https://doi.org/10.1016/j.snb.2023.134649)
- 5. Open questions in attochemistry;** Calejari F., Martin F.; *Commun. Chem.*; 2023; **6**, 1, 184; DOI: [10.1038/s42004-023-00989-0](https://doi.org/10.1038/s42004-023-00989-0)
- 6. Attosecond delays between dissociative and non-dissociative ionization of polyatomic molecules;** Gong X., Plésiat É., Palacios A., Heck S., Martín F., Wörner H.J.; *Nat. Commun.*; 2023; **14**, 1, 4402; DOI: [10.1038/s41467-023-40120-4](https://doi.org/10.1038/s41467-023-40120-4)
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- 8. Reversible metal-insulator transition in SrIrO₃ ultrathin layers by field effect control of inversion symmetry breaking;** Gallego F., Tornos J., Beltran J.I., Peralta A., Garcia-Barriocanal J., Yu G., Rojas G., Munuera C., Cabero M., Sanchez-Manzano D., Cuellar F., Sanchez-Santolino G., Sefrioui Z., Rivera-Calzada A., Mompean F.J., Garcia-Hernandez M., Leon C., del Carmen Muñoz M., Santamaria J.; *Commun. Mater.*; 2023; **4**, 1, 36; DOI: [10.1038/s43246-023-00362-7](https://doi.org/10.1038/s43246-023-00362-7)
- 9. Synergistic binding sites in a metal-organic framework for the optical sensing of nitrogen dioxide;** del Castillo-Velilla I., Sousaraei A., Romero-Muñiz I., Castillo-Blas C., S. J. Méndez A., Oropeza F.E., de la Peña O'Shea V.A., Cabanillas-González J., Mavrandonakis A., Platero-Prats A.E.; *Nat. Commun.*; 2023; **14**, 1, 2506; DOI: [10.1038/s41467-023-38170-9](https://doi.org/10.1038/s41467-023-38170-9)
- 10. A sensitive high repetition rate arrival time monitor for X-ray free electron lasers;** Díez M., Kirchberg H., Galler A., Schulz S., Biednov M., Bömer C., Choi T.-K., Rodríguez-Fernandez A., Gawelda W., Khakhulin D., Kubicek K., Lima F., Otte F., Zalden P., Coffee R., Thorwart M., Bressler C.; *Nat. Commun.*; 2023; **14**, 1, 2495; DOI: [10.1038/s41467-023-38143-y](https://doi.org/10.1038/s41467-023-38143-y)
- 11. Anomalous deep-red luminescence of perylene black analogues with strong π - π interactions;** Tang N., Zhou J., Wang L., Stolte M., Xie G., Wen X., Liu L., Würthner F., Gierschner J., Xie Z.; *Nat. Commun.*; 2023; **14**, 1, 1922; DOI: [10.1038/s41467-023-37171-y](https://doi.org/10.1038/s41467-023-37171-y)
- 12. Hybrid molecular graphene transistor as an operando and optoelectronic platform;** Trasobares J., Martín-Romano J.C., Khaliq M.W., Ruiz-Gómez S., Foerster M., Niño M.Á., Pedraz P., Dappe Y.J., de Ory M.C., García-Pérez J., Acebrón M., Osorio M.R., Magaz M.T., Gomez A., Miranda R., Granados D.; *Nat. Commun.*; 2023; **14**, 1, 1381; DOI: [10.1038/s41467-023-36714-7](https://doi.org/10.1038/s41467-023-36714-7)

- 13. Nearly-freestanding supramolecular assembly with tunable structural properties;** Caruso T., De Luca O., Melfi N., Policicchio A., Pisarra M., Godbert N., Aiello I., Giorno E., Pacilè D., Moras P., Martín F., Rudolf P., Agostino R.G., Papagno M.; *Sci. Rep.*; 2023; **13**, 1, 2068; DOI: [10.1038/s41598-023-28865-w](https://doi.org/10.1038/s41598-023-28865-w)
- 14. Formation and degradation of strongly reducing cyanoarene-based radical anions towards efficient radical anion-mediated photoredox catalysis;** Kwon Y., Lee J., Noh Y., Kim D., Lee Y., Yu C., Roldao J.C., Feng S., Gierschner J., Wannemacher R., Kwon M.S.; *Nat. Commun.*; 2023; **14**, 1, 92; DOI: [10.1038/s41467-022-35774-5](https://doi.org/10.1038/s41467-022-35774-5)
- 15. Scalable Synthesis and Electrocatalytic Performance of Highly Fluorinated Covalent Organic Frameworks for Oxygen Reduction;** Martínez-Fernández M., Martínez-Periñán E., de la Peña Ruigómez A., Cabrera-Trujillo J.J., Navarro J.A.R., Aguilar-Galindo F., Rodríguez-San-Miguel D., Ramos M., Vismara R., Zamora F., Lorenzo E., Segura J.L.; *Angew. Chem. Int. Ed.*; 2023; **62**, 47, e202313940; DOI: [10.1002/anie.202313940](https://doi.org/10.1002/anie.202313940)
- 16. Rotation of the c-Ring Promotes the Curvature Sorting of Monomeric ATP Synthases;** Valdivieso González D., Makowski M., Lillo M.P., Cao-García F.J., Melo M.N., Almendro-Vedia V.G., López-Montero I.; *Adv. Sci.*; 2023; **10**, 31, 2301606; DOI: [10.1002/adv.202301606](https://doi.org/10.1002/adv.202301606)
- 17. Donor–Acceptor–Donor Triads with Flexible Spacers: Deciphering Complex Photophysics for Targeted Materials Design;** Feng S., Wang L., Millán-Medina B., Meixner A.J., Kwon M.S., Park S.Y., Wannemacher R., Gierschner J.; *Adv Mater.*; 2023; **35**, 44, 2306678; DOI: [10.1002/adma.202306678](https://doi.org/10.1002/adma.202306678)
- 18. Disentangling the evolution of electrons and holes in photoexcited ZnO nanoparticles;** Milne C.J., Nagornova N., Pope T., Chen H.-Y., Rossi T., Szlachetko J., Gawelda W., Britz A., van Driel T.B., Sala L., Ebner S., Katayama T., Southworth S.H., Doumy G., March A.M., Lehmann C.S., Mucke M., Jablonsky D., Kumagai Y., Knopp G., Motomura K., Togashi T., Owada S., Yabashi M., Nielsen M.M., Pajek M., Ueda K., Abela R., Penfold T.J., Chergui M.; *Struct. Dyn.*; 2023; **10**, 6, 64501; DOI: [10.1063/4.0000204](https://doi.org/10.1063/4.0000204)
- 19. Luminescence colour modulation in benzotriazole-derived waveguides;** Donoso B., Torres-Moya I., Álvarez-Conde J., Chacón I., Díaz-Ortiz Á., Cabanillas-González J., Prieto P.; *Dyes Pigm.*; 2023; **219**, 111583; DOI: [10.1016/j.dyepig.2023.111583](https://doi.org/10.1016/j.dyepig.2023.111583)
- 20. Atomic force microscopy for the evaluation of corneal surface roughness after femtosecond laser flap creation and excimer ablation;** Cañones-Zafra R., Gros-Otero J., García-Gonzalez M., Casado S., Ketabi S., Villa-Collar C., Teus M.A.; *Int. Ophthalmol.*; 2023; **43**, 11, 4131; DOI: [10.1007/s10792-023-02821-z](https://doi.org/10.1007/s10792-023-02821-z)
- 21. Obtaining extended insight into molecular systems by probing multiple pathways in second-order nonlinear spectroscopy;** Fellows A.P., Balos V., John B., Díaz Duque I., Wolf M., Thämer M.; *J Chem Phys*; 2023; **159**, 16, 164201; DOI: [10.1063/5.0169534](https://doi.org/10.1063/5.0169534)
- 22. Strain-Induced Quasi-1D Channels in Twisted Moiré Lattices;** Sinner A., Pantaleón P.A., Guinea F.; *Phys Rev Lett*; 2023; **131**, 16, 166402; DOI: [10.1103/PhysRevLett.131.166402](https://doi.org/10.1103/PhysRevLett.131.166402)
- 23. Noncollinear, inelastic four-wave mixing in the extreme ultraviolet;** Mincigrucci R., Cannizzo A., Capotondi F., Cinquegrana P., Cucini R., Dallari F., Danailov M.B., De Ninno G., Mitri S.Di., Feurer T., Foglia L., Frei H.-M., Manfreda M., Maznev A.A., Monaco G., Naumenko D., Nikolov I., Ollmann Z., Paltanin E., Pamfilidis G., Pedersoli E., Principi E., Rehault J., Simoncig A., Svetina C., Knopp G., Masciovecchio C., Bencivenga F.; *Optica*; 2023; **10**, 10, 1383; DOI: [10.1364/OPTICA.497745](https://doi.org/10.1364/OPTICA.497745)
- 24. Mechanical Interlocking to Unlock the Reinforcing Potential of Carbon Nanotubes;** Mena-Hernando S., Eaton M., Fernández-Blázquez J.P., López-Moreno A., Pedersen H., Pérez E.M.; *Chem. Eur. J.*; 2023; **29**, 58, e202301490; DOI: [10.1002/chem.202301490](https://doi.org/10.1002/chem.202301490)
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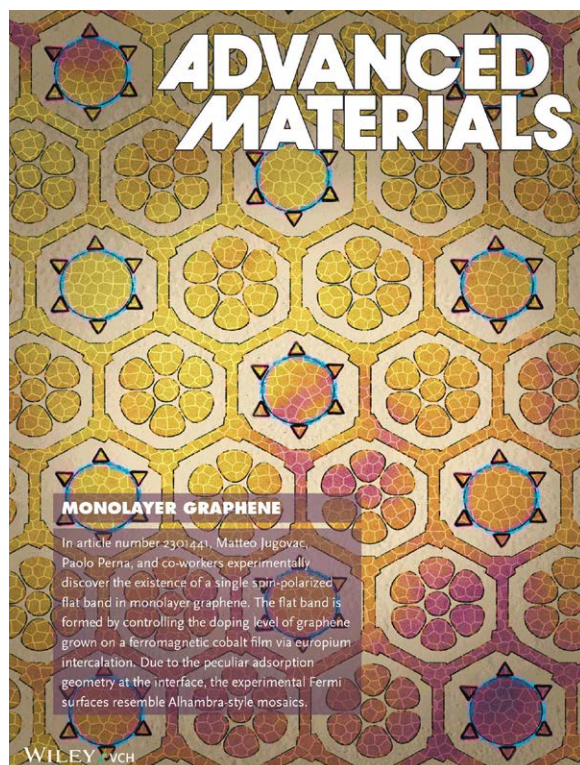
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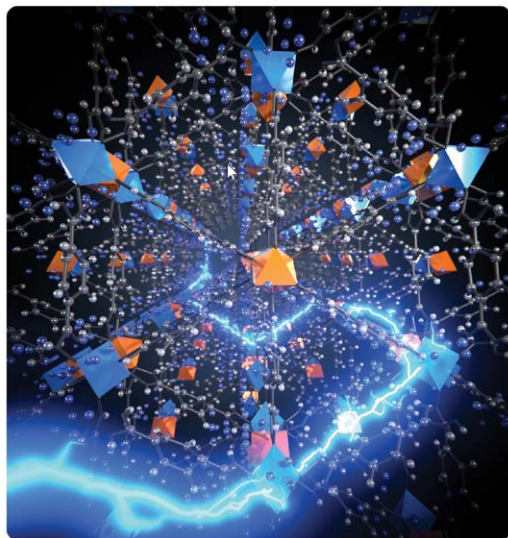
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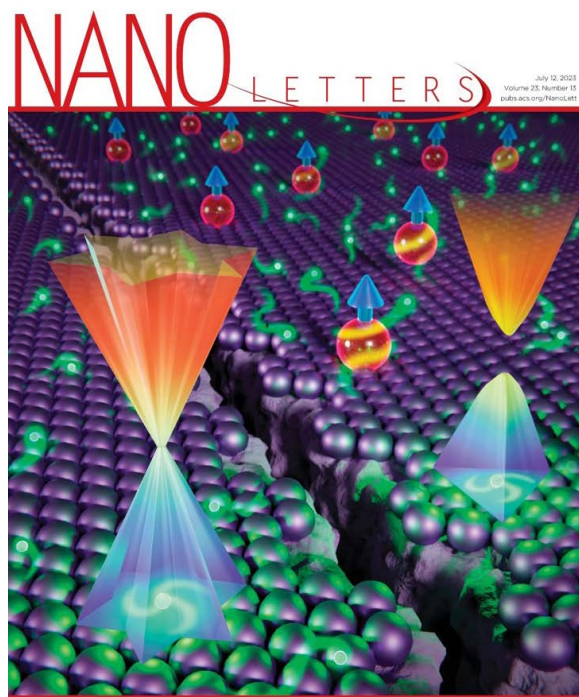
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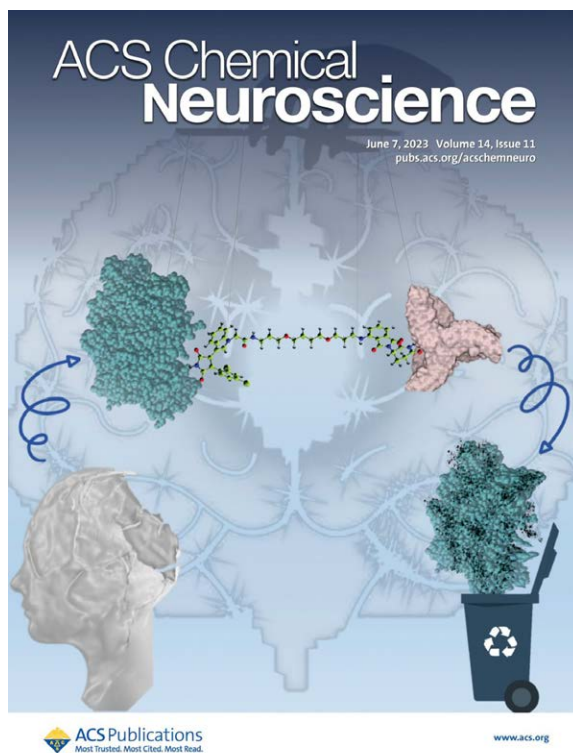
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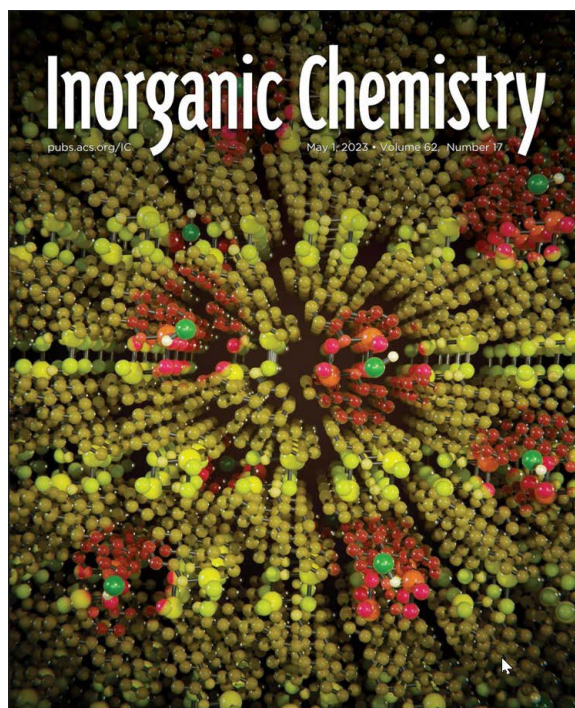
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5. Nanostructured ferrite materials for theranostics; Oluwasamni A., Santana-Otero A., Soenen S., Manshian B., Hoskins C., Ortega D.; *Ferrite Nanostructured Magnetic Mater.: Technologies and Applications*; 2023; **805**; DOI: [10.1016/B978-0-12-823717-5.00055-3](https://doi.org/10.1016/B978-0-12-823717-5.00055-3)

2. Patents

Nº	Title	Inventors	Applicants	Publication number	Publication date
1	Multiplexed System For The Detection Of Disease-Related Micromas In Biological Samples	Castanheira Coutinho Catarina [Es] Castellanos Molina Milagros [Es] Somoza Calatrava Alvaro [Es]	Fund Imdea Nanociencia [Es]	EP4234714A1	2023-08-30
2	Functionalized Metal Nanoparticles And Uses Thereof For Detecting Sars Cov 2 Genetic Material	Rodríguez Díaz Ciro [Es] Lafuente Gómez Nuria [Es] Castanheira Coutinho Catarina [Es] Castellanos Molina Milagros [Es] Somoza Calatrava Alvaro [Es]	Fund Imdea Nanociencia [Es]	W02023099720A1	2023-06-08
3	Miniaturized Electromagnetic Rotary Actuator	Díez Jiménez Efrén [Es] Valiente Blanco Ignacio [Es] Fernández Muñoz Miguel [Es] Villalba Alumbroeros Gabriel [Es] Morón Alguacil Carlos [Es] Martínez Pérez Alba [Es] Cruz Rosco Héctor [Es] Martínez Rojas Juan Antonio [Es] Sánchez Montero Rocío [Es] López Espi Pablo Luis [Es] Pereira González Emiliano [Es] Lastra Sedano Alberto [Es] Missous Mohamed [Gb] Sexton James [Gb] Muttlak Saad [Gb] Michalowski Marcin [Pl] Kusznierewicz Zbigniew [Pl] Bollero Real Alberto [Es] Granados Ruiz Daniel [Es] Camarero De Diego Julio [Es] Palmero Rodríguez Ester María [Es] Navío Bernabeu Cristina [Es] Soler Morala Jimena [Es] Rodríguez Osorio Manuel [Es] Acebrón Rodicio María [Es] Valera Bernal Andrés [Es] Flanagan Aiden [Ie] Fawdry Martin [Ie]	Univ De Alcalá Uah [Es] Advanced Hall Sensors Ltd Ahs [Gb] Politechnika Warszawska Wut [Pl] Fund Imdea Nanociencia Imdea [Es] Boston Scient Limited Bsl [Ie]	EP4142125A1	2023-03-01



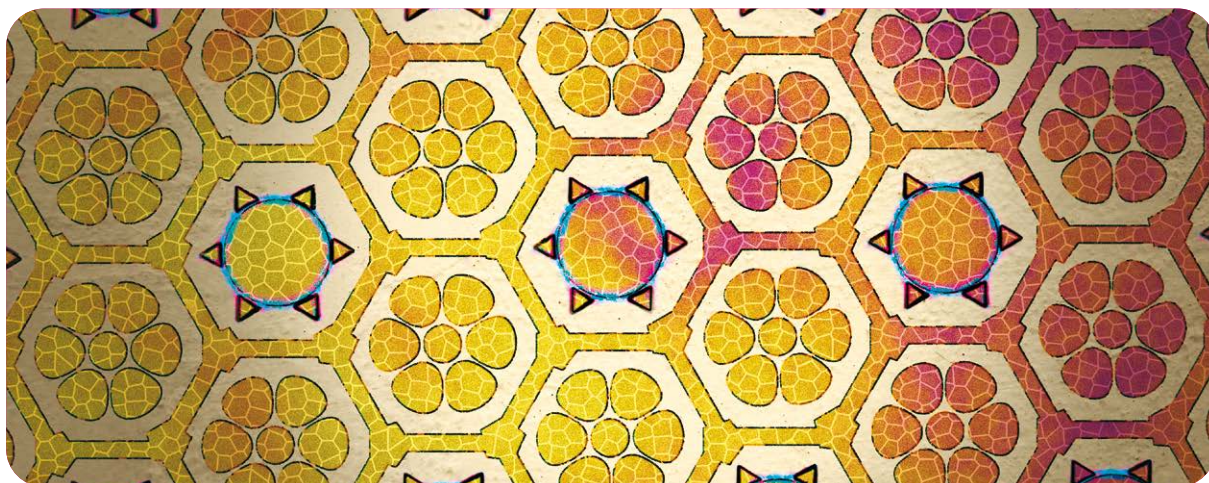
Nº	Title	Inventors	Applicants	Publication number	Publication date
4	Catalyst Anchoring Method, Oligomeric Ruthenium-Ligand Compositions Therefrom/And Their Use In Water Oxidation	Llobet Dalmases Antoni [Es] Gimbert Suriñach Carolina [Es] Maseras Cuni Feliu [Es] Moonshiram Dooshaye [Es] Gil Sepulcre Marcos [Es] Shi Yuanyuan [Be] Hoque Asmaul [In] Matheu Montserrat Roc [Es] De Aguirre Fondevila Adiran [Ch] Sala Román Xavier [Es] Schindler Dorothee [De] Würthner Frank [De]	Fundacio Institut Catala Dinvestigacio Quim [Es] Fundacion Inst Madrileno De Estudios Avanzados En Nanociencia Imdea Nanociencia [Es] Univ Wuerzburg J Maximilians [De] Univ Autònoma De Barcelona Uab [Es]	W02022018243A1	2022-01-27
5	Bidirectional Medical Devices For Monitoring And Stimulating Neurons	González Pérez María Teresa [Es] Camarero De Diego Julio [Es] Pérez García Lucas [Es] Rodríguez Fernández María Isabel [Es] Miranda Soriano Rodolfo [Es] Perna Paolo [Es] Martínez Ramírez Isidoro [Es] Guerrero Sánchez Rubén [Es] Rodilla González Beatriz Loreto [Es] Arché Núñez Ana [Es] Vera García Arturo [Es] Enger Luiz Guilherme [Fr] Flament Stéphane [Fr] Guillet Bruno [Fr] Lam Chok Sing Marc Ah-Liong [Fr] Mechin Laurence Liliane [Fr] Rousseau Olivier Henri Marc [Fr] Ballerini Laura [It] Scaini Denis [It] Calaresu Ivo [It] Serrano López-Terradas María Concepción [Es] Dominguez Bajo Ana [Es] López Dolado Elisa [Es] González Mayorga Francisco Ankor [Es] Lebargy Sylvain [Fr]	Fund Imdea Nanociencia [Es] Centre Nat Rech Scient [Fr] Scuola Int Superiore Di Studi Avanzati [It] Consejo Superior Investigacion [Es] Servicio De Salud De Castilla La Mancha Sescam [Es]	EP3939497A1	2022-01-19
6	Periacene Biradical Polymers	Écija Fernández David [Es] Urgel Tendero José Ignacio [Es] Lauwaet Koen [Es] Sánchez Grande Ana [Es] Miranda Soriano Rodolfo [Es] Martín León Nazario [Es] Santos Barahona José Manuel [Es] Jelínek Pavel [Cz]	Fund Imdea Nanociencia [Es] Univ Madrid Complutense [Es] Fyzikalni Ustav Av Cr V V I [Cz]	EP3843109A1	2021-06-30
7	Substrates For Culturing And Stimulating Cells	Rodríguez Fernández María Isabel [Es] González Pérez María Teresa [Es] Hernández Rueda Jaime Javier [Es] Pérez García Lucas [Es] Camarero De Diego Julio [Es] Miranda Soriano Rodolfo [Es] Ballerini Laura [It] Calaresu Ivo [It] Rauti Rossana [It] Scaini Denis [It]	Fund Imdea Nanociencia [Es]	EP4041871A1	2022-08-17
8	Colorimetric Detector	Sánchez Costa José [Es] Resines Urién Esther [Es] Gamonal Ruiz-Crespo Arturo [Es] Piñero Lucia [Es]	Fund Imdea Nanociencia [Es]	"EP3789761A1 EP3789761B1 EP3789761C0"	"2021-03-10 2024-03-20"



Nº	Title	Inventors	Applicants	Publication number	Publication date
9	Anticancer Compositions Containing Mirna Mimics And Uses Thereof	Somoza Calatrava Álvaro [Es] Milán Rois Paula [Es] Latorre Lozano Alfonso [Es]	Fund Imdea Nanociencia [Es]	EP3626820A1	2020-03-25
10	Method For Detection Of Marked Structures	Hernández Juárez Beatriz [Es] Arias González De La Aleja José Ricardo [Es] Rodríguez Rodríguez Héctor [Es] Acebrón Rodicio María [Es] Iborra Rodríguez Francisco José [Es]	Univ Madrid Autonoma [Es] Fund Imdea Nanociencia [Es] Consejo Superior Investigacion [Es]	W02020021154A1	2020-01-30
11	Method For Detection Of An Analyte	Cabrera Carrasco David [Es] Aires Trapote Antonio [Es] Artés Ibañez Emilio José [Es] Camarero De Diego Julio [Es] López Cortajarena Aitziber [Es] Terán Garcinuño Francisco José [Es]	Fund Imdea Nanociencia [Es]	W02019092131A1	2019-05-16
12	Ferrite Type Materials And Process For The Production Thereof	Real Alberto Bollero [Es] Deledda Stefano [No] Camarero De Diego Julio [Es] Guzik Matylda [No] Rodríguez Javier Rial [Es]	Inst Energiteknik [No] Fund Imdea Nanociencia [Es]	W02018211121A1	2018-11-22
13	Systems And Methods For Obtaining Unique Identifiers And Measuring Displacements By Sensing And Analyzing Spatial Magnetic Field Variations	Pedrosa Ruiz Francisco Javier [Es] Camarero De Diego Julio [Es] Bollero Real Alberto [Es]	Fundación Imdea Nanociencia [Es] Fund Imdea Nanociencia [Es]	"EP3246722A1" EP3246722B1"	"2017-11-22 2019-01-09"
14	Polymeric Composites With Functional Surfaces	Hernández Rueda Jaime [Es] Rodríguez Fernández Isabel [Es] Navarro Baena Iván [Es] Viela Bovio Felipe [Es]	Fundación Imdea Nanociencia [Es]	W02017167909A1	2017-10-05
15	Functionalised Magnetic Nanoparticle	López Cortajarena Aitziber [Es] Somoza Calatrava Álvaro [Es] Couleaud Pierre [Es] Ocampo García Sandra [Es] Aires Trapote Antonio [Es] Latorre Lozano Alfonso [Es]	Fundación Imdea Nanociencia [Es]	W02016150521A1	2016-09-29
16	Graphene Covalently Modified (Machine-Translation By Google Translate, Not Legally Binding)	Calleja Mitja Fabián [Es] Leret Garcia Sofia [Es] Navarro Ocana Juan Jesús [Es] Stradi Daniele [It] Black Morocoima Andrés [Es] Bernardo Gavito Ramón [Es] Garnica Alonso Manuela [Es] Granados Ruiz Daniel [Es] Lopez Vazquez De Parga Amadeo [Es] Perez Alvarez Emilio [Es] Miranda Soriano Rodolfo [Es] Navarro Ocana Juan Jesús [It] Stradi Daniele [Es] Perez Alvarez Emilio Miranda Soriano Rodolfo	Fund Imdea Nanociencia [Es] Univ Madrid Autonoma [Es]	"ES2578997A1" ES2578997B2"	"2016-08-03 2017-01-27"
17	Detection And Treatment Of Gnaq Mutant Uveal Melanoma Cells With Gold Nanoparticles	Urda Susana Ortiz [Us] Somoza Calatrava Alvaro [Es] Latorre Lozano Alfonso [Es] Posch Christian [Us]	Univ California [Us] Fundacion Imdea Nanociencia [Es]	W02015116502A1	2015-08-06
18	Functionalized Metal Nanoparticles And Uses Thereof For Detecting Nucleic Acids	Somoza Calatrava Álvaro [Es] Latorre Lozano Alfonso [Es] Ortiz Urda Susana [Us] Posch Christian [Us]	Fundación Imdea Nanociencia [Es] Univ California [Us]	EP2902503A1	2015-08-05



Nº	Title	Inventors	Applicants	Publication number	Publication date
19	Preparation Of Corrugated And Porous Graphene From Cof For Use As Supercapacitors (Machine-Translation By Google Translate, Not Legally Binding)	Coronado Miralles Eugenio [Es] Ribera Hermano Antonio Luis [Es] Abellan Saez Gonzalo [Es] Zamora Abanades Félix [Es] Mas Ballesté Rubén [Es] Rodríguez San Miguel David [Es]	Uni De València [Es] Univ Madrid Autonoma [Es] Fundación Imdea Nanociencia [Es] Univ De València Univ Madrid Autonoma Fundación Imdea Nanociencia	" ES2538604A1 ES2538604B1 "	"2015-06-22 2016-04-20"
20	Method For The Synthesis Of Covalent Organic Frameworks	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]	Fundación Imdea Nanociencia [Es] Univ Autónoma De Madrid [Es] Univ Madrid Complutense [Es]	WO2015015035A1	2015-02-05
21	Graphene Dried Powder And Method For Its Preparation	Miranda Soriano Rodolfo [Es] Zamora Abanades Félix Juan [Es] Mas-Ballesté Rubén [Es] Azani Mohammad-Reza [Es] Carcelén Valero Verónica [Es] Castellano Doblare Manuel [Es]	Fundación Imdea Nanociencia [Es] Univ Autónoma De Madrid [Es] Abengoa Res SI [Es]	WO2015014862A1	2015-02-05
22	Modified Solid Support For The Synthesis Of Oligonucleotides	Somoza Calatrava Alvaro [Es] Latorre Lozano Alfonso [Es]	Fundación Imdea Nanociencia [Es] Fundacion Imdea Nanociencia [Es]	US2016075680A1	2016-03-17
23	Position-Sensitive Photodetector, Method For Obtaining Same And Method For Measuring The Response From The Photodetector	Cabanillas Gonzalez Juan [Es] Campoy Quiles Mariano [Es]	Fundación Imdea Nanociencia [Es] Consejo Superior Investigacion [Es]	EP2650939A1	2013-10-16
24	Position-Sensitive Photodetector, Method For Obtaining Same And Method For Measuring The Response From The Photodetector	Cabanillas Gonzalez Juan [Es] Campoy Quiles Mariano [Es]	Fundación Imdea Nanociencia [Es] Consejo Superior Investigacion [Es] Fundación Imdea Nanociencia Consejo Superior Investigacion	" ES2384766A1 ES2384766B1 "	"2012-07-12 2013-05-22"



3. Contributions to conferences

118 conferences

276 contributions

84 invited talks

91 oral contributions

101 poster contributions



imdea nanoscience institute

5 Annex

1. National and international Congresses: invited talks and regular contributions

118 conferences
276 contributions:
84 invited talks
91 oral contributions
101 poster contributions

07/01/2023

16th Conference on Organic Electronics (OCOE)
Madrid

Oral communication(s)

Abstracts: 66/2023

Charge transfer state engineering for tailor-made luminescent organic materials

11/01/2023

International Workshop on Twisted Bilayer Graphene and Beyond (Twistronics 2023)
University of Seoul, Korea

Invited/plenary talk

E. Gomez

Electrons, strains, and phonons in twisted and untwisted graphene

13/01/2023

New IAdChem Researchers on the Block Workshop
Institute of Advanced Research in Chemical Sciences (IAdChem), Madrid

Invited/plenary talk

Wojciech Gawelda

Tracking electron transfer processes in photoactive transition metal complexes with ultrafast X-ray and optical spectroscopies

15/01/2023

IEEE Conference on Advances in Magnetism
Nanma, Italy

Oral communication(s)

J. Leinweber, J. Dotseba-Julia, D. Ortega

Estimating the heating and its distribution of complex nanoparticle aggregates for magnetic hyperthermia

Lucas Perez, Claudia Fernández-González, Alba Benja, Arantxa Manzanaga, Lucia Abajo, Michel Ferrière, Roy Sany, Susana Ruiz-Gonzalez
Tailoring the magnetization processes of chemically modulated cylindrical nanowires

23/01/2023

International Workshop on X-ray Raman and other non-resonant Inelastic X-ray Scattering at XFEL, European XFEL Users Meeting 2023

Hamburg, Germany

Invited/plenary talk

Wojciech Gawelda

X-ray Raman Scattering in molecular liquids and solvents – a preliminary study

25/01/2023

Symposium in honour of Prof. Fred Wudl 'Fullerenes and Friends'

Elche

Invited/plenary talks

Nazario Martín León

The revival of fullerenes

Temple Terms

Subphthalocyanines: Singular aromatic non-planar and chiral molecules

26/01/2023

Royal Society of Chemistry's virtual Macrocyclic and Supramolecular Chemistry Seminar Series (RSC VMASC Online Seminar Series)
Online (UK)

Invited/plenary talk

Enrique M. Pérez

Macrocyclic adventures in Nanoscience

27/01/2023

Symposium of the Computing – Conjugated Compounds Society (C²C) Computing – Conjugated Compounds'

Madrid

Invited/plenary talk

Nazario Martín León

Synthetic Chiral Molecular Nanographenes

31/01/2023

XIV Conference of Young Researchers in Atomic and Molecular Physics - 10th Young Scientists Workshop on Theoretical Chemistry and Computational Modelling
Madrid

Oral communication(s)

A J Suárez-Rubio, R Y Ballo, A Palacios, F Martín
Obtaining molecular photoionization time delays, a full-dimensional study

Francisco Fernández Villaverde, Jesús González Vázquez, Alicia Palacios, Fernando Martín
Time-Resolved Images of Intramolecular Charge Transfer in Organic Molecules





4. Funding

We include all research grants that were active during the whole part of 2022 funded by the European Commission, national and regional governments and other public and private agencies.

4.1. International programmes

EUROPEAN PROJECTS



ERC GRANTS



European Research Council
Established by the European Commission

ERC SYNERGY GRANT

TOMATTO



The ultimate Time scale in Organic Molecular opto-electronics, the ATTOsecond

Grant Agreement number: 951224

From 2021 to 2027

Principal Investigator: **Dr. Fernando Martín, Fundación IMDEA Nanociencia (CHI)**

Other Principal Investigators: **Drs. Nazario Martín (Universidad Complutense de Madrid) & Mauro Nisoli (Politecnico di Milano)**

Additional Beneficiaries: Universidad Autónoma de Madrid

ERC CONSOLIDATOR GRANTS

SUPRABOT

Swarming supramolecular robots

Grant Agreement number: 101087514

From 2023 to 2028

Principal Investigator: **Dr. Thomas Hermann**

ELEC NANO



Electrically Tunable Functional Lanthanide Nanoarchitectures on Surfaces

Grant Agreement number: 766555

From 2018 to 2023

Principal Investigator: **Dr. David Écija**

COLLABORATIVE PROJECTS

PL00TO



Product Passport through Twinning of Circular Value Chains

Pilot Action for Securing a Product Passport through Twinning of Circular Value Chains

HORIZON-CL4-2022-RESILIENCE-01

Grant Agreement number: 101092008

From 2023 to 2025

Principal Investigator: **Dr. Alberto Bollero**

<https://www.pl00to-project.eu/>



PASSENGER



Pilot Action for Securing a Sustainable European Next Generation of Efficient RE-free magnets

H2020-SC5-2020-2

Grant Agreement number: 101003914

From 2021 to 2025

Coordinated by IMDEA Nanociencia

Principal Investigator: **Dr. Alberto Bollero**

<https://passenger-project.eu/>

GRAPHENECORE2



Graphene-based disruptive technologies

GRAPHENECORE 3

Graphene Flagship Core Project 3

H2020-SGA-FET-GRAPHENE-2019

Grant Agreement number: 881603

From 2020 to 2023

Principal Investigator: **Dr. Francisco Guinea**

MARIE SKŁODOWSKA-CURIE ACTIONS (MSCA) | H2020



IDEAL



IMDEA Nanociencia Postdoctoral Training

Programme in Nanoscience

H2020-MSCA-COFUND-2020

Grant Agreement number: 101034431

From 2021 to 2026

Principal Investigator: **Dr. M. J. Villa** (Projects, Communication and Research Support Offices)

<http://www.idealcofund-project.eu/>



IMDEA Nanociencia PhD Training Programme in Nanoscience

H2020-MSCA-COFUND-2020

Grant Agreement number: 101081615

From 2022 to 2027

Principal Investigator: **Dr. M. Davies** (Projects, Communication and Research Support Offices)

<http://www.idealcofund-project.eu/>

TClock4AD

Targeting Circadian Clock Dysfunction in Alzheimer's Disease

HORIZON-MSCA-2021-DN-01

Reference 101072895

From 2023 to 2027 (48 months)

Principal Investigator: **Dr. Valle Palomo**

EURAMET – EMPIR



The EMPIR initiative is co-funded by the European Union's Horizon 2020 research and innovation programme and the EMPIR Participating States

MEMQuD

Memristive devices as quantum standard for nanometrology

H2020-EMPIR-2020-Normative

Reference: 20FUN06

From 2021 to 2024 (36 months)

IMDEA Nanociencia is Partner in a consortium of 15 coordinated by the Istituto Nazionale di Ricerca Metrologica (INRIM) / NMI (Italy)

Principal Investigator: **Dr. Mariela Menghini**

COMET**Two dimensional lattices of covalent- and metal-organic frameworks for the Quantum Hall resistance standard**

H2020-EMPIR-2020-Normative

Reference: 20FUN03

From 2021 to 2024 (36 months)

IMDEA Nanociencia is Partner in a consortium of 10 coordinated by the Centro Español de Metrología (CEM) / (Spain)

Principal Investigator: **Dr. Enrique Cánovas****EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY (COST ACTIONS)****NEXT****An international network for Non-linear Extreme Ultraviolet to hard X-ray techniques (NEXT) (CA22148)**

From 2023 to 2026

Chair: **Prof. Cristian Svetina**<https://www.cost.eu/actions/CA22148/>**ATTOCHEM****Attosecond Chemistry (CA18222)**

From 2019 to 2023

Chair: **Prof. Fernando MARTÍN**<https://www.cost.eu/actions/CA18222/#tabsName:overview>**OTHER INTERNATIONAL PROGRAMMES****DECOSMOL****Design and Control of Single Molecule Junctions**

EIG Concert-Japan 2022

Reference: PCI2023-143389

Principal Investigator: **Dr. Teresa González****MiniPINS****Miniaturized Sensor Packages and Delivery Systems for In-Situ Exploration**

From 11-2019 to 04-2023 (18 months)

ESA Contract No. 4000128070/19/NL/KML

IMDEA Nanociencia is subcontractor of in a consortium of 7 coordinated by the Finnish Meteorological Institute / FMI (FI)

Principal Investigator: **Dr. Héctor Guerrero****4.2. National Programmes****PROYECTOS DE I+D+I EN LÍNEAS ESTRATÉGICAS 2022****Call 2022****NEUMOSENSOR****Diagnóstico rápido de neumonía mediante marcado con nanopartículas magnéticas**

Ref.: PLEC2022-009490

From 2022 to 2025

Coordinator: Fundacion Instituto de Investigación Sanitaria de Santiago de Compostela, Spain

Principal Investigator: **Drs. Gorka Salas & Álvaro Somoza****PROGRAMA ESTATAL PARA DESARROLLAR, ATRAER Y RETENER TALENTO****Call 2023****WaSP****Waste-free Dissipative Supramolecular Polymerization**

Ref. ATR2023-143526

From 2023-2027

Principal Investigator: **Dr. Thomas Hermans**



PROYECTOS DE GENERACIÓN DE CONOCIMIENTO

Call 2021

SEMICON

Conjugated microlaser sensors

Ref.: PID2021-1283130B-I00

From 2022 to 2025

Principal Investigators: [Drs. Juan Cabanillas & Reinhold Wannemacher](#)

FLUOMEBCAC

Advanced fluorescence microscopy to understand and improve mechano-bactericidal nanomaterials

Ref.: PID2021-122231NB-I00

From 2022 to 2025

Principal Investigator: [Dr. Cristina Flors](#)

CONPHASETM

Epitaxial growth, doping engineering and characterization of transition metal ditellurides

Ref.: PID2021-123776NB-C21

From 2022 to 2025

Principal Investigator: [Dr. Manuela Garnica](#)

MITO-DYN

In vitro single-molecule characterization of mitochondrial replisome dynamics in human health and disease

Ref.: PID2021-126755NB-I00

From 2022 to 2025

Principal Investigator: [Dr. Borja Ibarra](#)

BIINTEL

Birradicales para Espintrónica y Aplicaciones Termoeléctricas

Ref.: PID2021-127964NB-C21

From 2022 to 2025

Principal Investigator: [Dr. Edmund Leary](#)

QDs4ALS

Improved biosensors for better drug assessment in amyotrophic lateral sclerosis

Ref.: PID2021-1283400A-I00

From 2022 to 2025

Principal Investigator: [Dr. Valle Palomo](#)

ECoSOx

Electric Control of Spin Orbit interactions and magnetic nanostructures

Ref.: PID2021-1229800B-C52

From 2022 to 2025

Principal Investigator: [Dr. Paolo Perna](#)

Call 2022

ABRUPT

Ultimate limits for photoinduced phase transitions and non-linear optics in quantum materials

Ref.: PID2022-137817NA-I00

From 2023 to 2026

Principal Investigator: [Dr. Allan Johnson](#)

NANOMATSURF

Nanomaterials at surfaces

Ref.: PID2022-136961NB-I00

From 2023 to 2026

Principal Investigator: [Dr. David Écija](#)

MAINSTREAM

Manufacturing of superconducting devices for PRIMA and future space missions

Ref.: PID2022-1377790B-C42

From 2023 to 2026

Principal Investigator: [Dr. Daniel Granados](#)

NOVMOMAT

Novel phenomena in moiré materials

Ref.: PID2022-1377790B-C42

From 2023 to 2026

Principal Investigator: [Dr. Daniel Granados](#)

ESTUDYAMOS**Ultrafast dynamics of ionized molecules and 2D materials**

Ref.: PID2022-138288NB-C31

From 2023 to 2026

Principal Investigator: [Dr. Fernando Martín](#)**ENCENDER****Bright or Dark - Regulation of Radiative vs. Nonradiative Processes in Novel Conjugated Organic Materials**

Ref.: PID2022-138222NB-C21

From 2023 to 2026

Principal Investigator: [Dr. Johannes Gierschner](#)**MAREA****Molecular Switchable Architectures for Energy Saving and Environmental Sensing**

Ref.: PID2022-141738NB-I00

From 2023 to 2026

Principal Investigator: [Dr. José Sánchez Costa](#)**PROYECTOS ESTRATÉGICOS ORIENTADOS A LA TRANSICIÓN ECOLÓGICA Y A LA TRANSICIÓN DIGITAL**

Call 2021

RESILIENS**RECYCLING OF SILICON FOR NEW SOLAR GENERATION: Non-contact time resolved electrical characterization of recycled silicon**

Ref.: TED2021-129624B-C44

From 2022 to 2024

Principal Investigator: [Dr. Enrique Cánovas](#)**FUNWIN****Manufacturing of functionalized optical devices for photovoltaic smart windows**

Ref.: TED2021-130920B-C22

From 2022 to 2024

Principal Investigators: [Drs. María Isabel Rodríguez & María Teresa González](#)**INTERPLAY****Design, Synthesis, and Characterization of Rigid Layered Perovskites**

Ref.: TED2021-131018B-C22

From 2022 to 2024

Principal Investigators: [Drs. José Sánchez Costa & Reinhold Wannemacher](#)**PERSOLAR****Disruptive Photo and Electroactive Materials for highly-stable hybrid 2D perovskite solar cells**

Ref.: TED2021-131255B-C41

From 2022 to 2024

Principal Investigators: [Dr. Nazario Martín](#)**RETAIN****Recycling through an affordable implementation of nanoscience: sustainable production of permanent magnets in Europe**

Ref.: TED2021-132490B-I00

From 2022 to 2024

Principal Investigators: [Drs. Alberto Bollero & Ester María Palmero](#)**MOSES****Sustainable H₂ production with new 2D bio-hybrid photocatalysts based on Earth abundant and environmentally friendly resources**

Ref.: TED2021-131906A-I00

From 2022 to 2024

Principal Investigators: [Drs. Víctor Vega & Sara Hernández](#)



PROYECTOS I+D+I» - MODALIDADES «RETOS INVESTIGACIÓN» Y «GENERACIÓN DE CONOCIMIENTO

Call 2020

NEXUS

Síntesis de Nanoestructuras L10-MNALC Monofásicas Diseñadas y de la Fase Cosmológica L10-FENI para la fabricación de Imanes L10 mediante Impresión 2D

Ref.: PID2020-115215RB

From 2021 to 2024

Principal Investigator: [Dr. Alberto Bollero](#)

PICANTE

Polímeros mecánicamente enlazados con nanotubos de carbono para electrodos de baterías

Ref.: PID2020-116661RB-I00

From 2021 to 2024

Principal Investigator: [Dr. Emilio M. Pérez](#)

NANORARE

Herramientas nanobiotecnológicas para detección y tratamiento de enfermedades raras: cáncer pancreático, melanoma de uvea y distrofia muscular de Duchenne

Ref.: PID2020-119352RB-I00

From 2021 to 2024

Principal Investigator: [Dr. Álvaro Somoza](#)

THEXP

Propiedades magnéticas y coloidales de nano-ensamblados formados tras la interacción específica entre nanopartículas magnéticas y biomarcadores

Ref.: PID2020-117080RB-C53

From 2021 to 2024

Principal Investigator: [Dr. Francisco Terán](#)

POMELO

Diseño de potentes metalofármacos y su seguimiento en el nanoespacio intracelular

Ref.: PID2020-117766GB-I00

From 2021 to 2024

Principal Investigator: [Dr. Ana M. Pizarro](#)

REGINNA

Nanomateriales Innovadores Regenerativos

Ref.: PID2020-120202RB-I00

From 2021 to 2024

Principal Investigator: [Dr. Isabel Rodríguez](#)

Call 2019

MADE

Fabricación de detectores superconductores mul- ti-frecuencia para futuras misiones espaciales en el FIR/sub-mm/mm

Ref.: PID2019-105552RB-C44

From 2020 to 2023

Principal Investigator: [Dr. Daniel. Granados](#)

NAISMAHT

Nanoestructuras para imagen, detección y calentamiento magnético de células tumorales

Ref.: PID2019-106301RB-I00

From 2020 to 2023

Principal Investigators: [Dr. Gorka Salas](#)

NEO-CHEM

Química Orgánica fuera del equilibrio: sistemas químicos compartimentalizados hacia la construcción de una protocélula sintética

Ref.: PID2019-106327GA-I00

From 2020 to 2023

Principal Investigators: [Dr. I. Colomer](#)

ERA-SOLAR

Dinámica de electrones en interfaces punto cuántico-co-óxido metálico: estudios fundamentales y desarrollo de dispositivos de alta eficiencia para la conversión de energía solar

Ref.: PID2019-107808RA-I00

From 2020 to 2023

Principal Investigators: [Dr. Enrique Cánovas](#)

pi-CONJUNANO

Diseño en superficies y propiedades físico-químicas de polímeros pi-conjugados

Ref.: PID2019-108532GB-I00

From 2020 to 2023

Principal Investigators: **Dr. David Écija**

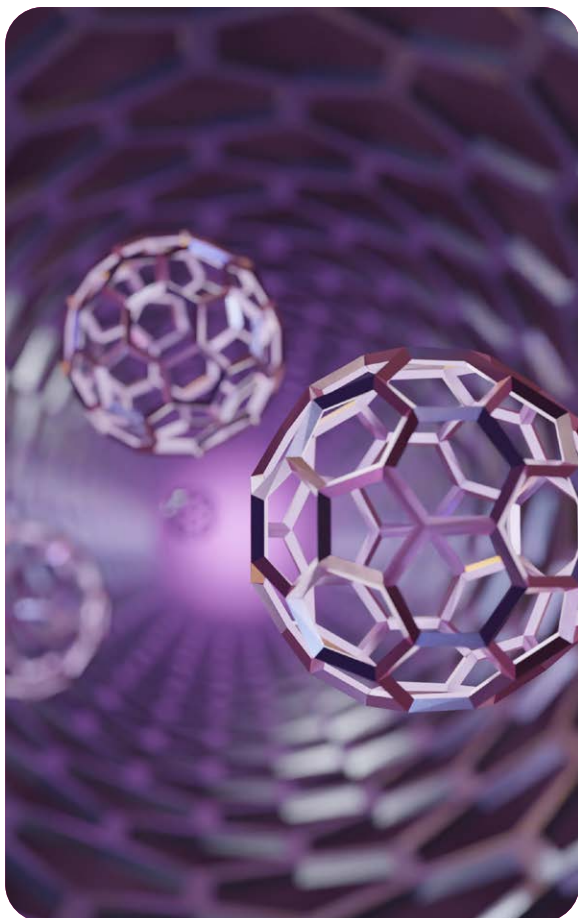
AIRE

Arquitecturas Conmutables Avanzadas para detección molecular

Ref.: PID2019-111479GB-I00

From 2020 to 2023

Principal Investigators: **Dr. J. Sánchez-Costa**



SUBPROGRAMA ESTATAL DE GENERACIÓN DE CONOCIMIENTO Y FORTALECIMIENTO CIENTÍFICO Y TECNOLÓGICO DE I+D+I

Centros de Excelencia «Severo Ochoa»

Severo Ochoa Centre of Excellence (Call 2017)



Ref.: CEX2020-001039-S

From 2022 to 2025

Scientific Director: **Dr. Fernando Martín**

IMDEA Nanociencia became an accredited Severo Ochoa Centre of Excellence by the Spanish Ministry of Economy, Industry and Competitiveness 2017 and in 2021. This award is the highest national recognition for centres of excellence in Spain and is granted after a rigorous evaluation process carried out by an independent international committee of prestigious scientists.

Europa Redes y Gestores - Europa Centros Tecnológicos 2020

IMPULSA

Plan estratégico para el impulso de la participación de IMDEA Nanociencia en Horizonte Europa (IM-PULSA)

Ref.: ECT2020-000746

From 2021 to 2023

Principal Investigator: **Dr. M. J. Villa** (Projects, Communication and Research Support Offices)

Redes de Investigación 2022

FOTO-AVAN

FOTOVOLTAICA AVANZADA

Ref.: RED2022-134939-T.

From 2023 to 2025

Investigador Principal: **Dr. Nazario Martín**



SUBPROGRAMA ESTATAL DE I+D+I ORIENTADA A LOS RETOS DE LA SOCIEDAD

Programación Conjunta Internacional

Call 2020

COSMAG

From the cosmos to the lab: Development of the L10-FeNi phase as a disruptive permanent magnet alternative

Funding: M-ERANET 2019 Ref.: PCI2020-112143

From 2020 to 2023

Principal Investigator: [Dr. Alberto Bollero](#)

Coordinated by IMDEA Nanociencia

Call 2019

SOgraphMEM

Spin Orbit functionalized GRAPHene for resistive-magnetic MEMories

Funding: FLAG ERA 3

From 2020 to 2022

Principal Investigator: [Dr. Paolo Perna](#)

Coordinated by IMDEA Nanociencia

Consolidación Investigadora 2023

Call 2022

Fun_MOFs

Functional Conductive Metal Organic Frameworks

Ref.: CNS2022-136203

From 2023 to 2025

Principal Investigator: [Dr. Enrique Cánovas](#)

ASEMIC

Atomic-scale synthesis and characterization of 2D semiconductors

Ref.: CNS2022-135175

From 2023 to 2025

Principal Investigator: [Dr. Manuela Garnica](#)

SPINCODE

Electrically-driven Spin-Orbit functionalized systems (SPINCODE)

Ref.: CNS2022-136143

From 2023 to 2025

Principal Investigator: [Dr. Paolo Perna](#)

NeuroEVs

Development of tools to study extracellular vesicle modulation in models of neurodegenerative diseases: improving drug evaluation in neurodegeneration

Ref.: CNS2022-135852

From 2023 to 2025

Principal Investigator: [Dr. Valle Palomo](#)



GOBIERNO DE ESPAÑA
MINISTERIO DE CIENCIA E INNOVACIÓN



CONVOCATORIA DE AYUDAS MARÍA DE GUZMÁN PARA EL FOMENTO DE LA INVESTIGACIÓN CIENTÍFICA DE EXCELENCIA

Call 2020-21

Nanociencia Abierta

Ref.: MDG-20-11189

From 2022 to 2024

Principal Investigator: [Dr. Mark Davies](#) (Projects, Communication and Research Support Offices)

CONVOCATORIA DE AYUDAS PARA EL FOMENTO DE LA CULTURA CIENTÍFICA

Call 2022

Nanociencia entretenida

Ref.: FCT-22-18542

From 2023 to 2024

Principal Investigator: [Patricia López Alegre](#) (Projects, Communication and Research Support Offices)

OTHER PROJECTS



ASOCIACIÓN ESPAÑOLA CONTRA EL CÁNCER. PROYECTOS COORDINADOS 2022

Reactivation of anti-tumor immune cell responses by functionalized nanoparticles in melanoma

From 2022 to 2027

Coordinator: **Dr. Héctor Peinado** (CNIO, Spain)

Principal Investigator: **Dr. Álvaro Somoza**

ASOCIACIÓN ESPAÑOLA CONTRA EL CÁNCER. IDEAS SEMILLA 2019

AECC Semilla 2021

Nuevo tratamiento de Glioblastoma basado en dual termonanopartículas

From 2021 to 2023

Principal Investigator: **Dr. Sebastian A. Thompson**

LA CAIXA HEALTH RESEARCH 2021



Drugs4ALS

Targeting TDP-43 with protein kinase inhibitors: an effective and measurable therapy for ALS

Principal Investigator: **Dr. Valle Palomo**

ASSOCIATION FRANÇAISE CONTRE LES MYOPATHIES



AFM-Téléthon

Functionalized nanoparticles for targeted genome editing in Duchenne Muscular Dystrophy

From 2022 to 2024

Coordinator: **Dr. Daniela Palacios** (Università Cattolica del Sacro Cuore, Milan, Italy)

Principal Investigator: **Dr. Álvaro Somoza**

4.3. Regional programmes

Plan de Recuperación, Transformación y Resiliencia – Recursos NEXT GENERATION-EU

LÍNEA DE ACTUACIÓN DE PROYECTOS DE I+D+I MATERIALES CON FUNCIONALIDADES AVANZADAS PARA LA NUEVA TRANSFORMACIÓN TECNOLÓGICA

Materiales Disruptivos Bidimensionales (2d)

From 2022-2025

Coordinator: Universidad Complutense de Madrid, Spain

Principal Investigators: **Drs. Francisco Guinea, Emilio M, Pérez, D. Ecija, Manuela Garnica & José S. Costa**

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

CONVOCATORIA BIOMEDICINA 2022

RENIM-CM

Red Madrileña de Nanomedicina en imagen molecular

P2022/BMD-7403

Coordinator: Fundación para la investigación biomédica del Hospital Gregorio Marañón

From 2023 to 2026

Principal Investigator: **Dr. Alvaro Somoza**



CONVOCATORIA TECNOLOGÍAS 2018

NMAT2D-CM



Nuevos materiales bidimensionales: caracterización, propiedades y aplicaciones

Coordinator: IMDEA Nanociencia

From 2019 to 2023

Principal Investigator: [Dr. Francisco Guinea](#)

NanomagCOST-CM



Soluciones del nanomagnetismo a los retos sociales

From 2019 to 2023

Coordinator: Universidad Autónoma de Madrid

Principal Investigators: [Drs. Rodolfo Miranda, Alberto Bollero and Paolo Perna](#)

TEC2SPACE-CM



Desarrollo y explotación de nuevas tecnologías para instrumentación espacial en la Comunidad de Madrid

Coordinator: Centro de Astrobiología (CAB)

From 2019 to 2023

Principal Investigator: [Dr. Daniel Granados](#)

MADRID-PV2-CM

Materiales, dispositivos y tecnologías para el desarrollo de la industria fotovoltaica

Coordinator: Instituto Energía Solar (Universidad Politécnica de Madrid)

From 2019 to 2023

Principal Investigator: [Dr. Isabel Rodríguez](#)

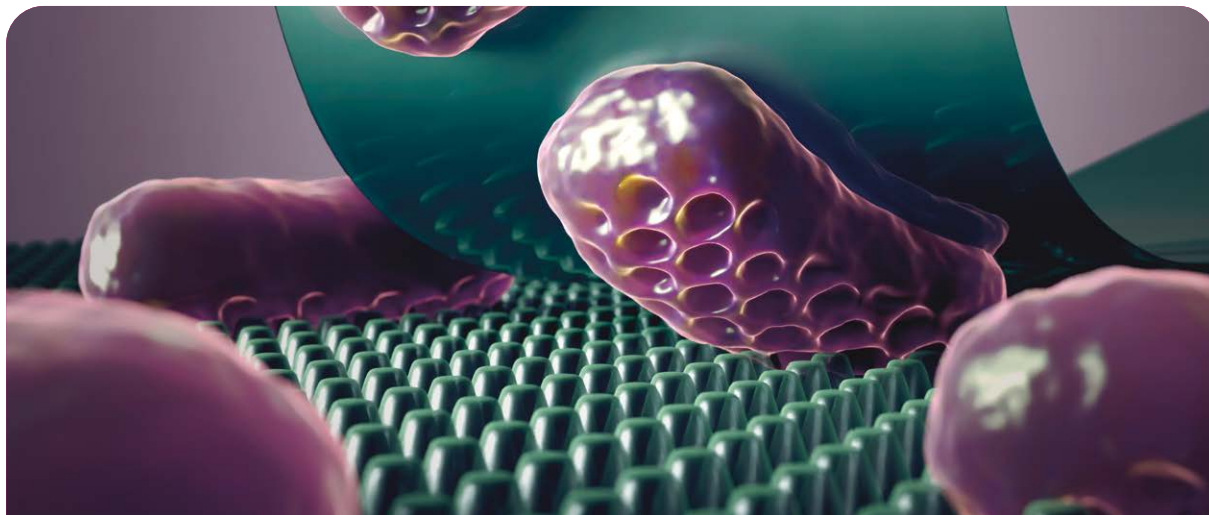
FotoArt-CM



Nueva generación de materiales multifuncionales para fotosíntesis artificial

From 2019 to 2023 Coordinator: IMDEA Energía

Principal Investigators: [Drs. Emilio M. Pérez & Cristina Navío](#)



4.4. Industrial projects

The Strategic Industrial Partnership Office (SIPO) plays a key role in establishing new strategic alliances, partnerships and collaborations with the private sector. The office also fosters collaboration with strategically important institutional partners.

A system has been introduced to manage all the contacts and monitor the maturity of the relationships using a proprietary set of metrics Partnership Readiness Level (PRL). 35 of these companies represents for IMDEA Nanociencia an Indus- trial opportunity. These are spread across several research areas: Aerospace, Security & Defence; Health & Food; Na- nomaterials, Sensors & Metrology; Transport / Logistics; Information (Artificial Intelligence); Energy & Environment are now part of the IMDEA Nanociencia eco-system, with 19% of these contacts coming from outside of Spain.

Nanocore Aps (Denmark)

nanocore
STRENGTH FROM WITHIN

TSUNAMI

From 2020 to 2023

Principal Investigator: [Dr. Emilio M. Pérez](#)

Airbus Defence and Space SAU (Spain)

 **AIRBUS**
DEFENCE & SPACE

GONDOLA

From 2021 to 2024

Principal Investigators: [Drs. Isabel Rodríguez & Gorka Hernández](#)

Bosch (Germany)

 **BOSCH**

Future Rare-Earth-Free Permanent Magnet Materials

From 2022 to 2025

Principal Investigators: [Dr. Alberto Bollero](#)

Tecnicas Reunidas + IMA S.L.U.

Celsa

4.5. Fellowships

4.5.1. International



MARIE SKŁODOWSKA-CURIE ACTIONS (MSCA) I H2020

LiquidWallCat

Embedding catalysts in liquid wall flow devices

HORIZON-MSCA-2022-PF-01

Grant Agreement number: 101105624

From 2023 to 2025

Fellow: [Dr. Marten Ploeger](#)

CRMS

Microfluidic Diffusion-based Chiral Resolution

HORIZON-MSCA-2022-PF-01

Grant Agreement number: 101108604

From 2023 to 2025

Fellow: [Dr. Avinash Dhamija](#)

STED

Real Space-Time imaging and control of Electron Dynamics

HORIZON-MSCA-2022-PF-01 Reference 101108851

From 2023 to 2025 (24 months)

Fellow: [Dr. Alberto Martín](#)

STORM

Synthesis of Transition metal dichalcogenides Optimized for MRAMs

HORIZON-MSCA-2021-PF-01

Grant Agreement number: 101063547

From 2022 to 2024

Fellow: [Dr. Iolanda di Bernardo](#)

**PhoMOFs**

Accessing Electron-Phonon interactions of two-dimensional Metal Organic Frameworks by Ultrabroadband Terahertz Spectroscopy based on the Spintronic Trilayer Emitter

H2020-MSCA-IF-2020

Grant Agreement number: 101030872

From 2021 to 2023

Fellow: [Dr. Vasileios Balos](#)

OssCaNa

On-Surface Synthesis, Transfer and Device Fabrication of Novel Carbon-based Nanomaterials

H2020-MSCA-IF-2019 MSCA-IF-EF-ST

Grant Agreement number: 886314

From 2021 to 2023

Fellow: [Dr. José Ignacio Urgel](#)

TweeTERS

H2020-MSCA-IF-2019

Grant Agreement number: n° 892667.

From 2020 to 2023

Fellow: [Dr. Natalia Martín](#)

IDEAL Postdoc

Fellows: [Dr. Felipe Viela](#), [Dr. Marc G. Cuxart](#), [Dr. Andrés Burgos](#), [Dr. Indranil Bhattacharjee](#), [Dr. Zhan Zhen](#)

4.5.2. National**PROGRAMA ESTATAL DE PROMOCIÓN DEL TALENTO Y SU EMPLEABILIDAD EN I+D+I**

Ayudas para la contratación de doctores «Ramón y Cajal»

Call 2022 [Drs. José Ignacio Urgel & Víctor Vega](#)

Call 2021 [Dr. Allan Johnson](#)

Call 2020 [Dr. Manuela Garnica](#)

Call 2019 [Dr. Valle Palomo](#)

Ayudas para la contratación de doctores «Juan de la Cierva»

Incorporación

Call 2020 [Dr. Ester María Palmero](#)

Formación

Call 2022 [Drs. Marco Ballabio & Aurelio Gallardo](#)

Call 2021 [Drs. Ana Isabel Barragán, Carmen García & Mario Martínez](#)

Ayudas para la contratación de personal técnico de apoyo a la I+D+i

Call 2018 [Drs. Patricia Pedraz & Cintia de Vequi](#)

Contratos predoctorales para la formación de doctores (FPI Programme)

Call 2022 [Julia Garcia, Maria Ortiz, Carmen Perez de la Lastra, Alejandro Bueso, Alba Guio, Jorge Gómez, Miguel Varea, Shreya Baghi, Zaida Curbelo](#)

Call 2021 [Alejandro Martin, Noelia Rodriguez, Alireza Amiri, Alejandro Venegas, Christensen Rocha Aperador](#)

Call 2020 [Luis Calahorra, Ignacio Figueruelo, Rosalía López, Héctor Sainz, Miguel Ángel Pulido](#)

Call 2019 [Claudia Cardozo, Alberto Martin Asensio, Saúl Garcia-Orrit, Ana Martínez, Ismael Plaza](#)

Call 2018 [Alicia Naranjo, Ana Arché, Jesús Galán, Alejandro Jimeno, Ingrid Ortega](#)

Contratos predoctorales para la formación del profesorado universitario (FPU Programme)

Call 2020 [Cristina García](#)

Programa «INVESTIGO» (Plan de Recuperación, Transformación y Resiliencia) (Servicio Público de Empleo Estatal)

Total 21

Call 2022 (19 research assistants & 2 Tech)

4.5.3. Regional (Comunidad de Madrid)



PROGRAMA DE ATRACCIÓN DE TALENTO INVESTIGADOR

Ayudas para la contratación de doctores con experiencia (Modalidad 1)

Call 2021 **Drs. José García & Fernando Ajejas**

Call 2019 **Drs. Ramón Bernardo & Víctor Vega**

Call 2018 **Dr. Yago Ferreirós, Dr. Alberto González**

Ayudas para la contratación de jóvenes doctores (Modalidad 2)

Call 2019 **Drs. Ramón Bernardo & Víctor Vega**

Call 2018 **Drs. Yago Ferreirós & Alberto González**

Ayudas destinadas a la atracción de talento investigador "César Nombela"

Call 2023 **Drs. Vasileios Basos & Sara Hernández**

Ayudas para la Contratación de Doctorados Industriales

Call 2023 **Altenea Biotech S.L. (IND2023/IND-28578) Guillermo Gutiérrez (Prof. Álvaro Somoza)**

Call 2020 **Alodia Farmacéutica S.L. (IND2020/IND- 17517). Arturo González (Prof. Alvaro Somoza)**

Ayudas para la Contratación de Personal Investigador Predoctoral en Formación

Call 2023 **Irene Pardo, Guillermo González, Guillermo Parra, Sandra Martínez, Gabriel Caballero, Alejandro Martín**

Programa Operativo de Empleo Juvenil y la Iniciativa de Empleo Juvenil (YEI). Realización de contratos de Ayudantes de investigación/ Técnicos de Laboratorio

Call 2021 **Elias Faro (Beatriz de Vicente), Cristina Sánchez, Eva Mar López, Sergio Polo (tech)**

Call 2020 **Nadia Pastor, Irene de la Iglesia, Alejandro M. Rivas (tech)**

4.5.4. Others Programmes



BBecas postdoctorales en Centros de Investigación y Universidades Españolas (Junior Leader)

Call 2021 **Dr. Sara Hernandez**

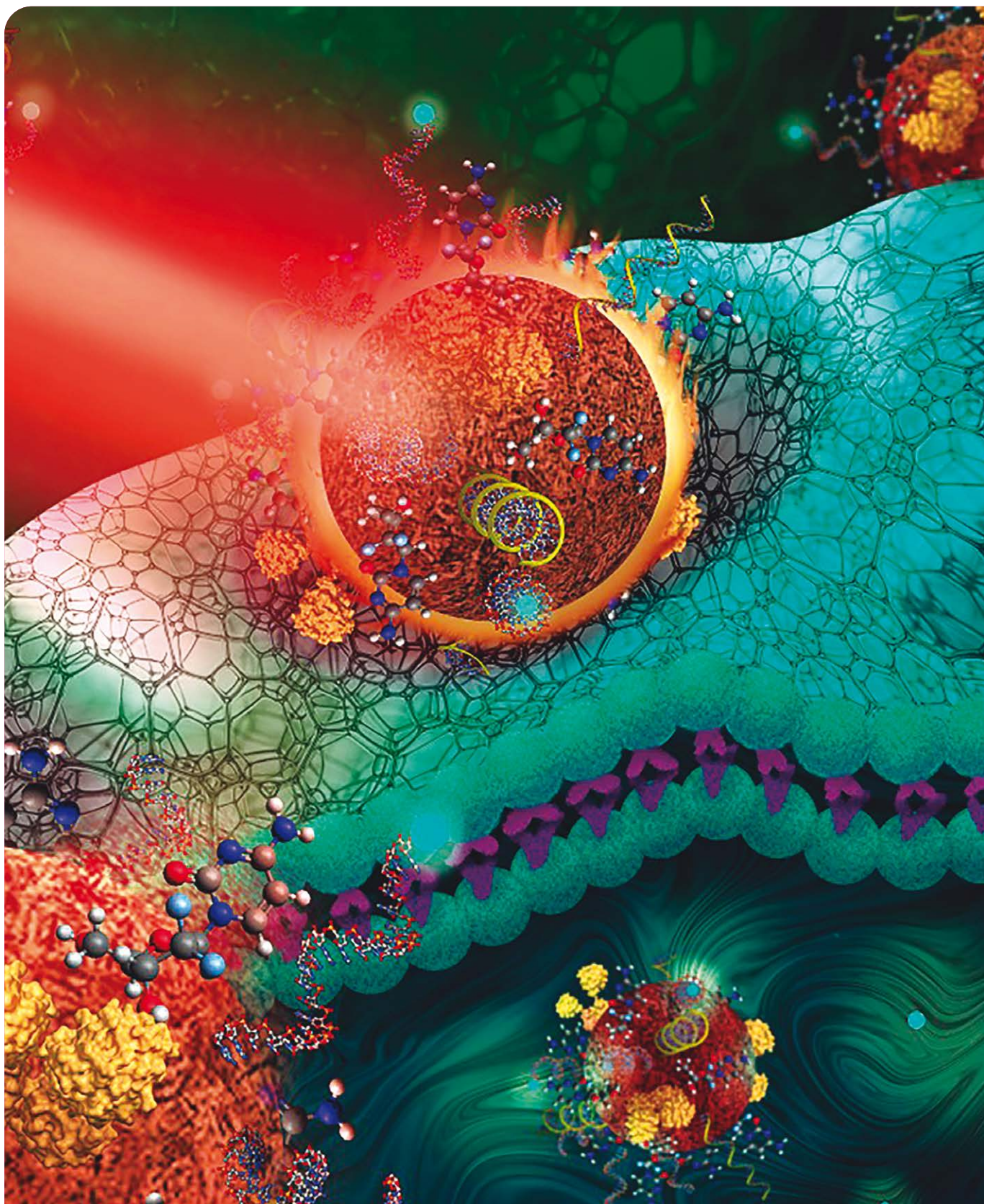
Programa de Becas de Doctorado InPhINIT

Call 2020 **Alonso José Campos**



Ayudas Predoctorales en Oncología (APRO)

Call 2019 **Dr. Catarina Coutinho**



5. Training

5.1. PhD theses

03/03/2023

María Teresa Alameda

Design and fabrication of nanostructured materials with regenerative and antibacterial properties

PhD Supervisor(s): Isabel Rodríguez

10/03/2023

Diego Jiménez Vicent

Tetrabromo-p-quinodimetanos (TBQs): bloques de construcción versátiles para electrónica orgánica

PhD Supervisor(s): Nazario Martín, José Santos Barahona

22/03/2023

José Manuel Díez Toledano

Detailed temperature and angular investigation on magnetic properties of model transition-metal oxides: from films grown on vicinal surfaces to bilayers exploiting interfacial exchange bias phenomena

PhD supervisor(s): Julio Camarero

30/03/2023

Paula Milán Rois

Therapies and diagnostic approaches based on ncRNAs and nanotechnologies: Reprogramming cancer cells and multimodal treatments

PhD supervisor(s): Álvaro Somoza

24/04/2023

Carla Muñoz Rodríguez

Nanostructuring and phase transformation in gas-atomized MnAlC: from powder to rare earth-free permanent magnets

PhD supervisor(s): Prof. Alberto Bollero, Dra. Ester M. Palmero

05/05/2023

Sergio Dávila Martínez

Tumor-on-a-chip devices for in vitro modelling of nanomedicine transport

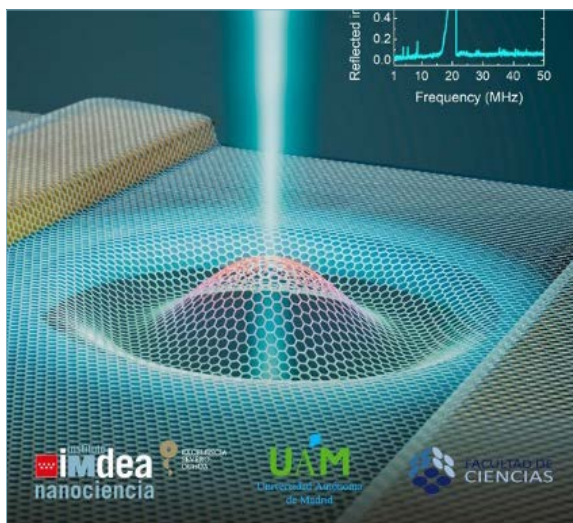
PhD supervisor(s): Prof. Isabel Rodríguez

09/05/2023

Víctor Marzoa

Optoelectrical Nanomechanical Drum Resonators Based on Few-Layer MoS₂

PhD supervisor(s): Daniel Granados Ruíz, Dr. Ramón Bernardo Gavito



22/05/2023

Tamara Guerrero Esteban

Desarrollo de dispositivos sensores basados en electroquimioluminiscencia para la detección de analitos de interés

PhD supervisor(s): Encarnación Lorenzo Abad, Cristina Gutiérrez Sánchez

**26/06/2023****Laura Álvaro Gómez***Current-induced motion of magnetic domain walls in cylindrical nanowires with chemical modulations*

PhD supervisor(s): Olivier Fruchart, Lucas Pérez

10/07/2023**Juan Carlos Martín Romano***Interactions and processes of short organic molecules on surfaces: from model prebiotic surface reactivity to organic transistors*

PhD supervisor(s): Miguel Ángel Niño, Julio Camarero

11/07/2023**Joel Fallaque***Theoretical study of aromatic single-molecule junctions with DFT-based methods*

PhD supervisor(s): Fernando Martín, Cristina Díaz

17/07/2023**Carmen Escalona Noguero***Applications of CRISPR/CAS technology and nanovehicles in the edition and detection of pathogenic mutations*

PhD supervisor(s): Begoña Sot

20/07/2023**Ingrid Ortega Rengifo***Real-time fluorescence microscopy to study bacterial response in antimicrobial strategies*

PhD supervisor(s): Cristina Flors

14/09/2023**Tomás Nicolás García***Design, synthesis and single-molecule manipulation of artificial molecular machinery*

PhD supervisor(s): Emilio M. Pérez, Borja Ibarra

19/09/2023**Jimena Soler Morala***Development of perpendicular magnetic anisotropy in (Nd, Pr)FeB thin films*

PhD supervisor(s): Alberto Bollero, Cristina Navío

03/10/2023**María Zamora Ceballos***Propiedades mecánicas de la cápsida del virus de la enfermedad hemorrágica del conejo. Análisis mutacional para su optimización como nanoplataforma.*

PhD supervisor(s): Juan Bárcena del Riego, Johann Mertens

25/10/2023**Kalyan Biswas***Emergence of π -magnetism in carbon-based nanomaterials designed by on-surface synthesis*

PhD supervisor(s): José I. Urgel, David Écija

17/11/2023**Alba Fonseca Crespo***Preparación de sistemas biohíbridos ftalocianina-peptido y nanopartículas supramoleculares de subftalocianina para su aplicación como fotosensibilizadores (PSs) en terapia fotodinámica (PDT)*

PhD Supervisor(s): Tomás Torres, Miguel Garcia-Iglesias

11/12/2023**Yana E. Kibireva (Philippova)***Synthesis and properties of Hemihexaphyrazines with Mixed Substitutions*

PhD Supervisor(s): Tomás Torres, Mikhail K. Islyaikin

14/12/2023**Ana Arché Núñez***Fabrication, characterization, and in-vitro biocompatibility of nanowire-based neural stimulation electrodes*

PhD Supervisor(s): M. Teresa González, M. Concepción Serrano

15/12/2023**Sara Moreno Da Silva***Close-up on the functionalization of nanomaterials: Thermodynamic analysis and microscopic characterization*PhD Supervisor(s): Emilio M. Pérez, M^a Luisa Ruíz González

5.1.1. Master theses

09/06/2023

Elisa Collet

Ultrafast excited-state dynamics in CuInS₂ quantum dots

Supervisor(s): Wojciech Gawelda, Andrés Burgos Caminal

23/06/2023

Alicia Cano

Development of quantum dots sensors for diagnosis and pharmacological monitoring in ALS

Supervisor(s): Valle Palomo

30/06/2023

Ignacio Benito Gómez

Nuevas aproximaciones para la conjugación eficiente y liberación de oligonucleótidos terapéuticos desde nanopartículas de oro

Supervisor(s): Álvaro Somoza, Mario Martínez

30/06/2023

Javier García Fernández

Desarrollo de nuevas plataformas electrocatalíticas como detectores para la determinación de pesticidas

Supervisor(s): Emiliano Martínez Perinián, Mónica Revenga Parra

30/06/2023

Javier Lorenzo Martín

Dispositivos sensores para la determinación directa de contaminantes emergentes en agua

Supervisor(s): Félix Pariente Alonso, Mónica Revenga Parra

05/09/2023

Ivan Zumeta

RNA packaging by the NP protein of SARS-COV19 virus

Supervisor(s): Borja Ibarra

14/09/2023

Eva Mar López Muñoz

Uso de 'non-coding' RNAs circulares como diana terapéutica en cáncer

Supervisor(s): Álvaro Somoza, Luis Alberto Campos

5.1.2. End-of-degree dissertations

30/05/2023

Ainara Jimeno Cruz

Estudio de la interacción de colorantes y ADN mediante técnicas espectroelectroquímicas. Aplicación a la detección de virus de interés clínico

Supervisor(s): Tania García Mendiola, Emiliano Martínez Perinián

30/05/2023

Alejandro Portero García

Bioconjugado de nanopartículas de oro y tetraedros de ADN para la detección de virus

Supervisor(s): Tania García Mendiola, Laura Gutiérrez Gálvez

30/05/2023

Clara María Polo Castilla

Desarrollo de métodos analíticos para la determinación de glutamato monosódico en alimentos

Supervisor(s): Emiliano Martínez Perinián

30/05/2023

Sara Fernández Miranda

Desarrollo de nuevos electrocatalizadores basados en nanopuntos de carbono dopados

Supervisor(s): Emiliano Martínez Perinián, M^o Cristina Gutiérrez Sánchez

07/10/2023

Irene Carmen Fernández Del Barrio

Nuclear temperature

Supervisor(s): Sebastián Thompson

07/12/2023

Alejandra Carrancio

Lysosomal temperature

Supervisor(s): Sebastián Thompson



5.2. Seminars

37 seminars were given by speakers from 33 different institutions (17 countries)

5.2.1 Cycle of seminars IMDEA Nanociencia

The talks of the Seminar Series aim to provide information on the research being carried out by IMDEA Nanociencia groups and other external research groups, with a focus on a specific field. The seminars are aimed at all researchers (PhDs, postdocs and PIs) of IMDEA Nanociencia and are open to the public as well.

Seminars committee: Manuela Garnica, José Á. Silva, Milagros Castellanos, Javier Urieta, Alejandro López, Enrique Cánovas.

10/01/2023

Prof. M. Pilar Marco

Improved Management of Infectious Diseases Targeting Quorum Sensing with Nanobiotechnological Approaches

Instituto de Química Avanzada de Cataluña (IQAC-CSIC), Spain

24/01/2023

Dr. Pablo P. Boix

Multiscale perovskites: new structures for new challenges

Instituto de Ciencia de los Materiales de la Universitat de València, Spain

07/02/2023

Dr. Claudio Giannetti

Coherent manipulation of macroscopic phases in quantum materials

Università Cattolica del Sacro Cuore, Brescia, Italy

14/02/2023

Prof. Thomas M. Hermans

Dissipative Self-assembly and Wall-less fluidics

University of Strasbourg & CNRS, France

21/02/2023

Dr. Sara H. Mejías

Protein-promoted chromophore excited-state decay modulation

IMDEA Nanociencia, Spain

23/02/2023

Prof. Jesús Santamaría

A new therapy in oncology? Nano-catalysts that kill cells and the tumor microenvironment

Nanoscience Institute of Aragon CSIC -University of Zaragoza, Spain

07/03/2023

Prof. Raymond Schiffflers

Lipid nanoparticles and beyond

UMC Utrecht, Netherlands

14/04/2023

Dr. Eugenio Zallo

Towards large-scale, high crystalline quality and defect controlled van der Waals semiconductors

Walter Schottky Institute, Technical University of Munich, Germany

08/05/2023

Gabriela Borin Barin

Bottom-up fabrication of graphene nanoribbons: from ultra-high vacuum to device integration

Swiss Federal Laboratories for Material Science and Technology, Empa Dübendorf, Switzerland

13/06/2023

Dr. Alejandro Criado

When chemistry meets graphene: improving FET biosensors by tailored design

University of A Coruña, Spain

31/10/2023

Dr. Pierre A. Pantaleón

Tales of a theoretical modelling group

IMDEA Nanociencia, Spain

21/11/2023

Dr. Marek Grzelczak

Tailoring gold nanoparticles for thermoplasmonic applications

Centro de Física de Materiales (CSIC-UPV/EHU), Donostia International Physics Center, Spain

28/11/2023**Dr. Patricia Pedraz***Capabilities of the atomic force microscopy lab at IMDEA Nanociencia*
IMDEA Nanociencia, Spain

5.2.2. Invited speakers

21/03/2023**Dr. Manish Garg***Imaging electronic and atomic motion in molecules*
Max Planck Institute for Solid State Research, Germany**23/03/2023****Sebastián Díaz***Structural DNA Nanotechnology: Engineering Biology and Engineering with Biology*
Naval Research Laboratory, US**13/04/2023****Prof. Matthias Lehmann***Shape-persistent mesogens and intrinsic void – a new design tool for tailoring nanostructured soft materials*
University of Würzburg, Germany**25/04/2023****Prof. Marina A. Petrukhina***Curved and twisted molecular nanographenes: novel multi-electron acceptors and metal hosts*
University at Albany, State University of New York, US**30/05/2023****Dra. Esther García***Unveiling the invisible: exploring the nanoworld through multimodal microscopy*
Central Laser Facility in Harwell, UK**01/06/2023****Maarten B.J. Roeffaers***Microscopy-based approaches for investigating materials properties and performance*
KU Leuven, Belgium**09/06/2023****Prof. Ji Eon Kwon***Designing organic electrode materials for future battery applications*
Korea Institute of Science and Technology, South Korea**13/06/2023****Prof Quentin Pankhurst***Biomedical applications of magnetic nanoparticles*
Director, University College London Healthcare
Biomagnetics Laboratory, UK**16/06/2023****Prof Silvia Marchesan***Chirality as a helm to navigate peptide assembly in nanostructures*
University of Trieste, Italy**11/07/2023****Ben L. Feringa***Molecular switches and motors*
University of Groningen, Netherlands**12/07/2023****Héctor Vázquez***Atomistic simulations of conducting and thermoelectric properties of single molecule junctions*
Institute of Physics, Czech Academy of Sciences, Czech Republic**13/07/2023****Danny Fainozzi***Extending the q-range in wave-mixing spectroscopies*
Elettra Sincrotrone Trieste, Italy**04/09/2023****Waldemar A. A. Macedo***Depth-resolved investigations of interfacial effects in Fe-based layered magnetic nanostructures*
Centro de Desenvolvimento da Tecnologia Nuclear, Belo Horizonte, Brazil**08/09/2023****Cynthia Quinteros***Self-assembled structures for in-materio signal processing*
Universidad Nacional de San Martín, Buenos Aires, Argentina

**15/09/2023****Alberto Martínez Cuezva***Harnessing the mechanical bond to control the selectivity in reactions within hydrogen-bonded [2]rotaxanes*

Universidad de Murcia, Spain

15/09/2023**Narain Karedla***Advanced fluorescence microscopy for biophysical applications*

Oxford University, UK

05/10/2023**Prof. Dan Oron***Quantum photon correlations as a resource in superresolution microscopy*

Weizmann Institute of Science, Israel

11/10/2023**Dr. Wilmer Esteban Vallejo Narváez***Modelado molecular en química supramolecular, materiales bidimensionales y su aplicación en catálisis*

Instituto de Investigaciones en Materiales-UNAM, Mexico

17/10/2023**Dra. Ana Rodríguez Ramos***Design and validation of a self-propelled nano-system for biomedical applications*

IMDEA Nanociencia, Spain

22/11/2023**Prof. Akimitsu Narita***Bottom-up synthesis of atomically precise graphene nanostructures and their emerging properties*

University of Okinawa, Max Planck Institute for Polymer Research, Japan

29/11/2023**Prof. Graham J. Bodwell***Long-range through-space charge transfer in a pH-responsive mixed cyclophane of pyridine and teropyrene*

Memorial University of Newfoundland, Canada

30/11/2023**Dr. Sonia Freddi***Carbon-based electronic noses for breath analysis applications*

Università Cattolica del Sacro Cuore, Italy

05/12/2023**Dr. Pietro Carrara***Time-resolved probing of magnetic and magneto-acoustic excitations*

Università degli Studi di Milano, CNR-IOM, Italy

13/12/2023**Prof. Eugenio Coronado***2D Magnetic heterostructures: from twisted magnets to smart molecular/2D heterostructures*

Institut de Ciència Molecular (ICMol), Universidad de Valencia, Spain

5.3. Training programmes

22-23/01/2023

IDEAL Postdoc Winter School

Speakers: Rodolfo Miranda, Emilio Pérez, David Écija, Ana Pizarro, Pablo P. Boix, Julio Camarero, Enrique Cánovas, Alberto Bollero.**Workshop:** *How diversity can improve your research strategy*
Divesiunity**Workshop:** *Integration of the sex/gender dimension into research: a Horizon Europe perspective*

Divesiunity

Workshop: *Professional development planning*

Vitae

13/06/2023

**IDEAL Postdoc summer School**

Speakers: Prof. Quentin Pankhurst, Prof. Silvia Marchesán

Workshop: Dealing with the business part of an innovation research proposal

Dr Cristina Saéñz de Pipaón

14/06/2023

Talk: The entrepreneurial journey as a researcher

Dr Cristina Saéñz de Pipaón

14/06/2023

The entrepreneurial journey as a researcher

Dr Cristina Saéñz de Pipaón

4/12/2023

Workshop: Find your Path to Impact

Dr Miguel Ángel López Trujillo

Other initiatives from the projects office

9/10/2023

Pilot internal funding call for impact and innovation activities



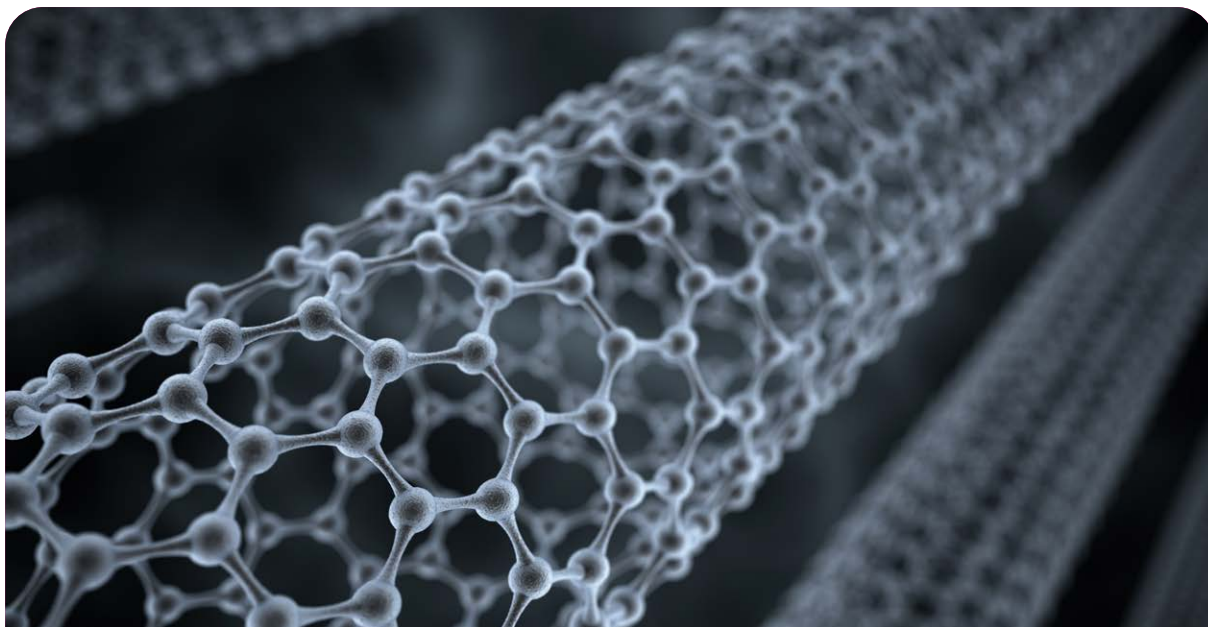
13/07/2023

IMDEA Nano Coffee Breaks: Funding calls MSCA 2023



24/11/2023

IMDEA Nano Coffee Breaks: EIC funding, insights from an evaluator





5.4. Organisation of conferences

23/01/2023

IDEAL Postdoc Winter School

Speakers: Rodolfo Miranda, Emilio Pérez, David Écija, Ana Pizarro, Pablo P. Boix, Julio Camarero, Enrique Cánovas, Alberto Bollero.

Place: IMDEA Nanociencia



16/03/2023

From Surface Science to Nanotechnology: a forty-five years journey - Miranda Fest 2023

Symposium in honour of Prof. Rodolfo Miranda

Speakers: Juan M. Rojo, Nazario Martín, Fernando Martín, Juan J. de Miguel, Roberto Otero, Daniel Granados, Juan de la Figuera, Amadeo L. Vázquez de Parga, Álvaro Somoza, Teresa González, Isabel Rodríguez, Alberto Bollero, Bonifacio Vega, Ivan K. Schuller.

Place: IMDEA Nanociencia



24/04/2023

Symposium in honour of Prof. M. Ángeles Vozmediano 'A view from the Dirac cone' (Geli Fest).

Co-organiser: José Á. Silva Guillén.

Place: Instituto de Ciencia de Materiales (ICMM-CSIC), Madrid.

29/05/2023

CECAM Workshop 'New Computational Methods for Attosecond Molecular Processes'.

Co-organiser: Fernando Martín.

Place: University of Zaragoza.

13/06/2023

1st IDEAL Summer School

Speakers: Prof. Quentin Pankhurst, Prof. Silvia Marchesan, Dr. Cristina Saénz de Pipaón and IDEAL Fellows: Andrés Burgos, Zhen Zhan, Indraniil Bhattacharjee, Marc González, Felipe Viela.

Place: IMDEA Nanociencia

22/06/2023

"Stories in the flatland (with a twist in the end)" symposium in honour of Prof. Francisco Guinea

Co-organisers: José Ángel Silva-Guillén, Pierre Pantaleón

Place: IMDEA Nanociencia



26/06/2023

XXXIX Reunión Bienal de la Real Sociedad Española de Química (Zaragoza)

Co-organisers: Nazario Martín (symposium '*Disruptive advanced materials: synthesis, properties and applications*'), Álvaro Somoza (symposium '*La Química de la Nanomedicina*').

29/06/2023

First Knowledge Transfer Symposium of Chemical Physics at UAM

Co-organiser: Juan Cabanillas.

01/07/2023

Ciclo de seminarios del departamento de Química Física de la UAM.

Co-organiser: Juan Cabanillas.

Nmat2D project final meeting

Co-organisers: Pierre Pantaleón, Enrique Cánovas, Juan Cabanillas.

Place: IMDEA Nanociencia

03/07/2023**Congreso Fuerzas y Túnel 25th anniversary**

Organiser: Manuela Garnica

Place: Zamora, Spain

10/07/2023**Curso de Verano UCM 'El Escorial': Nanociencia**

Co-organisers: Nazario Martín, Emilio Perez

Place: Real Centro Universitario Escorial – María Cristina

**17/07/2023****Curso de Verano Universidad Internacional Menéndez Pelayo:****Disruptive Advances in Chemistry for Societal Needs**

Co-organiser: Nazario Martín

27/08/2023**Joint European Magnetic Symposia 2023**

Co-organisers: Alberto Bollero, Lucas Pérez, Julio Camarero, Ester Palmero, Francisco Terán, Paolo Perna.

Place: Universidad Complutense de Madrid

04/09/2023**European School of Magnetism**

Co-organisers: Rodolfo Miranda, Julio Camarero, Lucas Pérez.

Place: La Cristalera, Miraflores de la Sierra.

28/09/2023**6th Spanish Conference on Biomedical Applications of Nanomaterials SBAN**

Co-organiser: Gorka Salas

Place: Instituto de Ciencia de Materiales de Madrid, CSIC

20/11/2023**1st training event of the MSCA Doctoral Network TCclock4AD****'Targeting Circadian Clock Dysfunction in Alzheimer's Disease'**

Organiser: Valle Palomo

Place: IMDEA Nanociencia

01/12/2023**6th Nobel Prize Winners Symposium**

Co-organisers: Álvaro Somoza, Valle Palomo, Fernando Martín, Manuela Garnica, Milagros Castellanos, José Á. Silva.

Place: IMDEA Nanociencia

14/12/2023**13th Early Stage Researchers Workshop in Nanoscience**

Organising committee: Manuela Garnica, Emilio M. Pérez, Valle Palomo, José Ángel Silva, Sara H. Mejías, M. Jesús Villa, Elena Alonso, Patricia López.

Place: IMDEA Nanociencia



5.5. Lectures

02/01/2023

Sebastián Thompson

Grado en Ciencias Químicas, Química Física I y II

Universidad Complutense Madrid

03/01/2023

J. Gierschner

Lecture Series (30 h): Photophysics of Conjugated Organic Materials

Universidad de Valencia

06/01/2023

Emilio M. Pérez

Chem 2425-Saint Louis University, Madrid

Organic Chemistry 2 Laboratory

15/01/2023

J. Gierschner

Brédas Group Seminar Series, University of Arizona (Tucson), Online

Scientific misconduct in current chemistry research: aspects and conditions

18/01/2023

Juan Cabanillas

Ciclo de Seminarios del Dpto. Química Física Aplicada (UAM), Online

Boosting the stimulated emission properties of host-guest polymer blends by disruption of exciton transport

23/01/2023

Luis Alberto Campos

Máster Universitario en Biomoléculas y Dinámica Celular, Universidad

Autónoma de Madrid, Nanomáquinas moleculares (1h)

26/01/2023

Bonifacio Vega

Encuentro de Innovadores en Nanociencia, organizado por la Fundación

PONS y Madrid Foro Empresarial

30/01/2023

Gorka Salas

Bachelor in Industrial Technology Engineering

Chemical Basis of Engineering

Madrid

01/02/2023

Emiliano Martínez-Periñán, Tania García-Mendiola, Cristina

Gutiérrez-Sánchez, Mónica Revenga-Parra, Ana Parra, Félix Pariente,

Encarnación Lorenzo

Master en Química Aplicada

Herramientas bioanalíticas

Universidad Autónoma de Madrid

Rebeca Bocanegra

Máster en Biomoléculas y Dinámica Celular

Nanomáquinas moleculares

Universidad Autónoma Madrid

03/02/2023

Borja Ibarra

Máster en Biomoléculas y Dinámica Celular

Fronteras en el estudio de las biomoléculas

Universidad Autónoma Madrid

05/02/2023

J. Gierschner

Student Seminar, Dep. for Physical Chemistry

Scientific misconduct in current materials research: aspects, conditions & perspectives

Universidad de Valencia

24/02/2023

Wojciech Gawelda

Doctoral School Seminar Series, Department of Applied Physical Chemistry

Chemical dynamics using ultrashort X-rays

Universidad Autónoma de Madrid

04/03/2023

Wojciech Gawelda

Master course in Materials Science MaMaSELF

X-ray free electron lasers - focus course

Rennes, France

17/03/2023

J. Gierschner

Lecture Series (6 x 45min), Department of Materials Science and Engineering

Photophysics of conjugated organic materials

Seoul National University

**Nazario Martín León**

Colloquium organized by the Department of Chemistry, Greece

Synthetic chiral molecular nanographenes

Online

23/03/2023**J. Gierschner**

Department of Advanced Materials, Hannam University

Tailor-made luminescent conjugated organic materials: deciphering complex photophysics for targeted materials design

Daejeon, South Korea

24/03/2023**J. Gierschner**

Korea Institute of Science and Technology

Tailor-made luminescent conjugated organic materials: deciphering complex photophysics for targeted materials design

Jeonbuk, South Korea

27/03/2023**Nazario Martín León**

Ciclo de conferencias Instituto de Química-Física Rocasolano

On-surface synthesis: a new scenario for new opportunities

Madrid

20/04/2023**Cristina Flors**

Curso de Microscopía y Aplicaciones, organizado por el Instituto de Óptica Daza de Valdés (CSIC) y la Universidad de Castilla-La Mancha

*Microscopía de superresolución***21/04/2023****Álvaro Somoza**

Grado de Química

Nanoquímica

Universidad Autónoma de Madrid

28/04/2023**Nazario Martín León**

MASTERQO – Master Universitario en Química Orgánica

Síntesis de nanografenos moleculares quirales

Madrid

01/05/2023**Enrique Cánovas**

Master de Energía Solar

Ultrafast dynamics at the nanoscale

Universidad Politécnica de Madrid

04/05/2023**Ana Pizarro**

Ciclo de Conferencias del Instituto de Síntesis Química y Catálisis

Homogénea 2023

Transition metal compounds as tools to interfere intracellular chemistry

Facultad de Ciencias, Universidad de Zaragoza-CSIC

07/05/2023**Wojciech Gawelda**

Seminar at the Institute of Physics 'Gleb Wataghin'

Tracking coupled electronic and structural dynamics in condensed phase matter with ultrashort X-ray pulses

University of Campinas, Brazil

11/05/2023**Isabel Rodríguez**

Journées Nationales de la Lithographie par Nano-Impression 2023,

Institute of Nanotechnology of Lyon (INL)

Nanoimprint lithography and hybrid processes to produce complex nanostructures

France

16/05/2023**J. Gierschner**

Centre d'Innovation et de Recherche en Matériaux Polymères

Charge transfer state engineering for tailor-made luminescent organic materials

Université de Mons, Belgium

17/05/2023**J. Gierschner**

Science Department

Scientific misconduct in current materials research: aspects, conditions & perspectives

Université de Mons, Belgium

25/05/2023**Wojciech Gawelda**

Flagship School of the Centre Européen de Calcul Atomique et



Moléculaire (CECAM) 'Ultrafast phenomena in Chemistry: Laser-matter interactions at the femto- and atto-second time scales', integrated within the Erasmus Mundus Master on Theoretical Chemistry and Computational Modeling

Laser technologies: FELs and applications

ZCAM, Zaragoza

14/08/2023

Tomás Torres

Department of Chemistry and Biochemistry

Subphthalocyanines: singular aromatic non-planar and chiral molecules

University of California, Santa Barbara, USA

01/09/2023

Emilio M. Pérez

Chem 2415-Saint Louis University

Organic Chemistry 1 Laboratory

Madrid

05/09/2023

Sara H. Mejías

Centro Nacional de Biotecnología Seminar Series

Model photosystems development for addressing challenges in light conversion

Madrid

10/09/2023

J. Gierschner

Lecture Series (30 h): Photophysics of Conjugated Organic Materials

University of Tübingen, Germany

14/09/2023

Daniel Granados

Curso de Vacío ASEVA

Lección 8. Medidores de vacío parcial

Online

26/09/2023

Francisco Guinea

Coloquio

Geneva, Switzerland

01/10/2023

Juan Cabanillas González

Tutorías Intercampus, Grado de Química

Química Física IV: Espectroscopia

UNED, Madrid

04/10/2023

Valle Palomo

XVI Conferencia del Foro 'Teófilo Hernando' de Jóvenes Investigadores

La revolución de la nanotecnología y su aplicación en la medicina e investigación biomédica

Real Academia de Medicina, Madrid

07/10/2023

J. Gierschner

Lecture Series (6 x 45min), Department of Materials Science and Engineering

Photophysics of conjugated organic materials

Seoul National University, Online

12/10/2023

Tomás Torres

Universität Bayreuth, Fakultät für Biologie, Chemie und Geowissenschaften, Makromolekulare Chemie I

Molecular materials based on subphthalocyanines

Bayreuth, Germany

13/10/2023

J. Gierschner

Student Seminar, Inst. for Physical Chemistry

Scientific misconduct in current materials research: aspects, conditions & perspectives

University of Tübingen, Germany

16/10/2023

Tomás Torres

Friedrich-Alexander Universität Erlangen-Nürnberg Faculty of Sciences, Department of Chemistry and Pharmacy, Physical Chemistry I

On-surface synthesis of organic nanostructures based on porphyrinoids

Erlangen, Germany

23/10/2023

Luis Alberto Campos

Máster Universitario en Física de la Materia Condensada y de los Sistemas Biológicos

Técnicas experimentales en Nanofísica y Biofísica (1h)

Universidad Autónoma de Madrid

25/10/2023

Cristina Flors

Máster en Física de la Materia Condensada y Sistemas Biológicos

Fluoresce microscopy

Universidad Autónoma de Madrid

**26/10/2023****Sara H. Mejías**

Máster en física de la materia condensada y nanotecnología
Diseñando nanosistemas para una conversión de luz eficiente
Universidad Autónoma de Madrid

30/10/2023**Tomás Torres**

University of Alberta, Faculty of Science, Department of Chemistry
Subphthalocyanines: singular aromatic non-planar molecules. supramolecular organization and optoelectronic properties
Edmonton, Canada

02/11/2023**Emilio M. Pérez**

Organic Chemistry Lectures
Chemistry and nanoscience: our research adventures in carbon nanotubes, 2D materials and supramolecular chemistry
Université de Geneve, Switzerland

07/11/2023**Tomás Torres**

Department of Chemistry, Simon Fraser University
The unique features and promises of porphyrinoids as advanced materials and nanostructures
Burnaby, Vancouver, Canada

09/11/2023**José Sánchez Costa**

Máster de Química para la Sostenibilidad y la Energía, Asignatura Foros de Debate en Química Sostenibles
Molecular-based switchable coordination complexes called Spin Crossover (SCO) as promising materials for future technological applications
Universidad Alcalá de Henares

12/11/2023**J. Gierschner**

Department of Physical Chemistry, Faculty of Sciences
Scientific misconduct in current materials research: aspects, conditions & perspectives
University of Málaga

22/11/2023**Borja Ibarra**

Master en Física de la Materia Condensada y de los Sistemas Biológicos
Técnicas experimentales en Nanofísica y Biofísica
Universidad Autónoma de Madrid

Rebeca Bocanegra

Master en Física de la Materia Condensada y de los Sistemas Biológicos
Técnicas experimentales en Nanofísica y Biofísica
Universidad Autónoma de Madrid

27/11/2023**Francisco Guinea**

Erasmus Mundus Joint Master Degree in Theoretical Chemistry and Computational Modelling
Madrid

27/11/2023**Wojciech Gawelda**

Warsaw PhD School in Natural and BioMedical Sciences, Institute of Physics of the Polish Academy of Sciences
Applications of XFELs in Chemistry and Molecular Sciences
Warsaw, Poland

01/12/2023**Borja Ibarra**

Máster en Biotecnología
Diseño en Biocatalisis y Nanobiotecnología
Universidad Autónoma de Madrid

05/12/2023**Isabel Rodríguez**

Máster Universitario en Biotecnología, Programa de Posgrado en Biociencias
Tutorial on mechanical modulation of cell behavior by engineered surfaces
Universidad Autónoma de Madrid

10/12/2023**Borja Ibarra**

Máster en Biomoléculas y Dinámica Celular
Nanomáquinas moleculares
Universidad Autónoma de Madrid



5.5. Alumni

Our Alumni programme is about staying part of the IMDEA Nanociencia community and connecting to your former colleagues. The Alumni initiative prepares activities to help the community stay connected: newsletter, meetings –Career Prospects– and social media feeds.



← **Alumni IMDEA Nanociencia**
233 posts

Alumni IMDEA Nanociencia
@AlumniIMDEAnano

Alumni Programme Official account. Life snapshots of alumni and #nanolMDEAns outside of @imdea_nano labs.

📧 Suscribe now to our newsletter eepurl.com/hr_jGH.
Traducir la biografía

🔗 nanociencia.imdea.org/alumni 📅 Se unió en junio de 2019

377 Siguiendo 206 Seguidores

Posts Respuestas Fotos y videos Me gusta

📌 Fijado

Alumni IMDEA Nanociencia @AlumniIMDEAnano · 23 sept. 2022
The #AlumniIMDEAnano is about staying part of the @IMDEA_Nano community and connecting to your former colleagues.



5.6. Collaborations



Collaboration agreement between the European XFEL and IMDEA Nanociencia



Max-Planck-Institut für Polymerforschung
Max Planck Institute for Polymer Research



Quantum Technology Centre | Lancaster University

GOBIERNO DE ESPAÑA | MINISTERIO DE INDUSTRIA, COMERCIO Y TURISMO
CEM CENTRO ESPAÑOL DE METROLOGÍA DE METROLOGÍA

6. Awards and honours

Prof. Nazario Martín

24/05/2023

Toma posesión como Académico de Número de la Real Academia de Ciencias Exactas, Naturales y Físicas



Tomás Torres

01/07/2023

A. v. Humboldt – J. C. Mutis Research Award

Alexander von Humboldt Foundation

Prof. Thomas Hermans

01/12/2023

2023 Netherlands Scholar Award for Supramolecular Chemistry

FMS Gravitation program (Netherlands)

Dr. Valle Palomo

17/05/2023

Most meritorious runner-up for the 2023 EFMC Prize for Young Medicinal Chemist or Chemical Biologist in Academia, European Federation for Medicinal Chemistry and Chemical Biology

04/10/2023

Fellow of the Young Forum 'Teófilo Hernando' of Royal Academy of Medicine of Spain





Dr. Sara Hernández Mejías

09/05/2023

Antalgenics SBE33 Prize

Sociedad Biofísica Española (SBE) y Antalgenics

Patricia Pedraz

22/08/2023

Jacob Wallenberg Foundation Award in Materials Science, Jacob Wallenberg Foundation through the Royal Swedish Academy of Engineering Sciences



Rodolfo Miranda, Nazario Martín, Emilio M. Pérez, Francisco Guinea, Fernando Martín, Johannes Gierschner, José I. Urgel

10/11/2023

2% most influential scientists according to the Stanford database (citations)

Fernando Martín

07/09/2023

Medalla Miguel Catalán, Grupo Especializado en Física Atómica y Molecular (RSEF y RSEQ)

Nazario Martín, Lucas Pérez

18/12/2023

Embajadores de Madrid Convention Bureau
Ayuntamiento de Madrid

Nuria Lafuente Gómez

15/06/2023

Best PhD Thesis 2022, Grupo Especializado de Química Biológica de la Sociedad Española de Química

26/09/2023

Premio a la Mejor Tesis de Doctorado en Nanomedicina, La Conexión Nanomedicina CSIC y el Grupo Especializado de Coloides e Interfases de la RSEF/RSEQ

11/10/2023

Accésit 'Ciencias de la Vida' del Premio de Investigación 'Margarita Salas' 2023

Fundación Margarita Salas y Ayuntamiento de Madrid

23/10/2023

3er Premio Talento y Tecnología

Ayuntamiento de Madrid

**Ana Martínez Martínez**

29/06/2023

Best oral communication, XXXIX Reunión Bienal de la Real Sociedad Española de Química

Best Poster (5th Symposium), XXXIX Reunión Bienal de la Real Sociedad Española de Química

27/09/2023

Best Twitter Interaction, 5th European Conference on Metal Organic Frameworks and Porous Polymers (EuroMOF2023)

Esther Resines Urien

27/09/2023

Best Poster

5th European Conference on Metal Organic Frameworks and Porous Polymers (EuroMOF2023)

Juan Carlos Roldao

09/06/2023

Mención Honorífica de Doctorado

Universidad Autónoma de Madrid

Carlota Tosat

15/06/2023

Lilly Award for PhD students

Lilly foundation with Sociedad española de Química Terapéutica

28/09/2023

Mención honorífica a la tesis doctoral de la Conexión Nanomedicina CSIC

Conexión Nanomedicina CSIC

07/11/2023

Premio de Investigación 2023

Fundación Lilly

Claudia Flórez

14/12/2023

Best Poster Award

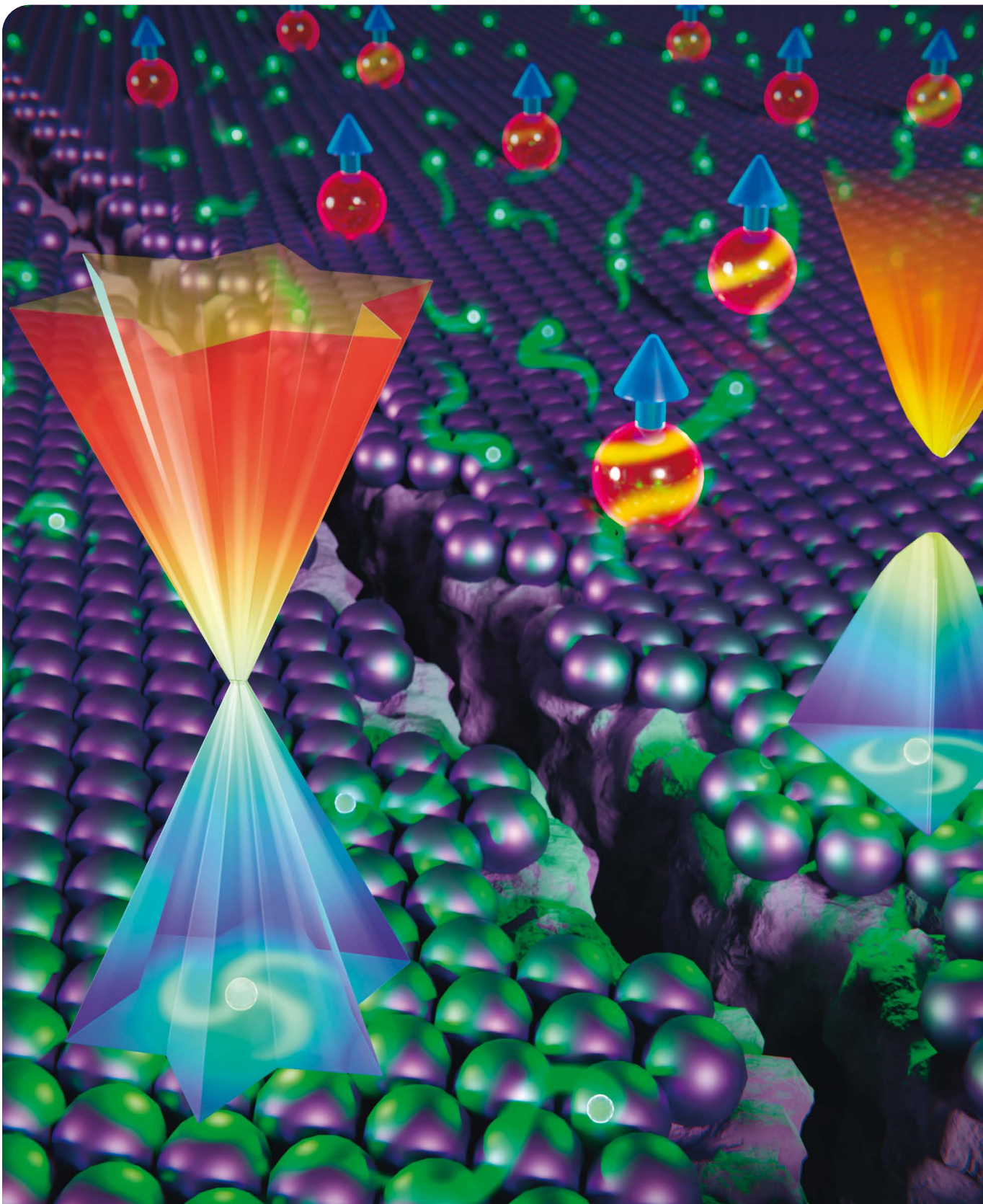
Early Stage Researcher's Workshop

Vanesa Nozal

15/11/2023

Premio Extraordinario de Doctorado

Facultad de Ciencias Químicas, Universidad Complutense de Madrid



7. Communication and Outreach

7.1. Talks

10/02/2023

International Day of Women and Girls in Science (IES Vicente Aleixandre, Pinto)

Cristina Flors

10/02/2023

International Day of Girls and Women in Science: 'How facing challenges can shape your way' (IES Zunzunegui, Portugalete)

Sara H. Mejías

11/02/2023

'Aperitivo con Científicas', organized by the Group for the Rehabilitation of Native Fauna, on the occasion of the International Day of Women and Girls in Science, Centro de Información y Educación Ambiental de la Dehesa de la Villa (Madrid)

Manuela Garnica

13/02/2023

'Nanociencia, el grafeno y sus tecnologías asociadas' (IES Guadarrama)

Alejandro Jimeno Pozo

16/02/2023

International Day of Women and Girls in Science (Colegio Virgen de Mirasierra)

Valle Palomo

20/02/2023

Academia de ciencias en las aulas: 'Nanociencia: la importancia de lo pequeño' (IES Pradolongo, Madrid)

Nazario Martín León

03/03/2023

Talk for the Spanish Association Against Cancer: 'El poder antioxidante de la fruta' (Escuela Antonio Mingote, Madrid)

Sebastián Thompson

22/03/2023

Encuentro Networking - organised by the Fundación Parque Científico de Madrid within the framework of the activities of the Enterprise Europe Network (EEN Madrid)

Bonifacio Vega

23/03/2023

Lecture Series of the Royal Academy of Sciences (Madrid): 'Perovskitas: ¿una revolución en energía fotovoltaica?'

Nazario Martín

23/03/2023

Feria de la Ciencia: Roundtable on Open Science, topic 'Permanent magnets and applications' (Madrid)

Nuria Lafuente Gómez, Demián Pardo Filipidis, Irene de la Iglesia del Pino, Irene Pardo Sierra, Eva López Martínez, María López Valls

30/03/2023

Academia de ciencias en las aulas: 'Nanociencia: la importancia de lo pequeño' (IES Gabriel Alonso de Herrera, Talavera de la Reina)

Nazario Martín León

13/04/2023

Encuentro sobre Fronteras de la Ciencia 2023 (Valladolid), 'El tsunami de la nanotecnología'

Rodolfo Miranda



20/04/2023

Talk to volunteers of the Spanish Association Against Cancer (Madrid)

Sebastián Thompson

17/05/2023

Thesis in 3 minutes (Madrid): 'Espectroscopia de terahercios en materiales semiconductores'

Sergio Revuelta Martínez

23/05/2023

Parque Científico y Tecnológico de Extremadura (Badajoz), 'Nanotecnología para la energía: de las celulas solares a la fotosíntesis artificial'

Rodolfo Miranda



25/05/2023

'Forces in the theme park' (Montcada i Reixac)

Ana Arché Núñez

05/06/2023

Speech for the 24h-livestream event for the International Environment Day, organised by the International Year of Basic Sciences for Sustainable Development and supported by the United Nations (online)

Ramón Bernardo Gavito

14/06/2023

Innovation Breakfast on Women and Science: barriers to women's entry and progression in scientific careers and tools to promote effective equality (CaixaForum Madrid)

Valle Palomo

14/06/2023

'Un café con los ERC Grantees' organised by Oficina Europea FECYT

Emilio M. Pérez

04/07/2023

Talk during the Closing Ceremony of the school Santa María de Europa Collegiate Course (Madrid)

Daniel Granados

03/10/2023

XXV "Antonio González" Scientific Week, Department of Applied Chemistry, University of La Laguna: 'Phthalocyanines, subphthalocyanines, porphyrins . . . and beyond: A journey from solution studies to on-surface synthesis' (Tenerife)

G. Bottari

02/11/2023

Educational programs for schoolchildren Ibercaja (Guadalajara)

Lucas Perez

17/11/2023

Roundtable 'Investigación-innovación, simbiosis al servicio de la competitividad' organised by Madri+d (Campus Google, Madrid)

Rodolfo Miranda, Daniel Granados



17/11/2023

Science Week 2023: 'Energía solar: un reto actual' (Universidad de la Rioja)

Nazario Martín León

01/12/2023

Annual Meeting of the Funtional Molecular Systems Research Center 'Controlling self-assembly by chemical fuels and light' (Zwolle, the Netherlands)

Thomas M. Hermans

01/12/2023

Round table of the D+i dissemination days "Nanociencia to-go" (Zaragoza)

Patricia López

12/12/2023

DivulgaNobel 2023: Acercando los Premios Nobel "Láseres de attosegundos: la cámara superlenta de la física, la química y... ¿la biología?" (Universidad de Elche)

Fernando Martín

7.2. Exhibitions

Open-doors tours at IMDEA Nanociencia

**26/01/2023**

Students of 1st and 2nd year of the higher degree of Clinical and Bio-medical Laboratory (Gregorio Fernández Teaching Center, Valladolid) visit IMDEA Nanociencia

02/06/2023

Students from the Faculty of Physical Sciences (UCM) visit the Neural Interfaces Laboratory with Noelia Rodríguez

22/06/2023

Prof. Iijima sensei and Prof. Komatsu sensei visit IMDEA Nanociencia with Emilio M. Pérez

Prof. Tirelli (Istituto Italiano di Tecnologia) visits IMDEA Nanociencia with Isabel Rodríguez and Teresa González

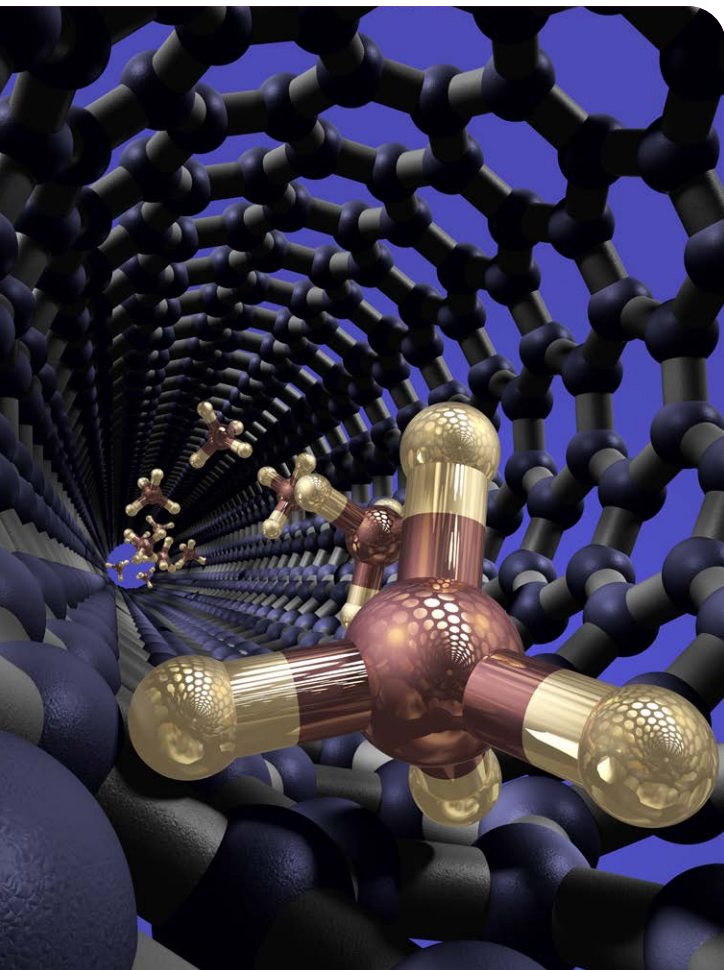
17/10/2023

IMDEA Nanociencia receives the visit of the Madrid cluster CITT-Semiconductores and the Department of Commerce of the United States, a visit organized by the Embassy of the United States in Madrid, with Daniel Granados

04/12/2023

Visit to IMDEA Nanoscience by students of the subject of Nanoelectronics and Nanophotonics of the Degree in Engineering Physics, Universidad Carlos III

Organized by: Juan Cabanillas, Ramón Bernardo, Teresa González





06/07/2023

Prof. Luis Echegoyen's visit to IMDEA Nanociencia with Nazario Martín



Semana de la Ciencia

06/11/2023

Presentation of the video game 'Nanocar Racing' at IMDEA Nanociencia
Presented by: Rodolfo Miranda, David Écija, Emilio M. Pérez

08/11/2023

Visit to IMDEA Nanociencia by 1st year baccalaureate students of the Colegio Estudiantes
Participants: Ana Pizarro, Isabel Rodríguez, Sara Hernández, Claudia Flórez, Upasana Das, Gonzalo Pérez, Teresa González, Noelia Rodríguez

16/11/2023

Visit to IMDEA Nanociencia of 3^o ESO of the Nuestra Señora Carmen Corazonistas school, the FP PRO2 Training Center, and the 3rd Degree Biomedical Engineering Francisco de Vitoria University students.
Participants: Emilio Pérez, Bonifacio Vega, Valle Palomo, Teresa González, Noelia Rodríguez, Milagros Castellanos, Begoña Sot, Carmen Escalona, Miguel Ángel Valbuena, Beatriz Muñoz, Alejandro López, Carmen García, José Sánchez Costa, Estefanía Fernandez, Álvaro Somoza, Demián Pardo, Arturo González, Esther Resines, Jorge Sangrador, Raquel Utrera, Ana Martínez

Nanociencia to-go

Nanoscience to-go is an initiative of IMDEA Nanoscience that aims to bring science closer to the elderly. After a visit to our facilities, together we do home experiments to understand the mechanisms that govern nanoscience, which they can then take home to share with their families.

19/05/2023

Universidad de Mayores UAM

Participants: Emilio M. Pérez, Isabel Rodríguez, Sara Hernández, Claudia Flórez, Upasana Das, Gonzalo Pérez, Elena Alonso, Patricia López, Laura Ortega

09/06/2023

Universidad de Mayores UCM

Participants: Lucas Pérez, Isabel Rodríguez, Carmen García, Cristina Carrizo, Valle Palomo, Fabián Calleja

26/10/2023 y 31/10/2023

Cultural Association 'Enseñarte Madrid' of the Madrid City Council
Participants: Álvaro Somoza, Enrique Cánovas, Manuela Garnica, Fabián Calleja, Patricia López, Clara Guillén, Ana Pizarro, Vasileios Balos, Mariela Menghini, Emilio Pérez, Borja Ibarra, Patricia López, Clara Guillén



International Day of Women and Girls in Science at IMDEA Nanociencia

10/02/2023

Valle Palomo, Isabel Rodríguez, Manuela Garnica, Milagros Castellanos y María Tenorio IMDEA Nanoscience laboratories show 2nd year baccalaureate students from the Fontenebro IS school (Moralzarzal)

European Researchers' Night

29/09/2023

At IMDEA Nanociencia, we received the visit of 4th ESO students from the Virgen de Europa School. Participants: Fernando Martín, Francisco Fernández, Laura Ortega, Clara Guillén, Miguel Ángel Valbuena, Beatriz Muñiz, Saul García, Alejandro Martín, Víctor Vega, Carmen García, Marina, Luis A Campos, Jaime Hernández, Ana Pizarro, Claudia Cardozo, Vasileios Balos, Christian Rocha.

At Caixaforum Madrid: 'Los imanes permanentes en la transición ecológica'. Participants: Zaida Curbelo, Alonso Campos, Cristina y Adrián.

At Residencia de Estudiantes (Madrid): 'Las cinco misiones de la UE vistas por los investigadores de IMDEA'. Participant: Valle Palomo.



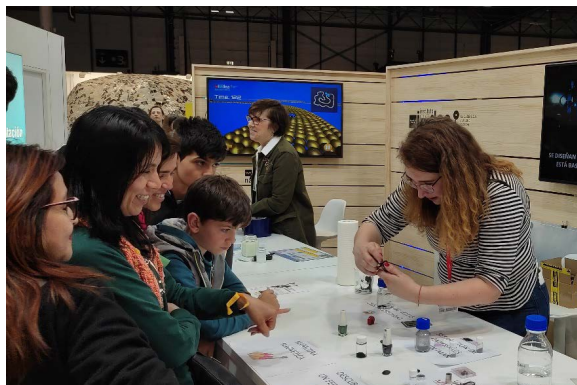
Exhibitions elsewhere

Feria 'Madrid es Ciencia' at the fairground IFEMA, Madrid

23/03/2023

IMDEA booth with science experiments for children.

Participants: Ana Pizarro, Alberto Bollero, Daniel Granados, Juan Cabanillas, Enrique Cánovas, José Sánchez Costa, Mariela Menghini, Álvaro Somoza, Nuria Lafuente, Valle Palomo, Teresa González, Paco Guinea, Ignacio Figueruelo, Gabriel Caballero, Jorge Sangrador Pérez, Raquel Utrera Melero, Esther Resines Urien, Guillermo Parra, José Á. Silva, David Écija, Koen Lauwaet, Cristian Svetina, Wojciech Gawelda



22/02/2023

Bienal Ciudad y Ciencia in Círculo de Bellas Artes, Madrid

Participants: Alberto Bollero, David Écija, Koen Lauwaet, José Ángel Silva, Guillermo Parra, Paco Guinea

12/04/2023

Workshop 'Fuerzas Invisibles' at Instituto de Física de la Materia Condensada (IFIMAC-UAM)

Participants: Beatriz Muñiz Cano, Miguel Ángel Valbuena

24/09/2023

World Cancer Research Day in Plaza Chamberí, Madrid

Participants: Sebastián Thompson, Cristina Carrizo



21/10/2023

Miraexplora, Feria de Divulgación Científica de Miraflores de la Sierra, by Laura Lorente



7.3. In the media (TV, radio, magazines)

13/03/2023

Video:

IDEAL PhD Programme



30/05/2023

Video:

ERC Synergy project TomATTO 'Attosecond, the ultimate time scale in organic molecular opto-electronics'



14/03/2023

Press release

IMDEA Nanociencia investigates the critical materials that Europe needs

Impact: noticias de Comunidad de Madrid + 4 online magazines.

23/03/2023

Press release

Microwave-driven exfoliation of MoS₂ produces large flakes with high yields

Impact: radio (Ágora, Aragón Radio), magazines (Revista Española de Física + 5 online magazines.)

25/03/2023

Regional TV

Mariela Menghini for Telemadrid on the occasion of the XII Feria Madrid Es Ciencia "Los científicos del futuro se citan en IFEMA"



28/03/2023

Popular publication

Report by the Bankinter Foundation: "Quantum Computing e Inteligencia Artificial: la revolución silenciosa", by Daniel Granados

17/04/2023

Video

2022 'la Caixa' Foundation PhD and Postdoctoral Scholarship Awarding Ceremony. Sara H. Mejías is the face of the Junior Leader 'la Caixa' Foundation 2023 scholarship campaign.



20/04/2023

Press release

Mixing X-rays: the future of ultrafast science

Impact: meeting report for Commun. Phys. 6, 315 (Nature).

16/05/2023*Press release*

TOMATTO, the European project that aims to capture electrons in motion

Impact: Tribuna Complutense + 4 website posts.**23/05/2023***Press release*

A new spectroscopic fingerprint of magnetic interactions between topological states and Rare-Earth magnetic dopants, first paper of the Spin-ARPES lab at IMDEA Nanociencia

Impact: Alba Synchrotron news (first publication with data from LOREA beamline)**07/06/2023***Popular publication*

'El Universo, la Complejidad y la Vida' by Juan Rojo for the magazine of the Spanish Royal Academy of Exact, Physical and Natural Sciences, nº 111

23/06/2023*Interview*

Rodolfo Miranda for Innovaspain "Porque el tamaño sí importa, existe la Nanociencia"

24/06/2023*Popular publication*

'El potencial de lo más pequeño como elemento habilitador transversal' by Daniel Granados, for the BIT magazine of the Official College of Telecommunications Engineers.

18/07/2023*Interview*

Daniel Granados for Fundación Innovación Bankinter "El futuro de la Inteligencia Artificial: cuántica, fotónica y neuromórfica"

18/09/2023*Popular publication*

'Smaller, faster, more complex? Watching a phase transition with X-ray eyes' from Allan Johnson for The Science Breaker

22/09/2023*Communication Campaign*

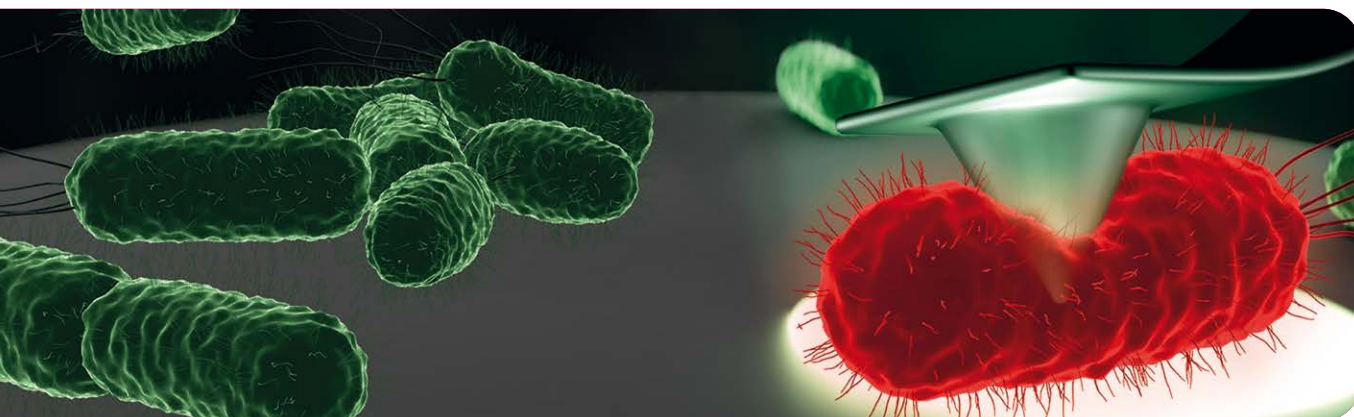
IMDEA Nanociencia hosts the event of the Spanish Association Against Cancer AECC on the occasion of the 'World Cancer Research Day' with a round table "La AECC reclama que los investigadores españoles tengan las mismas oportunidades que sus homólogos en otros países para superar el 70% de supervivencia en cáncer" with Rodolfo Miranda, Álvaro Somoza, Ana Pizarro, Esther Díez, Cuca Vargues, and Isabel Orbe.

Impact: in 26 online media outlets across Spain.**29/09/2023***Press release*

AM@Esp, the new research and industry platform of the Complementary Programme in Advanced Materials

06/10/2023*Press release*

Nobel Prize in Physics 2023 and attochemistry at IMDEA Nanociencia (ERC Synergy TomATTO project)

Impact: Madri+d Notiweb



14/10/2023

Radio

Fernando Martín on the programme “Principio de Incertidumbre” of Radio Canal Extremadura: “La física de attosegundos, premio Nobel de 2023”

18/10/2023

Press release

The IMDEA Nanociencia Institute joins the Spanish Association of the Semiconductor Industry AESEMI

30/10/2023

Press release

IMDEA Nanociencia researchers find analytical solutions for 1D channels in twisted bilayer graphene

Impact: Revista Española de Física (RSEF) + 6 online magazines.

10/11/2023

Press release

Researchers at IMDEA Nanociencia among the 2% most influential according to the Stanford database (citations): Emilio Pérez, Rodolfo Miranda, Fernando Martín, Johannes Gierschner, Nazario Martín, José I Urgel.

14/11/2023

Press release

The tsunami of nanotechnology has reached the Nobel prizes

29/11/2023

Press release

The COST Action ‘NEXT’ for Extreme Ultraviolet to X-Ray techniques will be coordinated from IMDEA Nanociencia

07/12/2023

Press release

Generating antiaromatic moieties on surfaces

Impact: front cover of Nature Synthesis, Vol 2, Issue 12

18/12/2023

Press release

The M30 meeting of the project PASSENGER is held at IMDEA Nanociencia

7.4. Digital media

Institutional accounts



4.476
followers

266 k
impressions

@IMDEA_Nano



1.161
followers

14 k
impressions

@imdeananociencia



2.925
followers

@imdea-nanociencia



1.053
followers

3 k
impressions

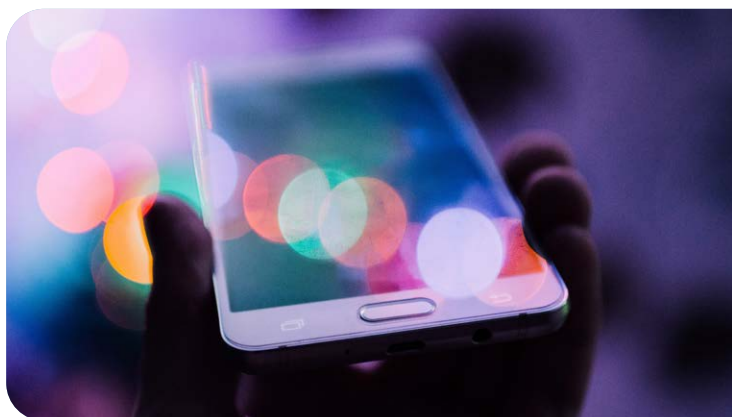
@IMDEAnanociencia



343
suscribers

54 k
views

@IMDEANano



Websites

IDEAL Fellowships Programme

<https://idealcofund-project.eu/>



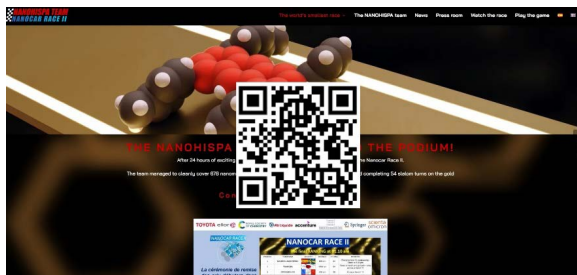
TOMATTO

<https://tomatto.eu/>



Nanocar Race

<https://nanohispa.nanociencia.imdea.org>



IMDEA projects and groups X accounts

 @alumniIMDEAnano	 @PhotPhys_IMDEA	 @SpinARPES_Lab
 @tomATTOsecond	 @NanoBioTube	 @PerMagIMDEA
 @IDEALcofund	 @NFS_IMDEA	 @hyperthermiaNan

Newsletter



Issues 32-40 (2023) inform IMDEA Nanociencia staff last day of the month about the current and forthcoming funding calls, events, news and publications at IMDEA Nanociencia. There is a special section "Igualdad de Género" with relevant information on gender perspectives in research.





Videogame

Inspired by the real-life Nanocar Race, where cutting-edge worldwide research teams manipulate their own custom-designed molecules using a scanning tunneling microscope, this game captures the essence of the thrilling competition.

Nanocar Racing: the game

imdea nanoscience institute

Time / 時間: 220

スタート!

GO!

Play now (only PC)

Download the app now and play in your mobile device

GET IT ON Google Play

Download on the App Store

The advertisement features a central image of a golden nanocar track with a red car at the start. A QR code is located on the right side, and a red button at the bottom left says 'Play now (only PC)'. The text 'Time / 時間: 220' and 'スタート!' is displayed in white and blue. The 'GO!' text is large and white. The bottom section includes logos for Google Play and the App Store, along with the text 'Download the app now and play in your mobile device'.





8. Research Management Offices

Research Projects Office (RPO)

The Research Projects Office at IMDEA Nanociencia works to promote the participation of its researchers in funding programmes to develop ambitious, innovative and high-quality research in the national and international field.

We therefore offer expert advice and dedicated administrative support and in the preparation and implementation of all projects that somehow involve our researchers.

TRANSVERSAL LINES

- Implementation of best practices in human resources management for research
- Development of Gender Equality Plan and the integration of the gender dimension in research



HR EXCELLENCE IN RESEARCH



igualdad de género

instituto imdea nanociencia





9. High-quality research infrastructure

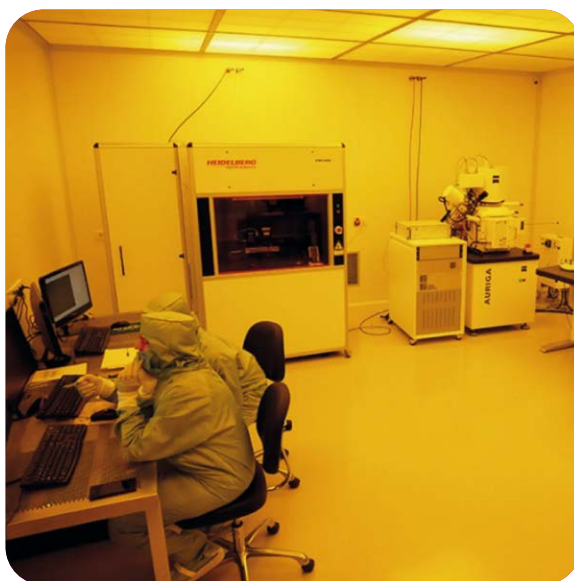
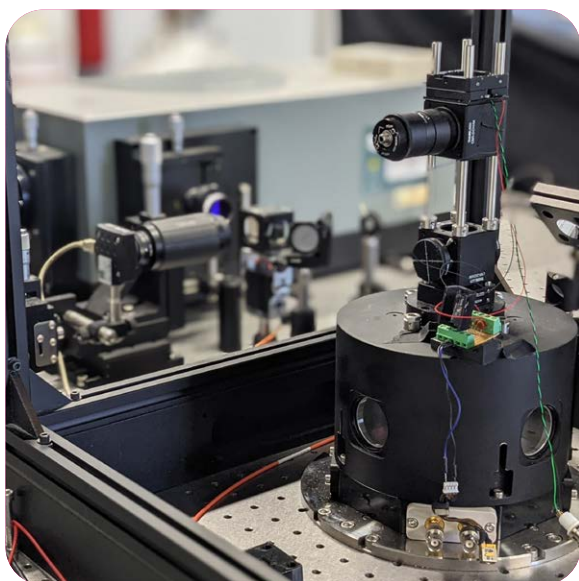
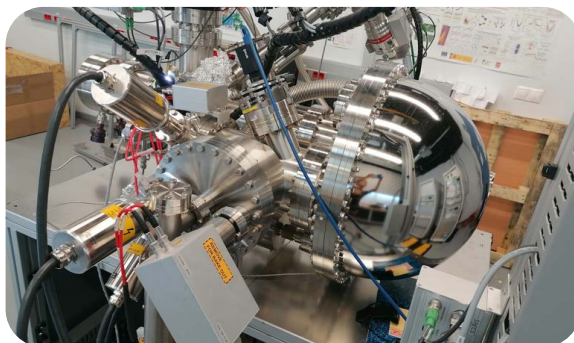
1. Existing infrastructure

IMDEA Nano's premises host more than 5,000 m² of research laboratories and infrastructures distributed among 5 floors, 2 of them vibration-isolated underground. 53 laboratories and 9 core facilities are currently operative adding to a total of 62 areas dedicated to science and technology. Around 10% of the total lab space remains available for future growth. Core facilities are available for external research groups and companies and include:

- Centre for Nanofabrication (CI-100/1000 Clean Room) with latest technology to produce nanodevices at wafer scale. Including among other tools an ultra-high vacuum e-beam evaporator.
- Helium liquefying and recovery plant with 60 litres/day liquefying efficiency. Expanded capabilities in 2019 of the Helium liquefying plant and incorporation of a new full time cryogenics engineer for its maintenance and supply of cryogenic liquids to the research labs.
- Fully equipped Mechanical Workshop.
- Electron microscopy suite with two field emission microscopes for scanning and transmission.
- Atomic Force microscopy suite with several AFMs.
- Automatized Nuclear Magnetic Resonance service.
- An industrial Pilot Plant for roll-to-roll Nanoimprinting.
- Chemical characterization lab including Raman, IR, UV-vis, fluorescence, dichroism and other techniques.
- Ultrafast spectroscopy labs equipped with homemade setups like transients absorption, femtosecond pump-probe spectroscopy, time resolved THz spectroscopy and Time resolved photoluminescence. These setups enable cryogenic measurements and variable energy and pump sources.
- A variety of characterization tools and homemade experimental setups are also available, such as: Vibrating Sample and Optic Kerr Effect magnetometers, Super-resolution Fluorescence Microscopy, Molecular Beam Epitaxy systems combined with sputtering for metals and organic materials with in-situ characterisation, five He cryostats for transport measurements and opto-electronic characterisation.
- Five Scanning Tunnelling Microscopes are currently up and running on-site, working under UHV and Low temperature (4 K to 800mK) and brand-new Non-Contact UHV-AFM at 4 K has been installed. Also, an unique non-contact AFM/STM laboratory in UHV and cryogenic temperatures is fully operational as part of D. Ecijas ERC Project.
- Spin & Angle Resolved Photoemission Spectroscopy system, permitting the characterisation of the electronic structure of spin polarised bands in surfaces and interfaces.
- Fully equipped X-Ray diffractometer service for thin films or powder samples.
- Closed-circuit helium cryostat with ultra-low vibrations for opto-electronic characterisation (AttoDry800).
- Photovoltaic Energy Laboratory, with two connected glove box to develop hybrid Solar Cells.



- The Institute host 10 laboratories for chemical synthesis and 3 labs for biochemistry, one of them certified as GLP.
- Cell Culture and Microbiology Unit hosting two laboratories working under BioSafety Level 2; animal cell culture and pathogenic bacteria. These labs enable in-house projects and encourage transversal transfer of knowledge between research programmes.
- Laboratory for PhotoHyperthermia for nanomedicine applications, in particular for cancer treatments.



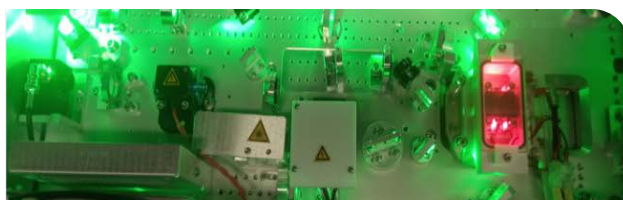
2. New singular infrastructure

Advanced Optical Characterization Lab

A new advanced optical characterization lab has been created at IMDEA Nanociencia. This lab has been conditioned for hosting a brand new Titanium Sapphire femtosecond laser (7W, 800nm, 50fs, 1KHz) coupled to a state-of-the-art optical parametric amplifier that were purchased in December 2022. For optimum performance of this singular equipment, an enclosure with passive and active elements for Temperature and humidity control were constructed. Furthermore the laser was placed onto a state-of-the-art optical table (6x1.5m²) enabling mechanical isolation. The lab was fully functional by June 2023, since then two brand new home-made singular time resolved THz spectrometers have been developed in the lab, characterization techniques which are unique in Spain, and combined also unique in EU.

The first setup developed is an ultra-broad band time-resolved THz spectrometer; a ~ 10 THz bandwidth setup with a sub-ps temporal resolution. This equipment links the microwave and far-infrared regions of the electromag-

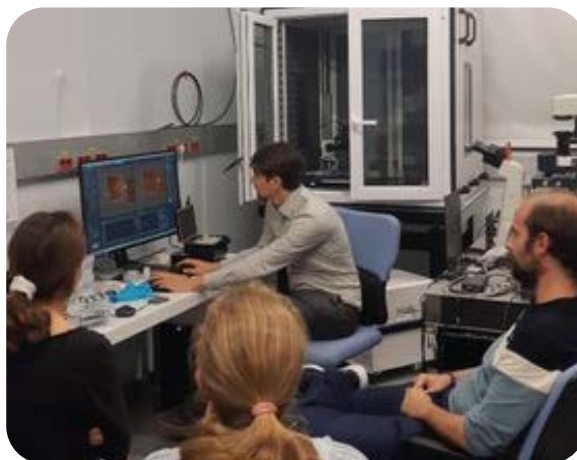
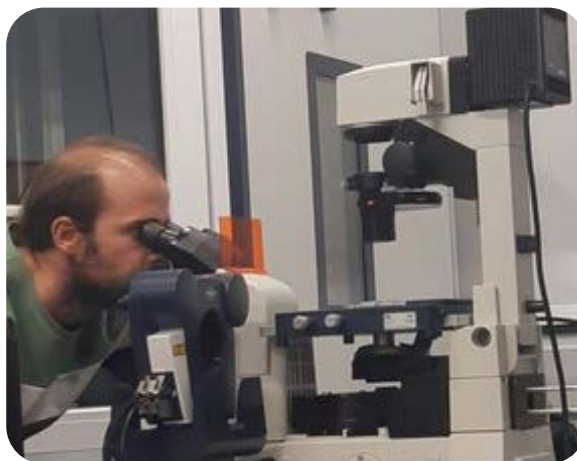
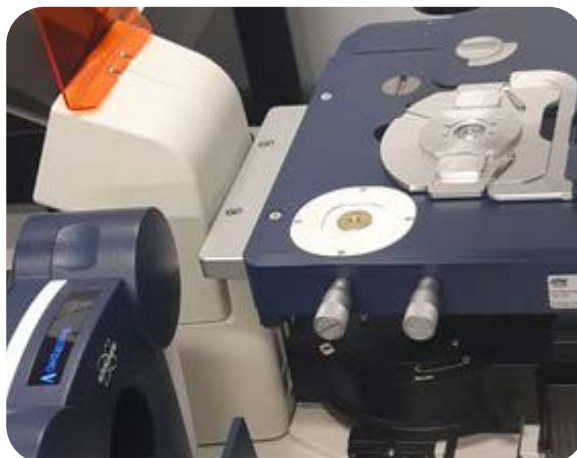
netic spectrum, a region rich in information about the presence of molecular vibrations, free charge carriers, phonons, polarons, excitons, etc. In turn, this equipment can determine the temporal dynamics of these particles and quasiparticles under different experimental conditions; with the aim of extracting critical information that can be complemented by the one obtained on the same time scales by readily available time-resolved photoluminescence and transient absorption. The second setup developed is a high field time-resolved THz spectrometer; a ~ 2 THz bandwidth setup with sub-ps temporal resolution with the unique capability of generating ultra-strong local THz electric fields by a LiNbO₃ crystal. This high field THz setup allows realizing nonlinear THz spectroscopy; this implies e.g. the possibility of realizing THz pump-THz probe experiments (even and uniquely with the possibility of pumping with the high field and probing with broadband source). Experiments capable of analyze the photo physics of particles and quasiparticles in matter in the non-perturbative limit (e.g. studying the dynamics of vibrational modes or phonons in matter without following the generation of free carriers or excitons in the samples). For the 2 brand new setups, experiments can be realized in a controlled or high vacuum environment, at room or cryogenic temperature up to 4K and under variable energy and photon flux excitations (up to 7W and from the UV to the far IR).





Atomic Force Microscopy Lab

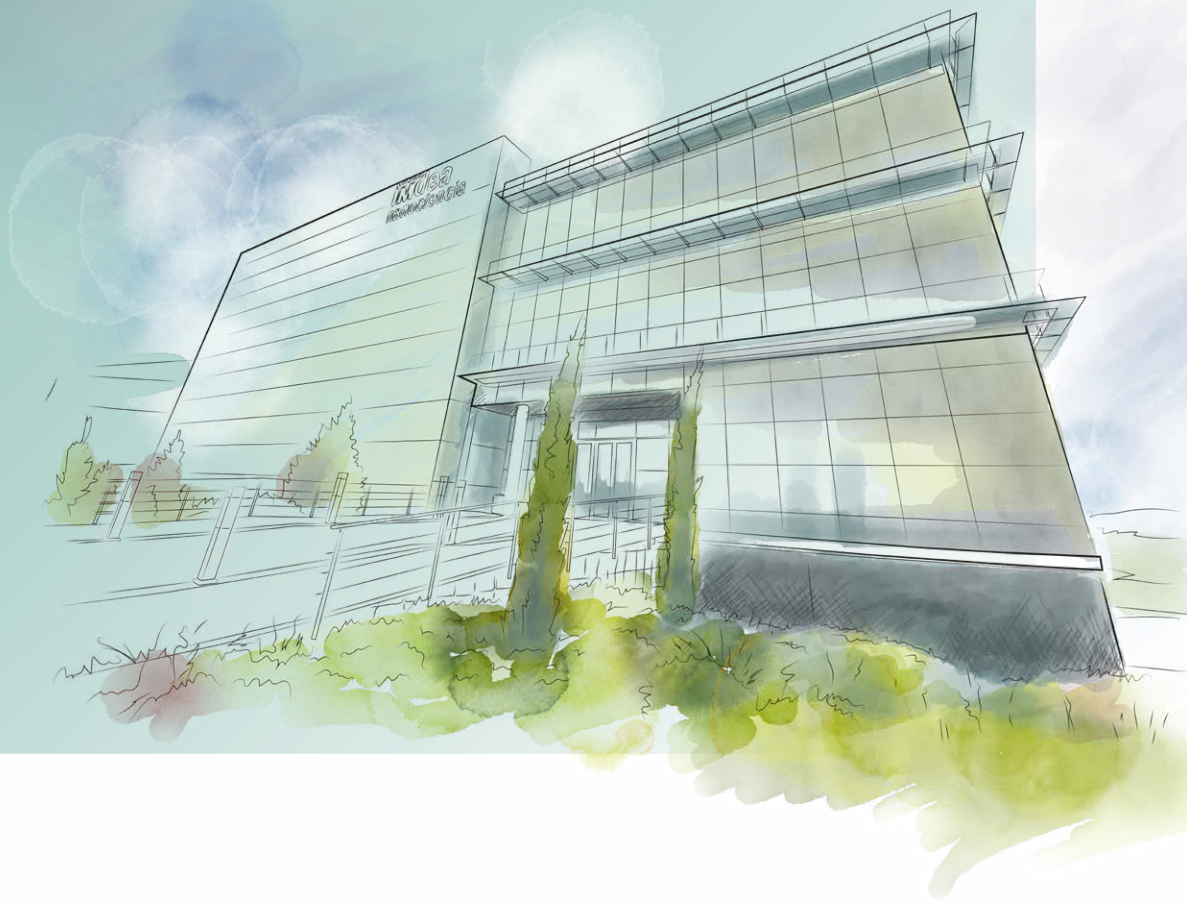
The atomic force microscopy (AFM) unit at IMDEA Nanociencia is a consolidated service that has provided support to a large number of internal and external researchers since 2010, being the first service to be launched after the creation of the Institute in 2007. Currently, it includes four instruments with complementary capabilities and features for measuring nanoscale topography, force spectroscopy, as well as electrical and magnetic properties. The most recent addition is a JPK/Bruker Nanowizard 5, the first AFM of these characteristics installed in Europe. Its advanced technical features allow, among others, acquisition of fast dynamics (FastScan module, 400 lines/s in areas of maximum $2 \times 2 \mu\text{m}^2$) and advanced nanomechanical measurements (Peakforce Tapping[®] and QI[®]). The Nanowizard 5 AFM is coupled to a home-developed super-resolution fluorescence microscope based on single-molecule localization, enabling correlative imaging. This AFM instrument, together with its predecessor the Nanowizard 2, are particularly suited for biological applications, since measurements can be performed both in air and liquid. The service also includes a Nanotec Cervantes, with a "jumping" mode that facilitates the measurement of samples with weak interactions with the surface, as well as a range of electrical modes. Finally, our NT-MDT Ntegra Prima is mostly used for electric and magnetic experiments. The AFM instruments are currently located in laboratories B11, B15 and Z01, and measurements can be performed by the service staff or by the user after a short training. In the last 5 years, more than 40 internal users have been trained, and service has been provided to at least 10 external national and international academic institutions and companies.



4

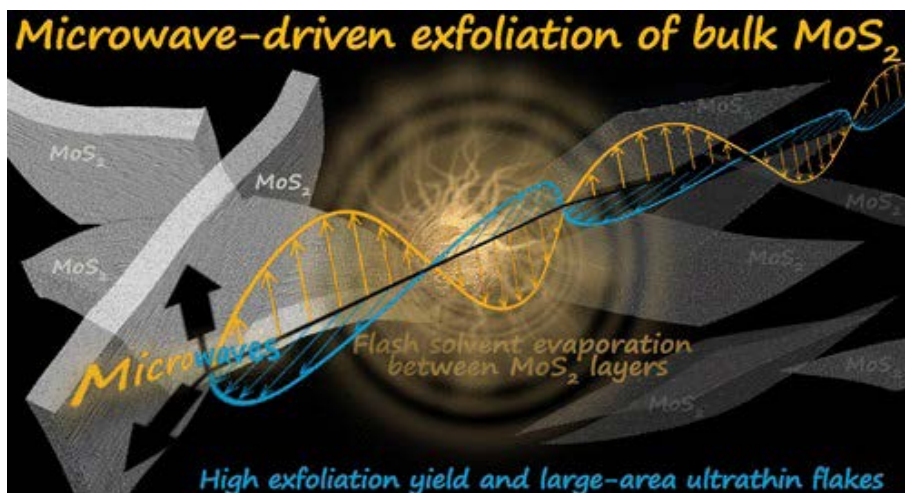
research highlights

annual
report
20
23





MICROWAVE-DRIVEN EXFOLIATION OF MoS_2 PRODUCES LARGE FLAKES WITH HIGH YIELDS



A team of researchers led by Prof Emilio M. Pérez (IMDEA Nano) and Profs Víctor Sebastián and Jesús Santamaría (INMA, CSIC-UNIZAR) have developed a new method for exfoliating MoS_2 flakes that produces very large and very thin flakes with high yield.

MoS_2 is a transition metal dichalcogenide that is interesting in the field of electronics for its wide range of physical properties. The number of stacked layers is crucial in determining these properties. Monolayer MoS_2 , for instance, exhibits a direct bandgap of 1.90 eV, while bulk 2H- MoS_2 presents an indirect bandgap of 1.23 eV. These tailorable properties make them ideal candidates for many applications. However, obtaining large area, high-quality MoS_2 flakes has proved challenging.

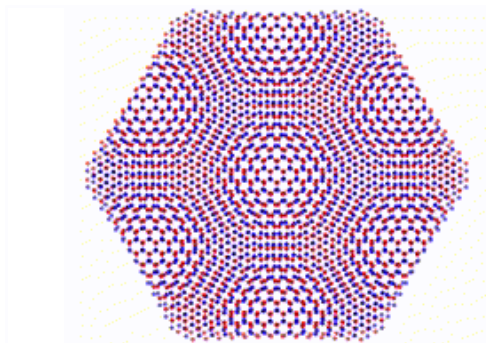
Existing liquid-phase exfoliation methods have low yields and often result in broad thickness distributions, making it difficult to obtain monolayer and few-layered 2H- MoS_2 . In an attempt to improve yields, researchers have explored other techniques, including ball milling, electrochemical exfoliation, and fluid dynamics exfoliation. However, these methods have scalability problems or produce metallic 1T- MoS_2 , which has different properties and applications.

The team tested a novel microwave-assisted method for exfoliating MoS_2 flakes and this method produced well-exfoliated material with lateral sizes comparable to those obtained by mechanical exfoliation. The yield of the process is roughly 50 times greater than ultrasonication exfoliation methods. It gives a material quality comparable to mechanical exfoliation, whose flakes are similar to those obtained by this method but with an incomparably higher yield (mechanical exfoliation is actually carried out flake by flake!). The process is fast, taking only a few minutes, and requires minimal processing.

The method has the potential to enable new applications of MoS_2 in electronic and photonic devices. It has been applied to MoS_2 , but it could be used to exfoliate any material with high microwave absorption capabilities, being a versatile approach in the area of emerging 2-dimensional (2D) materials. The researchers plan to investigate the method further, exploring its scalability and potential applications in more detail.

This work has been partially funded by the ERC-PoC grant 842606, ERC-AdG 742684 and the Comunidad de Madrid project MAD-2D. **Reference:** R. Quirós-Ovies, M. Laborda, N. Martín Sabanés, L. Martín-Pérez, S. Moreno-Da Silva, E. Burzurí, V. Sebastian, E. M. Pérez, and J. Santamaría. **Microwave-driven exfoliation of bulk 2h- MoS₂ after acetonitrile prewetting produces large-area ultrathin flakes with exceptionally high yield.** ACS Nano (2023). DOI: 10.1021/acsnano.3c00280

IMDEA NANOCIENCIA RESEARCHERS FIND ANALYTICAL SOLUTIONS FOR 1D CHANNELS IN TWISTED BILAYER GRAPHENE



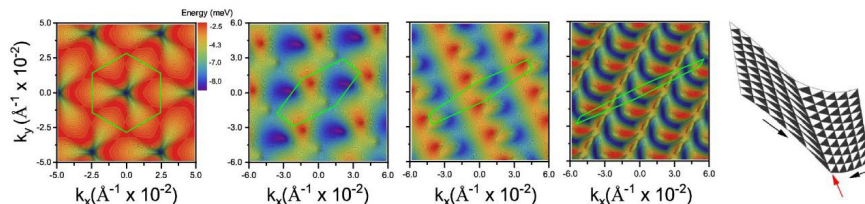
The work methodology in a theoretical group often implies discussions in front of the data to elucidate the story that nature is trying to tell us. One day, an interesting revelation took place in the Group of Theoretical Modelling at IMDEA Nanociencia. Dr Pierre Pantaleón, a researcher in the group, was discussing with Prof Paco Guinea –the leader of the Group– about **strained bilayer graphene**, that is, two layers of graphene piled on top of each other and slightly stretched out by a small

force. Pierre, a meticulous researcher with a penchant for visual aids, was showing the group his animated visualization of strained graphene when Prof Guinea noticed an anomaly that had escaped everyone else's scrutiny. As it turns out, when bilayer graphene goes under strain, its Brillouin zone (the unit cell in the momentum space) is distorting, and eventually, collapsing in one direction. This distortion at the collapsing point caused an error in Pierre's visualization programme suggesting the presence of some kind of singularity.

In Physics, singularities, like the one the researchers were observing, demand careful consideration. They could indicate something may be amiss, shifting, or simply necessitating a closer examination. By that time, Dr Andreas Sinner a theoretical physicist joined the group and started investigating together with Pierre on the origin of this singularity. It was the concurrent transformation in real space that truly captivated their attention: strained graphene gave rise to the emergence of almost perfect one-dimensional moiré patterns –**one-dimensional channels**– within the 2-dimensional material.

Previously, scientists had glimpsed such phenomena through microscopes and had regarded them as design errors such as dislocations or adhered materials, but, behind what appeared to be artefacts were masked effects the researchers describe now. The research team at IMDEA Nano confirmed that this is a **natural occurrence** within hexagonal honeycomb lattices –like those of graphene– specifically taking place when two layers are stacked at a slight twist angle, and strain is applied.

The most significant contribution of the researchers lies in their discovery of analytical solutions for the critical strain required to generate these one-dimensional channels. Surprisingly, **this solution is beautifully simple**, relying on



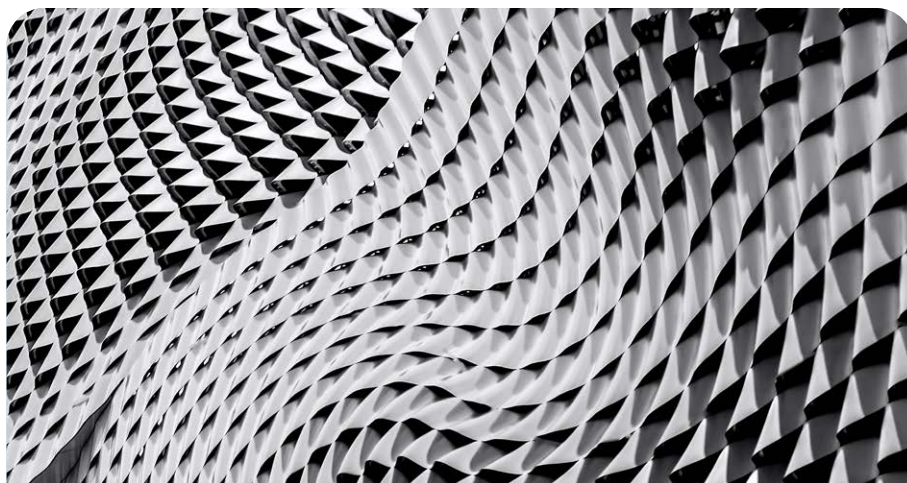
Evolution of the energy landscape of twisted bilayer graphene as a function of the applied strain. Close to the critical strain the collapse of the Brillouin zone is appreciated.

just two variables: the twist angle and the Poisson ratio—a material-specific constant. Their findings lead them to obtain a single mathematical formula to describe the phenomenon, and this formula gives us information on the physical origin.

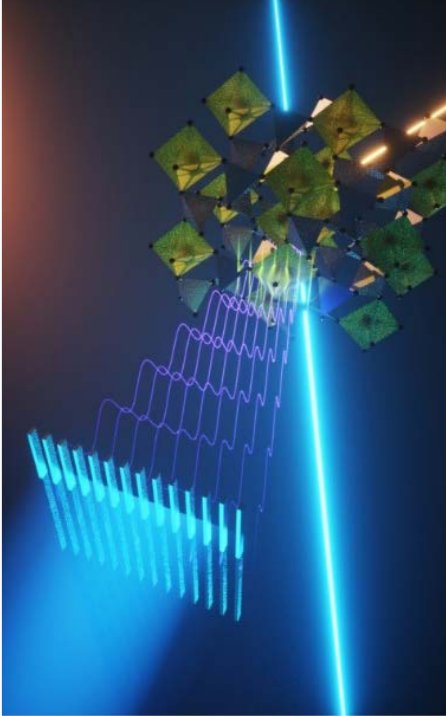
Their work, published in *Physical Review Letters*, is not new, but the explanation of the phenomenon in such simple terms—**single analytical expression**—is elegant and unique. The findings open the door to engineering novel materials on surfaces capable of featuring these one-dimensional channels. Within these channels, electrons find themselves confined, in contrast to the free movement they exhibit in the standard 2D graphene landscape. Electrons within these channels exhibit a preferential direction of movement. The implications of this discovery are vast, with potential applications extending to other materials, such as dichalcogenides, and can be extended to other geometric configurations as well.

This work has been funded by the EU's Graphene Flagship, the regional grants NMAT2D and MAD2D, and the Spanish Programme on Advanced Materials.

Reference: A. Sinner, P. A. Pantaleón, F. Guinea. **Strain-Induced Quasi-1D Channels in Twisted Moiré Lattices.** *Phys. Rev. Lett.* (2023). <https://link.aps.org/doi/10.1103/PhysRevLett.131.166402>



MIXING X-RAYS: THE FUTURE OF ULTRAFAST SCIENCE



The group of Dr Cristian Svetina at IMDEA Nano will push forward the boundaries of knowledge of the X-ray science field with a new collaboration with the European XFEL (EuXFEL) in the long-term project “*Dynamics of nanoscale phenomena in solids and liquids studied with X-ray Transient Gratings*” led by Dr Svetina. This project will perform up to 8 experiments at the EuXFEL facility over 3 years in a consortium, composed by 44 scientist from 7 countries (Italy, Germany, Switzerland, Sweden, Poland, United States and Spain).

Background:

As the size of an object becomes smaller and smaller, the laws of classical physics break down and quantum physics rules the nanoworld. There, not only the intuitive notions of particle and waves are different, but even the concepts of locality and temperature fade away.

At such scales, charges, magnetism, orbitals and the lattice (atoms) couple generating an immense zoo of possibilities whose interplay is, in general, not understood. As microchips are shrinking in size, magnetic switches are getting faster, magnetic storage devices are improving in capacity and medical equipment for diagnostics and treatments are expanding, most of these technologies rely on devices taking advantage of such strongly coupled quantum nano-systems with immense benefit for medicine, tele-communication, computing, etc.

However, there are still many fundamental unanswered questions that urge for understanding in order to develop the next generation of green nano-technologies. An example that affects day-to-day life is thermal management at the micro-nano scale: on large scales heat propagates in waves but at nanoscales it bounces like billiard balls on a table (the so called ballistic regime) and the prediction on how it will dissipate is not trivial. Being able to understand and control heat transport in semiconductors at these scales would allow us to substantially reduce the energy losses of electronic devices, thus alleviating the problem of heat dissipation and boosting the realization of more compact and efficient electronic elements.

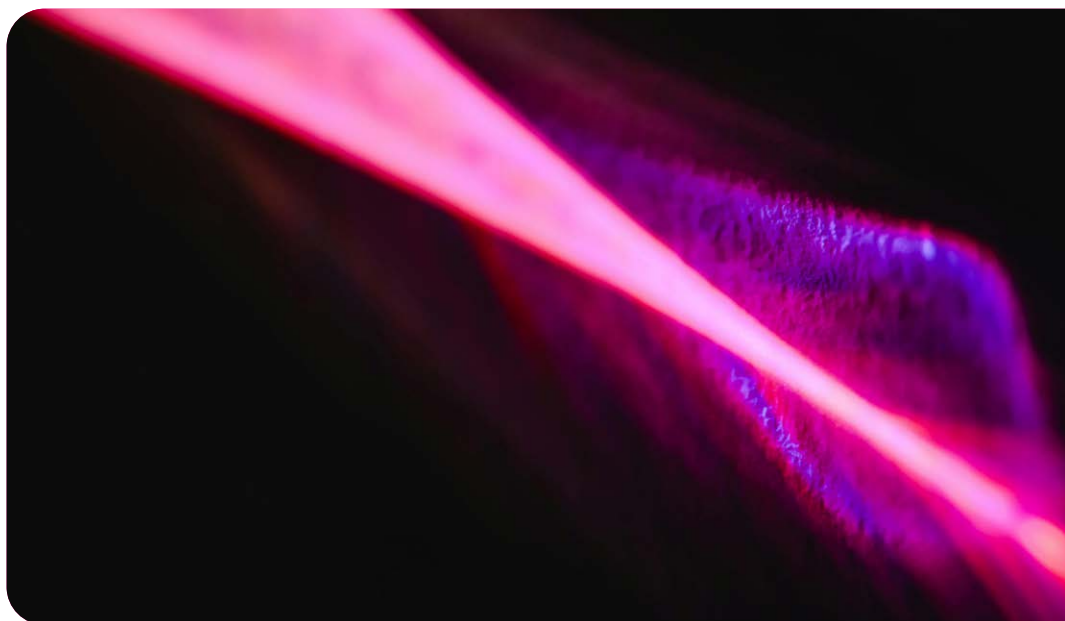
Now more than ever we need to address these questions: how can we design and build new and better energy-efficient functional nanomaterials with desired properties such as high-temperature superconductors, ultrafast magnetic switches, nano-thermal devices, photo-to-electro catalysis, ultrafast non-volatile memory storage, etc.? To answer these questions we must develop new experimental method. To solve this problem, scientists at IMDEA Nano are leading an international effort developing a class of novel methodologies called X-ray wave-mixing opening unprecedented opportunities.



Basically X-rays pulses (with high photon energy thus very short wavelengths), generated at X-ray Free Electron Lasers X-FELs (very long laser sources emitting intense pulsed X-rays) are mixed at a sample and, as a consequence, a new pulse is generated: the signal. Like in a good recipe, the outcome is much more than the sum of the single ingredients thus the signal carries all the information needed to understand how the material behaves. Extending this class of nonlinear experiments, routinely applied with optical lasers, in the X-ray domain would mean to be able to access to information on the transport processes, propagation of electrons between different atomic sites and the interplay of the degrees of freedom with sub-nanometre and ultrafast resolution with element and chemical specificity.

Imagine the impact these methods can provide in our understanding of physics in condensed systems (solids, liquids): we could shine light to the many pressing open questions regarding the nanoscale thermal transport, ultrafast demagnetization dynamics of ferromagnets, collective dynamics of disordered systems (glasses and liquids – for instance we still don't know much about the fascinating properties of water and its many anomalies), charge transfer in light-harvesting systems, detection of chiral systems dynamics, dynamics of fluctuating charge density waves and quasi-particle in high temperature superconductors with consequences in the development of functional devices. Transport phenomena also play a central role in solution chemistry: at the macroscopic scale, they are governed by diffusion times in the micro- to millisecond range, but at the nanoscale, we enter the femto-to-picosecond domain, which may entail a ballistic behaviour prior to a diffusive one. Accessing it with X-ray wave-mixing opens new perspectives onto solution chemical dynamics. Biophysics will also possibly benefit from the application of these methods to study side-chain dynamics in proteins, or charge/energy transfer in biosystems.

Truth is that application of these methods with the X-ray is so new, and still under development, that we don't yet know how far they will bring us. What we know for sure is that the preliminary results obtained are exciting and pointing in the right direction: we are developing the right tools to gain understanding of Nature at the nano and ultrafast scales.



STORIES IN THE FLATLAND (WITH A TWIST IN THE END)" IS A SYMPOSIUM IN HONOUR OF PROF. FRANCISCO GUINEA

Since the isolation of a single layer of carbon atoms (graphene) about two decades ago, the field of two-dimensional materials has only grown in systems and phenomena. Fundamental questions related to their structural and mechanical properties remain open and, simultaneously, the quantum mechanical behavior of electrons in these flatlands never ceases to surprise us. The most recent surprise: The discovery of superconductivity together with other indications of strong electronic correlations when two graphene layers are misaligned about 1 degree.

Francisco Guinea (Paco for friends and colleagues) has been at the theoretical forefront of this field even before the field was recognized as such. With this conference we want to celebrate Paco's many scientific contributions and his mentorship and his friendship through the years.





22nd-23rd june
IMDEA Nanociencia Conference Room



SYMPOSIUM
Stories in the flatland
(with a twist in the end)
In honour of Professor
FRANCISCO GUINEA

PacoFest

1) FLATLANDS I

9:45-10:20
Wes Egiton
New trends of 2D materials: from strained bubbles and ion storage to superconductivity

10:20-10:55
M. Angeles B. Hernandez
Paco and the Dirac equation

10:55-11:15
Pilar Lopez Sanchez
The importance of the lattice

11:15-12:00 **Coffee break**

12:00-12:35
Antonio Castro Neto
Topology and batteries

12:35-13:10
Jose Cornago
MoS2 grain boundaries plus recalling interactions with Paco

13:10-14:30 **Lunch**

2) FLATLANDS II

14:30-15:05
Pablo San José
Medical sensors and Majoranas in encapsulated graphene bilayers

15:05-15:40
Alexandra Rivera Paco
Valley-locked spin-light Superconductivity in low-twisted few layers of Graphene

15:40-16:15
36:15-36:45 **Coffee break**

36:45-37:20
Luis M. Rivera
Phonons in Graphene structures with an (Artificial Intelligence) twist

37:20-38:00
B. Arora
TMA

23rd JUNE

3) A TWIST IN THE END

Eva Andreu
Flatland superconductivity with a double twist

9:35-10:10
Jose Sanchez
Non-Abelian gauge fields in graphene ribbons

10:10-10:45
Elina Ruusonen
Heavy quasiparticles and cascades without symmetry breaking in twisted bilayer graphene

10:45-11:15 **Coffee break**

11:15-11:50
M. Kozubov
Structural commensurability and incommensurability in twisted Van der Waals systems

11:50-12:25
Bratach Arora
The role of superconductivity in moiré materials

12:25-13:00
Nishi West
Twisting, stretching and relaxing: exploring 2D materials

13:00-13:00 **Lunch**



IDEAL FELLOWSHIP PROGRAMME

As part of IMDEA Nanoscience's strategy to attract and train exceptional researchers in the field of Nanoscience and Nanotechnology, the IDEAL Fellowship Programme aims to boost the careers of 24 talented fellows. The programme is supported by the European Commission Marie Skłodowska-Curie Actions, and IMDEA Nanociencia has received > € 2.5 M from the COFUND calls to help co-finance the programme across two separate actions IDEAL Postdoctoral and IDEAL PhD.



This programme is currently supported by the EU-COFUND programme with the long-term aim is to finance both from public competitive sources and collaborations with relevant industrial partners and links with strategic academic partners.



€ 1.4 M
(HE MSCA COFUND 2022)
12 PhD fellowships
2 open calls - started in 2023



€ 1.1 M
(H2020 MSCA COFUND 2020)
12 postdoctoral fellowships
2 open calls - started 2022

OBJECTIVES

The inherent multidisciplinary character of Nanoscience means that both industry and academia increasingly require highly skilled professionals from a broad range of scientific backgrounds. The objectives of the programme are:

- Offer an **interdisciplinary research training** programme of excellence in an environment that realises the candidate's full potential and maximises their career prospects.
- Nurture a mind-set towards open and **collaborative research** that promotes sustainable innovation and a positive impact in society.
- **Consolidate institutional best practice** in our recruitment, research support and management processes.
- Provide **attractive working and employment conditions** and a tailored career development plan with access to quality **mentoring**.

TRAINING

The content and training will be delivered via: day-to-day and on-the-job activities, summer schools, and appropriate secondments. The modules are described below, although developed under the COFUND fellowship programme the training will be made available to all PhD students and postdoctoral staff.

MODULE 1 - Research and technical skills

- Interdisciplinary research project, secondment.
- Research conferences and seminars.
- Workshops: *research integrity and ethics, open science practices, gender equality and gender dimension of research, citizen science and social innovation...*

MODULE 2 - Professional skills and Career development

- Developing networks: participation in projects and networks.
- Organisation and management: grant writing, supervision.
- Workshops: *working with others, career development plan, communication skills, grant writing, project management...*

MODULE 3 - Entrepreneurship education

- Venture creation project (optional)
- Workshops: *lean and agile principles, ideation, road-mapping and value proposition, business plan, early stage funding, pitching...*

MODULE 4 - Research impact

- Communication and dissemination activities (Nanociencia to go, Open Days, European Researchers' Night)
- Workshops: *intellectual property rights and protection, exploitation of results, standardisation...*

CELEBRATING 15 YEARS OF OUTREACH

YEAR 2007

IMDEA Nanociencia is founded...

...and we participate for the very first time in the two most important dissemination events in the Madrid Region:

- VIII Feria Madrid es Ciencia held at IFEMA.
- VII Semana de la Ciencia with visits to our first facilities, at the Faculty of Science of the UAM.

Since 2007 we have taken part in 17 editions of *Semana de la Ciencia* and 6 editions of *Feria Madrid es Ciencia*.

YEAR 2008

Our outreach motto is born: "Nanoscience: small is different"

Furthermore, we start reaching out to educational institutions, with talks in high schools in Madrid and Segovia such as Rodolfo Miranda's '*Nanoscience: small is different*' and '*Nanoscience: magic inside the small*'.

YEAR 2009

We participate in the European Researchers' Night for the first time

The activity was carried out at The Planetarium, Rome

The aim was "Demonstrating the international dimension of research, the importance of collaboration,

attracting young people to a career in science, discussing EU key objectives with public: sustainable growth, environmental protection. Demonstrating how nanoscience helps reach these objectives."

YEAR 2010

Increased presence in the mainstream media

We start increasing our presence in specialized interviews, monographs, reports on the institute, dissemination articles by our researchers, etc.

YEAR 2011

The dissemination of the European Project MULTIFUN begins

Since then, our outreach on European Projects has been diversified and enhanced by the joint work of the communication office and our research groups.

YEAR 2012

We move into our brand-new building...

...and we hold the first outreach visits here. *Since then, more than 4,000 students and 70 schools from all over the region have visited our laboratories.*

YEAR 2013

Our Social Mediais launched

We start with Facebook and Twitter and later with Instagram and Youtube. With a strategy for each of them, we try to reach more and more people.

YEAR 2014

Our outreach programme "Nanociencia para todos" is officially launched

It starts as a monthly "Open Day" activity in response to the demand for popular science activities from the citizens of Madrid.

"Nanoscience for all" means that we have reached everyone from 3-year-olds to elderly people in nursing homes. In the first nine months of the program we receive over 250 visitors and peaked in 2019 with more than 1300 visitors.

YEAR 2015

Social commitment hand in hand with fostering vocations

We collaborate with initiatives that aim to improve society through the dissemination of science: training centres for secondary school teachers, 4ESO+Empresa to foster scientific vocations, Fundación Dáporis for underprivileged university students or the 'Entertaining Nanoscience' programme that fights boredom in nursing homes.





YEAR 2016

UNESCO declares 11th February the International Day of Women and Girls in Science

Each year, on 11th February, IMDEA Nanociencia highlights the crucial role of women in science and takes the opportunity to inspire scientific vocations in the younger generations through outreach activities.

As Audrey Azoulay (UNESCO Director-General) said: *Women need science, and science needs women. Only by tapping into all sources of knowledge, all sources of talent, can we unlock the full potential of science, and rise to the challenges of our time.*

YEAR 2017

Systematic production of press releases

We start the dissemination of our outstanding articles with press releases. With the recently awarded Severo Ochoa, a new stage in the dissemination of IMDEA Nanociencia begins.

YEAR 2018

Nanociencia to go

One of the institute's flagship outreach projects starts. The project is aimed at the elderly and aimed to turn them into disseminators with the kits of experiments to go.

Since 2019, we have **527 participants** and we have delivered **1,571 kits of experiments**.

Video tutorials have more than **5,800 visualizations**.

YEAR 2019

Science meets Arts: different and it can also be inspiring

Photographic exhibition of images taken by the groups during the European Researchers' Night. We also produced the first bookmarks with images and magazine covers.

YEAR 2020

Outreach under social distancing

Despite the restrictions and confinement, IMDEA Nanociencia staff continued to carry out outreach work by different means:

- Outreach activities through Zoom
- The exhibition #IMDEANanoPics
- Games and escape rooms on social networks
- Virtual tour

YEAR 2021

Dissemination videos to reach a wider audience

After 8 years in social media we clearly begin to focus on the creation of dissemination videos as a means to reach a wide and diverse audience: outreach of European projects, dissemination talks, tutorials of experiments to take away, animations of the groups' research, etc.

By 2024, we have professionally produced 10 videos.

YEAR 2022

We win the 2nd NanoCar Race

The second edition of the world's smallest car race takes place in 2022. The team NanoHispa formed by David Ecíja and Emilio Pérez's groups compete for the first time only to win the title. The rest is history.

YEAR 2023

Nanociencia entretenida: fighting boredom with (nano) science

This project is created for the enjoyment of the elderly living in residential homes, combining science and entertainment.

YEAR 2024

A new era begins... How would you like the outreach to be?

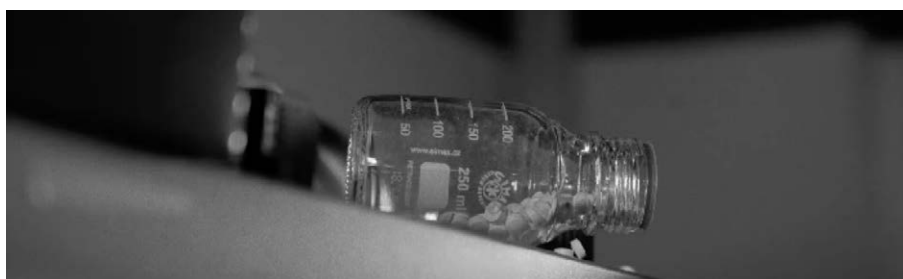


NANOSCIENCE FOR STORYTELLING: “LOS CASOS DE AMPARO PEÑA”

Nanociencia para contar (FCT-22-18542) is the third edition, funded by FECYT, of the outreach project aimed at the elderly that IMDEA Nanociencia has been running since 2018.

On this occasion, special emphasis has been placed on the ‘Entertaining Nanoscience’ line, which aims to use scientific dissemination as a means to help alleviate the boredom of elderly people institutionalised in nursing homes. It is a multidisciplinary project, as we work with professionals from the social sciences to combine scientific outreach and entertainment.

For this line, a movie has been developed following the canons of old-fashioned film noir detective stories, full of touches on the research carried out at the institute. The film serves as the storyline for the activities and experiments that take place during the sessions at the nursing homes.





NANOCAR RACING

The Nanocar Race is the world's smallest car race covering the longest distance possible on a gold track for 24 hours, where the vehicles are molecules driven remotely by the interaction with the tip of a scanning tunneling microscope (STM). After 24 hours of exciting nanoracing, the NANOHISPA team took first place in the Nanocar Race II (Toulouse, 2022).

To celebrate the top of the podium finish, researchers created a videogame to simulate the exciting race of the Nanocar Race. The videogame is available for PC, Android and Apple, and was installed in an arcade machine in the hall of IMDEA Nanociencia.

<https://nanohispa.nanociencia.imdea.org/play-the-game/>

A virtual competition was organised for the outreach event 'Semana de la Ciencia y la Innovación'. During the 'Bencene Cup', more than 7.900 games were played by more than 100 players from 12 regions worldwide, including Europe, Latinamerica and Asia. Prizes were awarded to the fastest players and there were also prizes raffled among all participants.



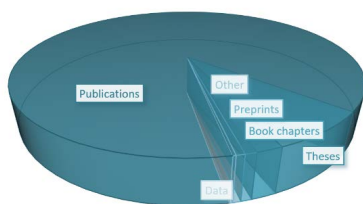
INSTITUTIONAL REPOSITORY

The institutional Repository of IMDEA Nanociencia is the digital archive that collects the scientific production of the institute, with the aim of preserving and disseminating research results in open access. It is periodically harvested by main aggregators such as OpenAIRE (EU), Recolecta (FECYT) or Google.

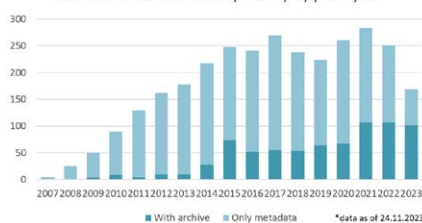
The Repository collects more than 3.000 research outputs, papers and data, and hosts approximately 60% of the archives for 2023 publications. The Repository portal has received 45.800 visits in 2023, including robots, from which 4.769 visits would be organic traffic from the 580 different visitors that used the Repository.

The repository has been funded by a María de Guzmán 2021-2022 grant from FECYT-Ministerio de Ciencia e Innovación.

REPOSITORY CONTENT



Number of items in the repository by publ. year



repositorio institucional IMDEA Nanociencia

instituto IMDEA nanociencia

en | es

Repositorio institucional de IMDEA Nanociencia / **Communities and Collections**

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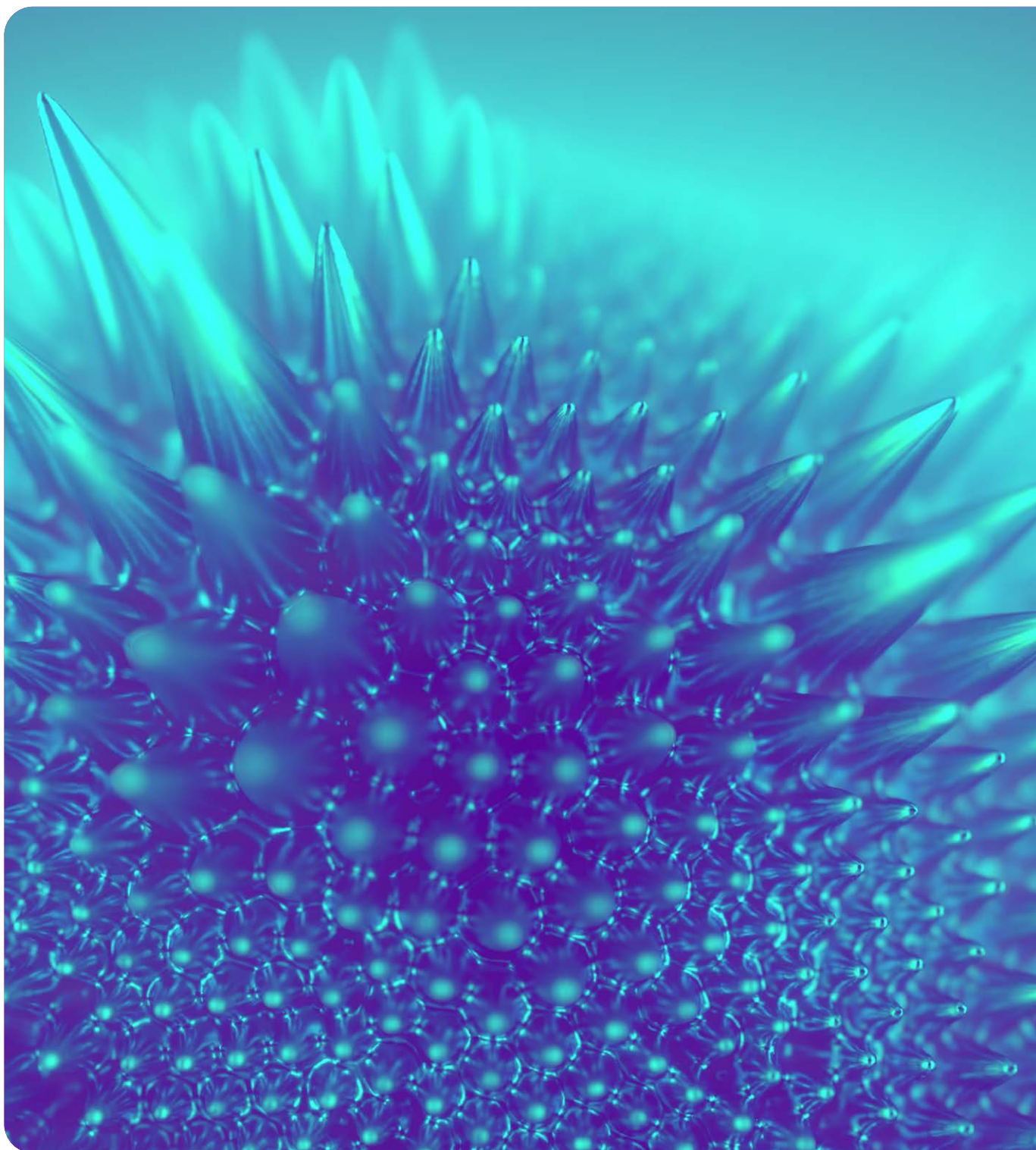
Services

- » Autoarchive guide
- » Open access policies
- » Licenses
- » Help - FAQs

Communities and Collections

Shown below is a list of communities and the collections and sub-communities within them. Click on a name to view that community or collection home page.

- Academic activities **220**
- Institutional documents **17**
- Research **2805**

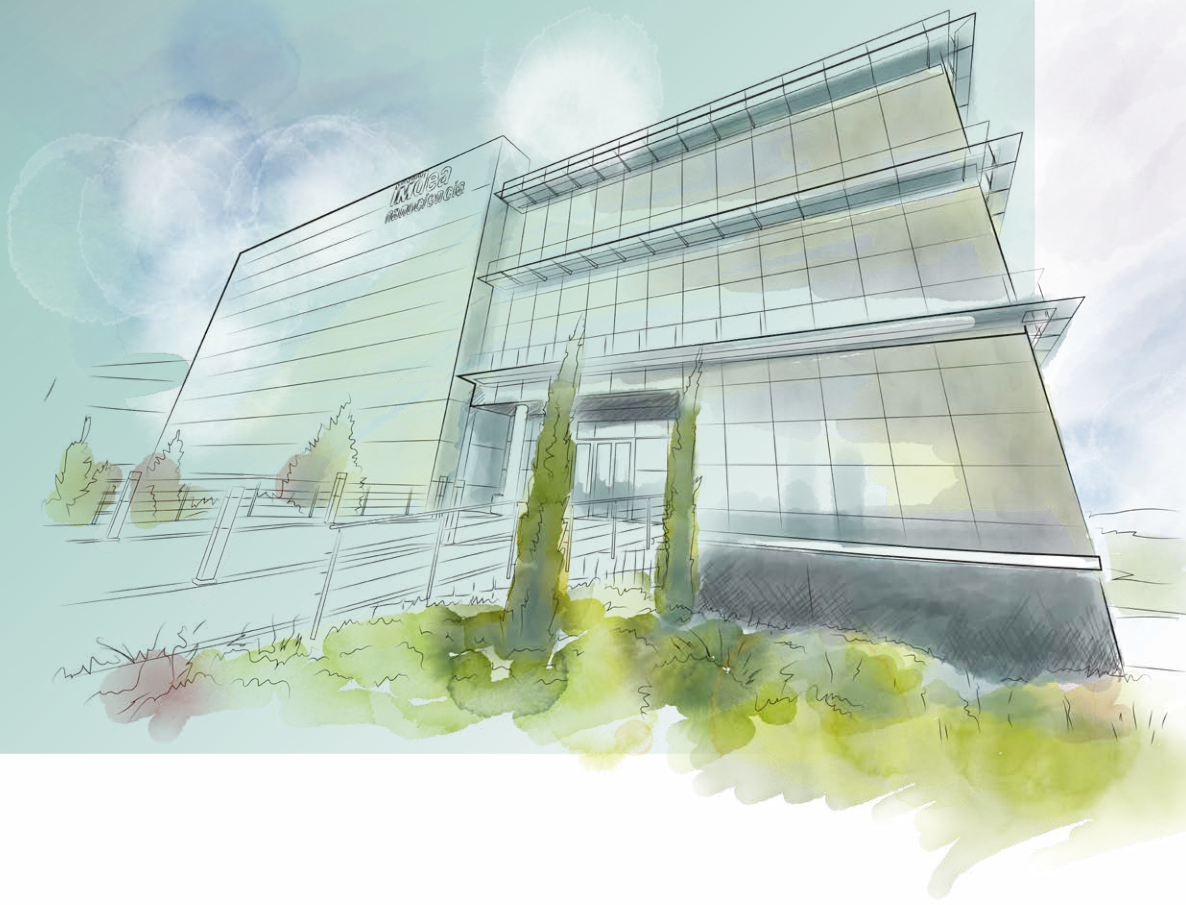


5

annexes

1. Contributions to conferences [173]

annual
report
20
23





1. Contributions to conferences

118
conferences

276
contributions:

84 invited talks

91 oral contributions

101 poster contributions

07/01/2023

16th Conference on Organic Electronics (ICOE)

Madrid

Oral communication(s)

Johannes Gierschner

Charge transfer state engineering for tailor-made luminescent organic materials

11/01/2023

International Workshop on Twisted Bilayer Graphene and Beyond (Twistronics 2023)

University of Seoul, Korea

Invited/plenary talk

F. Guinea

Electrons, strains, and phonons in twisted and untwisted graphene

12/01/2023

New IAdChem Researchers on the Block Workshop

Institute of Advanced Research in Chemical Sciences (IAdChem), Madrid

Invited/plenary talk

Wojciech Gawelda

Tracking electron transfer processes in photoactive transition metal complexes with ultrafast X-ray and optical spectroscopies

15/01/2023

IEEE Conference on Advances in Magnetism

Moena, Italy

Oral communication(s)

J. Lelieaert, J. Ortega-Julia, D. Ortega

Estimating the heating and its distribution of complex nanoparticle aggregates for magnetic hyperthermia

Lucas Perez, Claudia Fernández-González, Alba Berja, Arantazu Mascaraque, Lucia Aballe, Michael Foerster, Ruy Sanz, Sandra Ruiz-Gomez

Tailoring the magnetization processes of chemically modulated cylindrical nanowires

23/01/2023

International Workshop on X-ray Raman and other non-resonant Inelastic X-ray Scattering at XFELs, European XFEL Users Meeting 2023

Hamburg, Germany

Invited/plenary talk

Wojciech Gawelda

X-ray Raman Scattering in molecular liquids and solvents – a preliminary study

25/01/2023

Symposium in honour of Prof. Fred Wudl 'Fullerenes and Friends'

Elche

Invited/plenary talks

Nazario Martín León

The revival of fullerenes

Tomás Torres

Subphthalocyanines: Singular aromatic non-planar and chiral molecules

26/01/2023

Royal Society of Chemistry's virtual Macrocyclic and Supramolecular Chemistry Seminar Series (RSC vMASC Online Seminar Series)

Online (UK)

Invited/plenary talk

Emilio M. Pérez

Macrocyclic adventures in Nanoscience

27/01/2023

Symposium of the Computing π -Conjugated Compounds Society (C C) 'Computing π -Conjugated Compounds'

Madrid

Invited/plenary talk

Nazario Martín León

Synthetic Chiral Molecular Nanographenes

31/01/2023

XIV Conference of Young Researchers in Atomic and Molecular Physics - 10th Young Scientists Workshop on Theoretical Chemistry and Computational Modelling
Madrid

Oral communication(s)

A J Suñer-Rubio, R Y Bello, A Palacios, F Martín

Obtaining molecular photoionization time delays, a full-dimensional study

Francisco Fernández Villaloria, Jesús González

Vázquez, Alicia Palacios, Fernando Martín

Time-Resolved Images of Intramolecular Charge Transfer in Organic Molecules

01/02/2023

Workshop on Coupled Electron-Nuclear Dynamics for Electron Capture Processes

Paris, France

Oral communication(s)

Fernando Martín

Effect of nuclear motion on the electron dynamics generated by attosecond pulses in molecules

**XII Reunión de la División de Física de la Materia Condensada de la Real Sociedad Española de Física (GEFES2023)**

Salamanca

Oral communication(s)

Joan Ripoll-Sau*, I. Di Bernardo, F. Calleja, P. Casado Aguilar, I.M. Ibarburu, R. Miranda, A.L. Vázquez de Parga, M. Garnica

Phase engineering of two-dimensional transition metal ditellurides

Poster communication(s)

Cristina García Pérez, Julia García Pérez, Fernando Jiménez Urbanos, María Acebrón Rodicio, María Teresa Magaz, Alicia Gómez, Daniel Granados, Ramón Bernardo-Gavito

Development of Superconducting Single-Photon Detectors based on NbTiN and Graphene

G. Caballero, J. García Pérez, F. J. Urbanos, F. Aguirre, R. Bernardo-Gavito, E. Miranda, M. Menghin, D. Granados

Memristive behaviour in exfoliated and nanostructured three-terminal MoS₂ devices

Ignacio Figueruelo, Ángel Adolfo del Campo, Manuel R. Osorio, Aida Serrano, Gabriel Caballero, Gladys Nieva, Elvira M. González and Mariela Menghini

Fabrication and characterization of exfoliated high-temperature

Julia García-Pérez, Ramón Bernardo-Gavito and Daniel Granados

Performing an array of MoS₂ micro-drum resonators

Mariela Menghini, Gabriel Caballero, Ana Parente, Ignacio Figueruelo, Yako Irusta, Manuel R. Osorio, Iciar Arnay, Álvaro Muñoz-Noval, Paolo Perna, Elvira M. Gonzalez

Magneto-transport properties and anomalous Hall effect in ferromagnet/nanostructured superconductor hybrid systems

Ramón Bernardo Gavito, Julia García Pérez, Daniel Granados

Exploiting nonlinearities of two-dimensional micro-drum resonators for random number generation

XIV Conference of Young Researchers in Atomic and Molecular Physics - 10th Young Scientists Workshop on Theoretical Chemistry and Computational Modelling

Madrid

Oral communication(s)

Prateek Pranjal, R. Y. Bello, F. Martín

Photoionization spectra of CO₂**06/02/2023****Bits of Advanced Nanobioscience in the Madrid area**

Centro Nacional de Biotecnología, Madrid

Invited/plenary talk

C. Flors

Advanced combinations of fluorescence and atomic force microscopy to study Biology at the nanoscale

10/02/2023**16th European Conference on Molecular Electronics (ECME)**

Bari, Italy

Oral communication(s)

Edmund Leary

How Does Antiaromaticity Affect Single Molecule Conductance?

Johannes Gierschner

Charge transfer state engineering for tailor-made luminescent organic materials

17/02/2023**European Chemical Society (EuChemS) Division of Organic Chemistry Online Event: 'Highlighting Organic Chemistry in Spain'**

Online

Invited/plenary talk

Tomás Torres

Can something that is called "sub" be superb?

The case of subphthalocyanines

Workshop of the Institute for Advanced Research in Chemistry (IAdChem): Materials for Biosensing & Bioimaging

Madrid

*Oral communication(s)*Laura Gutiérrez-Gálvez, Daniel García-Fernández, Melisa del Barrio, M. Luna, Íñigo Torres, Félix Zamora, Milagros Castellanos, Álvaro Somoza, Tania García-Mendiola and Encarnación Lorenzo
SARS-COV-2 detection through a new electrochemiluminescence platform based on tetrahedral dna nanostructures and few-layer bismuthine*Poster communication(s)*

Daniel García-Fernández, Laura Gutiérrez-Gálvez, Íñigo Torres, Félix Zamora, Tania García-Mendiola, Encarnación Lorenzo

BRCA1 mutation detection by combining graphene nanosheets and carbon nanodots.

Estefanía Enebral Romero, Laura Gutiérrez-Gálvez, Rafael del Caño, Manuel Vázquez Sulleiro, Alicia Naranjo, I. Jénifer Gómez, Félix Pariente, Emilio M. Pérez, Tania García-Mendiola and Encarnación Lorenzo

Heterostructured 2D MoS₂/graphene aptasensor for virus detection**18/02/2023****Biophysical Society Annual Meeting**

San Diego, USA

Oral communication(s)

Collada A, Maestro A, Mertens J, Batllori-Badia E, Galindo A, Pérez-Gil J and Cruz A

Pulmonary surfactant structure as solved by neutron reflectometry and atomic force microscopy

22/02/2023**Final Meeting of the DARTER COST Action 'Delivery of Antisense RNA Therapeutics'**

Bilbao

Oral communication(s)

Álvaro Somoza

Oligonucleotide conjugation to gold, iron oxide, and albumin nanoparticles

*Poster communication(s)*

Irene Pardo*, Luis A. Campos, Álvaro Somoza
Long non-coding RNA FOXD3-AS1 as a therapeutic target for breast and colon cancer

Paula Milán-Rois*, David García Soriano, Eva López, Luis A. Campos, Irene Pardo, Miguel Gisbert-Garzarán, Mario Martínez Mingo, Nuria Lafuente-Gómez, Gorka Salas, Álvaro Somoza
Non-coding RNAs and chemotherapeutics for synergistic cancer treatment

27/02/2023**Higher European research course for users of large experimental systems (HERCULES School)**

Grenoble, France

Poster communication(s)

Paolo Perna

Temperature and angular features of magnetic and transport properties in LSMO films towards biosensor applications

03/03/2023**Aspen Center for Physics Winter Conference 2023 'Novel Quantum States of Matter in Moiré Materials'**

Aspen, USA

Invited/plenary talk

F. Guinea

06/03/2023**VI Reunión del Grupo Especializado de Química Biológica de la Real Sociedad Española de Química (GEQB-RSEQ)**

Valencia

Oral communication(s)

Álvaro Somoza

LncRNAs as therapeutic targets in combination therapy

07/03/2023**21st International Metrology Conference**

Lyon, France

Oral communication(s)

O. Bottascio, I. Rubia-Rodriguez, A. Arduino, L. Zilberti, M. Chiampi, D. Ortega

How virtual experiments can aid a targeted decision about exclusion criteria for patients carrying implants during hyperthermia treatments

08/03/2023**15th International Conference on Femtochemistry**

Berlin, Germany

Oral communication(s)

Wojciech Gawelda

Unravelling excited-state dynamics in molecular dyads using ultrafast X-ray spectroscopy

Shandong Shengda Plastic Technology Co., Ltd., Yantai City, Shandong Province, China
Online (China)

Invited/plenary talk

Tomás Torres

Machines on a molecular scale

17/03/2023**II Workshop de la Sociedad Española de Óptica 'Mujer, Óptica y Fotónica' (SEDOPTICA)**

Salamanca

Invited/plenary talk

C. Flors

Microscopía óptica a la nanoescala

29/03/2023**International Symposium 'Membranes and Modules'**

Berlin, Germany

Poster communication(s)

Collada A, Mertens J, Pérez-Gil J and Cruz A

A study of pulmonary surfactant mechanical properties using atomic force microscopy: the role of hydrophobic proteins SP-B and SP-C

02/04/2023**Conference Series 'Focus on Microscopy'**

Oporto, Portugal

Invited/plenary talk

C. Flors

Advanced combinations of fluorescence and atomic force microscopy to study Biology at the nanoscale

03/04/2023

I Simposio Internacional de Nanoquímica Aplicada, organizado por la Universidad Distrital Francisco José de Caldas, la Escuela de Aviación del Ejército de Colombia y la Sociedad de Doctores e Investigadores de Colombia (SoPhIC)
Online (Colombia)

Invited/plenary talk

G. Bottari

Fabricación ascendente y caracterización a escala atómica de nanoestructuras basadas en porfirinas

Tomás Torres

Liquid crystals, structure, properties and applications

Nanoscience and molecular materials

17/04/2023

European Molecular Biology Organization (EMBO) Workshop 'Time-resolved spectroscopy meets time-resolved crystallography: The future of dynamic photobiology'

Online

Invited/plenary talk

Sara H. Mejías

Protein promoted chromophore excited state modulation

19/04/2023

3rd Workshop on Magnetic Nanoparticles for Hyperthermia Anisotropy and Other Adventures

Santiago de Compostela

*Invited/plenary talk*

Francisco J. Teran

Beyond monitoring magnetic losses by AC magnetometry

VI Escuela de Espectroscopias de Sólidos Inorgánicos

Universidad Internacional de Andalucía, Baeza Spain

Oral communication(s)

Rodolfo Miranda

Microscopías y Espectroscopías avanzadas para el estudio de materiales: Microscopía y Espectroscopía de túnel a escala atómica

24/04/2023**Optica Biophotonics Congress**

Vancouver, Canada

Oral communication(s)

J. Torra, C. Flors

Unconventional fluorophores for super-resolution microscopy

Symposium in honour of Prof. M. Ángeles Vozmediano 'A view from the Dirac cone' (Geli Fest)

Instituto de Ciencia de Materiales (ICMM-CSIC), Madrid Spain

Invited/plenary talk

F. Guinea

The beginning of a great collaboration

27/04/2023**International Seminar on the occasion of the retirement of Prof. P. Predeep 'Mystery and Magic'**

National Institute of Technology Calicut, Kozhikode India

Invited/plenary talk

Johannes Gierschner

Magics & mysteries of physics: solving a 20 years old riddle on luminescence of organic compounds (invited)

28/04/2023**British Intrapartum Care Society (BICS)****Spring Meeting**

Madrid

Invited/plenary talk

Valle Palomo

Biosensors to evaluate CNS promising drugs

07/05/2023**16th European School on Molecular Nanoscience (ESmolNA2023)**

San Lorenzo del Escorial

Invited/plenary talk

Cánovas Enrique

Record-high charge carrier mobilities in 2D covalent- and metal- organic frameworks

D. Écija

On-surface synthesis

Rodolfo Miranda

Magnetism in the flatland

3rd Fusion Conference 'From Carbon-Rich Molecules to Carbon-Based Materials'

Riviera Maya, Mexico

Invited/plenary talk

Nazario Martín León

Towards the stereoselective synthesis of molecular nanographenes

10/05/2023**Budapest School on Modern X-ray Science 2023**

Wigner Research Centre for Physics, Hungarian Academy of Sciences, Budapest, Hungary

Oral communication(s)

Wojciech Gawelda

Time-resolved chemical reaction dynamics with ultrashort X-ray pulses

15/05/2023**IEEE International Magnetism Conference (INTERMAG 2023)**

Sendai, Japan

*Oral communication(s)*D. Cabrera ;J. Ranjbar ;A. Santana-Otero ;M. E. Sharifabad ;D. Ortega ;N. D. Telling ;A. Harper
Iron oxide nanoparticles as a new tool for treating cardiovascular diseasesLucas Perez, Claudia Fernández-González, Alba Berja, Arantzazu Mascaraque, Lucia Aballe, Michael Foerster, Ruy Sanz, Sandra Ruiz-Gomez
Tailoring the magnetization processes of chemically modulated cylindrical nanowires**22/05/2023****European Biophysical Society Meeting**

Stockholm, Sweden

*Oral communication(s)*I Plaza-G.A, F.J. Cao, G Ciesielski, Borja Ibarra*
Single-molecule optical tweezers studies of human mitochondrial DNA replication: Unraveling the coordinated activities of PolG and mtSSB**Workshop IMDEA Nanociencia & Red Conexión Nanomedicina CSIC**

Madrid

Invited/plenary talk

C. Flors

Advanced combinations of fluorescence and atomic force microscopy to study Biology at the nanoscale

Emilio M. Pérez

Novel chemical tools to modify carbon nanotubes and 2D materials

Oral communication(s)

Isabel Rodríguez

Tumor on chip models to screen nanoparticle transport

Jose Sanchez Costa

Potential Applications For Multifunctional Porous Metal-Organic Frameworks

Valle Palomo

Quantum dot and peptide-based sensors to improve drug selection in neurodegenerative diseases

Gorka Salas

Hybrid inorganic magnetic nanomaterials for biomedical applications

**26/05/2023****3rd Workshop on Advanced Nanobioscience**Centro Nacional de Biotecnología, Madrid
Spain*Invited/plenary talk*

C. Flors

How much force is needed to kill a single bacterium?

Oral communication(s)

Bocanegra, R; Ormaetxea, J; Shnyrova AV, Frolov, VA, Ibarra, B*

Comparative analysis of force generation by dynamin isoforms during membrane remodelling

Poster communication(s)

I Plaza G.A.*, K M. Lemishko, G L. Ciesielski, S Fukuda, B Ibarra

Single-molecule characterization of the human mitochondrial DNA helicase

28/05/2023**243rd Meeting of the Electrochemical Society (ECS) & 18th International Symposium on Solid Oxide Fuel Cells (SOFC)**

Boston, USA

Invited/plenary talk

Cánovas Enrique

Minimizing thermal losses at quantum dot-metal oxide interfaces for solar energy conversion
Record-high charge carrier mobilities in 2D covalent- and metal- organic frameworks

D. Écija

Tailoring pi-conjugation on surfaces

Emilio M. Pérez

2D-2D heterostructures beyond van der waals
Mechanically interlocked derivatives of swnts: what, why, how, and what for?

Nazario Martín León

Chiral bilayer nanographenes: synthesis, reactivity and properties

Stereoselective synthesis of molecular nanographenes

Tomás Torres

Recent advances in subphthalocyanines

Oral communication(s)

Jose Sánchez Costa

Playing with the weakest supramolecular interactions in a 3D crystalline hexakis[60] fullerene induces control over hydrogenation selectivity

29/05/2023**The European Materials Research Society Spring Meeting (EMRS 2023)**

Strasbourg, France

Oral communication(s)

Ana Arché-Núñez, Beatriz L. Rodilla, Pilar Ocón, Lucas Pérez, M. Concepción Serrano and M. Teresa González

On-bench characterization and in-vitro biocompatibility of nanowire-based electrodes for neural interfaces

Daniel F. Fernandes, Jaime J. Hernández, Alberto Martín-Asensio, Isabel Rodríguez, Tomas Kubart

Crystallization kinetics of TiO₂ thin films deposited by reactive high power impulse magnetron sputtering**01/06/2023****Solitons and Skyrmion Magnetism (SOLSKYMAG 2023)**

Donostia

Oral communication(s)

Paolo Perna

Rashba-like spin textures in graphene promoted by ferromagnet-mediated electronic-hybridization with heavy metal

03/06/2023**Quantum Geometric Advantage Workshop**

Nanyang Technological University, Singapore

Invited/plenary talk

F. Guinea

Long range interactions, phase diagram, and superconductivity in twisted bilayer graphene

05/06/2023**16th International Conference on Organic Electronics (ICOE2023)**

Madrid

Oral communication(s)

G. Bottari

Porphyrin-based nanoarchitectures: Bottom-up fabrication and atomic-scale characterization

54th Annual Meeting of the of the American Physical Society's Division of Atomic, Molecular and Optical Physics (APS DAMOP)

Spokane, USA

Oral communication(s)

G. Grell, P. Declava, A. Palacios, F. Martín

Influence of the shot-to-shot variation of sub-fs soft X-Ray free electron laser pulses on pump-probe measurements of attosecond charge migration in aromatic molecules

XIII Reunión Científica de Bioinorgánica (BioGranada 2023)

Granada

Spain

Invited/plenary talk

A. M. Pizarro

Potent tethered Osmium(ii) half-sandwich anticancer agents bearing phenylpyridine

07/06/2023**41st International Conference on Vacuum Ultraviolet and X-ray Physics (VUVX)**

Campinas, Brazil

Oral communication(s)

Wojciech Gawelda

Unravelling excited-state dynamics in molecular dyads using ultrafast X-ray spectroscopy

08/06/2023**14th Spanish Conference on Electron Devices**

Valencia

Poster communication(s)



Nerea Dasilva et al.
UMG silicon

Conference of Condensed Matter Physics 2023

Liyang, China

Poster communication(s)

Zhen Zhan

Extended magic phase in twisted graphene multilayers

09/06/2023

Clinical Implementation of Hyperthermic Oncology in Spain and Europe

Barcelona

Invited/plenary talk

D. Ortega

Basics of magnetic hyperthermia in oncology

Discussion meeting of the Swiss 'Molecules at Surfaces' research community (MoCH)

Bern Switzerland

Invited/plenary talk

D. Écija

Tailoring pi-conjugation on surfaces

XVII Iberian Joint Meeting on Atomic and Molecular Physics (IBER2023)

Coimbra, Portugal

Oral communication(s)

Wojciech Gawelda

Ultrafast X-ray and optical studies of charge carries dynamics in colloidal quantum dots

12/06/2023

16th International Conference in Magnetic Fluids 2023

Granada

Oral communication(s)

P. Palacios-Alonso, E. Sanz-de Diego, N. Silvestri, E. J. Artés-Ibáñez, R. Delgado-Buscalioni, T. Pellegrino, A. L. Cortajarena, and F. J. Teran
Surface effects of ac magnetization: experiments and simulations

C. Frade-González, D. Ortega

Targetable thermomagneto-phoretic nanopump for controlled release of biomolecules

C. Lozano-Pedraza, R. López-Méndez, F. Sanz-Rodríguez, A. Espinosa and F. J. Teran

Optical or magnetic activation of iron oxide nanoparticles inside cells? The question behind thermal losses in biological environments

Poster communication(s)

C. Frade-González ;A. Santana-Otero ;D. Ortega

The phase-director effect of iron glycinate complexes in fast microwave-assisted synthesis of iron oxide nanoparticles

12/06/2023

Semana del Doctorado en la Universidad Autónoma de Madrid

Madrid

Oral communication(s)

Mónica Dhanjani

Síntesis versátil y no tóxica de nanopartículas magnéticas para

Poster communication(s)

Julia García-Pérez, Ramón Bernardo-Gavito, Daniel Granados

Performing an array of MoS₂ micro-drum resonators

16/06/2023

Organic Chemistry PhD Workshop 2023 UAM

Madrid

Invited/plenary talk

Emilio M. Pérez

Chemistry and nanoscience: our research adventures in carbon nanotubes, 2d materials and supramolecular chemistry

Oral communication(s)

A. Villechenous, V. Rodríguez-Fanjul, A. M. Pizarro

Fluorescent metallodrugs for anticancer applications

19/06/2023

2nd Annual Conference on Global Nanotechnology (Nanoseries 23)

Instituto de Ciencia de Materiales (ICMM-CSIC), Madrid

Invited/plenary talk

Cánovas Enrique

Record-high charge carrier mobilities in 2D covalent- and metal- organic frameworks

D. Écija

On-surface synthesis

Emilio M. Pérez

Mechanical Interlocking to Unlock the Potential of SWNTs

Congreso Bienal de la Sociedad Española de Terapia Génica y Celular (SETGYC)

Pamplona

Poster communication(s)

Carmen Escalona-Noguero, Nuria Lafuente Gomez, Álvaro Somoza, Gorka Salas, Begoña Sot
Non-viral CRISPR delivery using magnetic nanoparticles

M. López-Valls and B. Sot

CRISPR/Cas13 targeting survivin mRNA: A promising approach for cancer therapy

Nanophotonics of 2D Materials (N2D2023)

Donostia/San Sebastián

Oral communication(s)

Julia García-Pérez, Ramón Bernardo-Gavito and Daniel Granados

Phase imaging and dynamic characterisation of vibrational modes of MoS₂ microdrum resonators

Poster communication(s)

Cristina García Pérez, Julia García Pérez, Fernando Jiménez Urbanos, María Acebrón Rodicio, María Teresa Magaz, Alicia Gómez, Daniel Granados, Ramón Bernardo-Gavito

Development of Superconducting Single-Photon Detectors based on NbTiN and Graphene

**Physics and Applications of High Brightness Beams 2023**

Donostia/San Sebastián

Invited/plenary talk

Allan Johnson

Measuring the dynamics of quantum materials over different length scales with X-ray free electron lasers

21/06/2023**18th Annual Event of the Nanomedicine European Technology Platform (ETPN) & 5th Conference of the British Society for Nanomedicine (ENM) - NANOMED Europe**

Liverpool, UK

Invited/plenary talk

Álvaro Somoza

Combination nanotherapies against cancer

22/06/2023**IX Symposium of Medicinal Chemistry Young Researchers by the Spanish Society of Therapeutic Chemistry (SEQT)**

Santiago de Compostela

Invited/plenary talk

Valle Palomo

My experience as a medicinal chemist looking for drugs against neurodegenerative diseases: from PhD to Junior PI

Jornada de Networking 'Innovaciones en generación y acumulación de energía' #InnoUAM_Energía

Universidad Autónoma de Madrid

Oral communication(s)

Tomás Torres

Materiales disruptivos bidimensionales

Reunión del Grupo Español de Hipertermia Oncológica de la Sociedad Española de Oncología Radioterápica (SEOR)

Las Palmas de Gran Canaria

Invited/plenary talk

D. Ortega

Nanotecnología en la hipertermia oncológica

25/06/2023**XXXIX Reunión Bienal de la Real Sociedad Española de Química**

Zaragoza

Invited/plenary talk

D. Écija

Tailoring pi-conjugation on surfaces

Oral communication(s)

A. Martínez-Martínez, 1 E. Resines-Urien, 1 L. Piñeiro López, 1 A. Fernández-Blanco, 2, 3 A. Lorenzo Mariano, 3 R. Poloni, 3 J. A. Rodríguez-Velamazán, 2 E. Carolina Sañudo, 4 J. Albalad, 5 D. Maspoch, 6 E. Burzurí,* 1, 7 and J. Sánchez Costa* 1

How does the spin transition affect electrical transport in 3D crystalline MOFs?

Álvaro Somoza

LncRNAs as therapeutic targets in combination therapy

E. Resines-Urien, 1 M. A. García García-Tuñón, 2 M. García-Hernández, 3 J. A. Rodríguez-Velamazán, 4 A. Espinosa, 5* J. Sánchez Costa 1*

Switchable spin crossover material for passive control of temperature fluctuations in buildings

Emilio M. Pérez

2D-2D heterostructures beyond van der Waals

Jose Sanchez Costa

Non-porous coordination polymers acting as porous as a versatile platform for reversible opto-electronic read-outs displays

Poster communication(s)

Jorge Sangrador Pérez, Jose Sánchez costa

Lanthanide-based metal-organic frameworks as luminescent sensors of atmospheric pollutants

26/06/2023**Conference on Lasers and Electro-Optics/Europe – European Quantum Electronics Virtual Conferences (CLEO/Europe-EQEC 2023)**

München, Germany

Invited/plenary talk

Fernando Martín

Temporal characterization of sub-3-fs DUV/UV pulses generated by RDW emission

Summer School on the Calculation of Ionic Quantum and Anharmonic Effects with the Stochastic Self-Consistent Harmonic Approximation (SSCHA School 2023)

Donostia/San Sebastián

Oral communication(s)

J. A. Silva Guillén

Precise characterization of the low temperature structures of vanadium oxides

27/06/2023**XVII International Congress of the Spanish Biophysical Society (SBE2023)**

Castelldefels

Invited/plenary talk

Sara H. Mejías

Protein promoted chromophore excited state modulation

Oral communication(s)

Bocanegra, R*; Carlero, D; Fukuda, S; Martin-Benito, J; Ibarra, B

Exploring the conformational dynamics of influenza A virus vRNP during transcription using high-speed atomic force microscopy

Poster communication(s)

I Plaza G.A.*, K.M. Lemishko, G.L. Ciesielski, S Fukuda, B Ibarra

Single-molecule characterization of the human mitochondrial DNA helicase

I Zumeta*, G.L. Ciesielski, B Ibarra.

Effect of temperature on the real-time kinetics of the mitochondrial replisome



Ortiz-Rodríguez*, M.; Galleto, R.; Cao, F.J.; Ibarra, B.

Single-molecule manipulation of genome integrity guardians

03/07/2023

16th International Conference on Materials Chemistry (MC16)

Dublin, Ireland

Oral communication(s)

A. Martínez-Martínez, I. E. Resines-Urrien, I. L. Piñeiro López, I. A. Fernández-Blanco, I. A. Lorenzo Mariano, I. R. Poloni, I. J. A. Rodríguez-Velamazán, I. E. Carolina Sañudo, I. J. Albalad, I. D. Maspoch, I. E. Burzurí, *I, I, I and I. Sánchez Costa*¹

How does the spin ransition affect electrical transport in 3D crystalline MOFs?

E. Resines-Urrien, I. M. A. García García-Tuñón, I. M. García-Hernández, I. J. A. Rodríguez-Velamazán, I. A. Espinosa, I. J. Sánchez Costa¹*

Concomitant Thermo-chromic and Phase-Change Effect in a Switchable Spin Crossover Material for Efficient Passive Control of Day and Night Temperature Fluctuations

Poster communication(s)

Jorge Sangrador Pérez, Jose Sánchez costa
Lanthanide-based metal-organic frameworks as luminescent sensors of atmospheric pollutants

16th International Conference on Organic Electronics (ICOE2023)

Madrid

Invited/plenary talk

D. Écija

Tailoring pi-conjugation on surfaces

Emilio M. Pérez

Novel chemical tools to modify carbon nanotubes and 2D materials

Tomás Torres

Subphthalocyanines: singular nonplanar aromatic compounds with applications as

41st International Conference on Vacuum Ultraviolet and X-ray Physics (VUVX)

Campinas, Brazil

Oral communication(s)

Gilbert Grell, Fernando Martín

Conferencia bianual 'Fuerzas y Túnel' (FyT2023)

Zamora

Spain

Oral communication(s)

A. Gallardo*, B. Mallada, K. Biswas, J. I. Urgel, P. Jelínek, D. Écija

Real-space imaging of charge distributions by means of Kelvin probe force microscopy

E. Pérez-Elvira

Generating antiaromaticity: thermally-selective skeletal rearrangements at interfaces

L. Watson, I. Di Bernardo*, J. Ripoll-Sau, C. Gonzalez, F. Calleja, Manuela

Garnica, Amadeo L. Vázquez de Parga, Michael S. Fuhrer

Ultra-low temperature scanning probe imaging of WTe₂

M. Tenorio, S. K. Mathialagan, S. O. Parreiras, L. Černa, D. Moreno ,B. Muñiz-Cano, K. Lauwaet, M. Valvidares, M. A. Valbuena, J. I. Urgel, P. Gargiani, R. Miranda, J. Camarero, J. I. Martínez, J. M. Gallego and D. Écija

Electronic and magnetic properties of bottom-up synthesized lanthanide-based metallocenes

Poster communication(s)

A. Amiri*, M. G. Cuxart, B. Muñiz Cano, M. A. Valbuena, A. L. Vázquez de Parga, M. Garnica
Growth and characterization of MnTe₂ mono- and bilayer

A. Martín-Jiménez, K. Lauwaet*, Ó. Jover, D. Granados, A. Arnau, V.M. Silkin, R. Miranda, and R. Otero

Electronic Temperature and Two-Electron Processes in Overbias Plasmonic Emission from Tunnel Junctions

Cosme G. Ayani*, Michele Pisarra, Iván Martínez, Manuela Garnica, Rodolfo Miranda, Fabián Calleja, Fernando Martín, Amadeo L. Vázquez de Parga

Kondo lattice development in a TaS₂ van der Waals heterostructure

F. Calleja*, C.G. Ayani, I.M. Ibarburu, M. Garnica, R. Miranda, A.L. Vázquez de Parga

Atomic and electronic properties of a 1H/1T-TaS₂ polymorphic van der Waals heterostructure

Iván M. Ibarburu, Clara Rebanal*, Manuel Vázquez-Sulleiro, Alicia Naranjo, Manuela Garnica, Fabián Calleja, Emilio Pérez, Amadeo L. Vázquez de Parga

Chemical functionalization of MoS₂ based on maleimides chemistry

J. Ripoll-Sau*, I. Di Bernardo, F. Calleja, C. G. Ayani, R. Miranda, J. A. Silva-Guillén, E. Canadell, A. L. Vázquez de Parga, M. Garnica
Metastable polymorphic phases in monolayer TaTe₂

K. Biswas, M. Urbani, A. Sánchez-Grande, D. Soler-Polo, K. Lauwaet*, A. Mat j, P. Mutombo, L. Veis, J. Brabec, K. Pernal, J.M. Gallego, R. Miranda, D. Écija, P. Jelínek, T. Torres, and J.I. Urgel

Interplay between π -conjugation and exchange magnetism in one-dimensional porphyrinoid polymers

12/07/2023

European Network to Find the Cure of Amyotrophic Lateral Sclerosis (ENCALS)

Barcelona

Poster communication(s)

Carmen Pérez de la Lastra, Gracia Porras, Carlota Tosat, Ángeles Martín-Requero, Ana Martínez, Valle Palomo

Assessment of protein aggregation in a model of ALS and cells derived from patients

Paula Fernández-Gómez, Carlota Tosat-Bitrián, Ángeles Martín Requero, Valle Palomo

Improving pathological protein analysis by flow cytometry and immunofluorescence in ALS



17/07/2023

International Workshop on Quantum phenomena in 2D Matter (QP2DM)

Donostia/San Sebastián

Invited/plenary talk

F. Guinea

Twisted bilayer graphene: superconducting order parameter and novel devices

Poster communication(s)

Alejandro Jimeno Pozo

Superconductivity from repulsive interactions in bernal bilayer graphene

G. Parra, F. Guinea, J. A. Silva Guillén

Electronic properties of twisted TMDs using Wannier based Tight-Binding model

Pierre A. Pantaleón Peralta

Strain induced unidimensional channels in twisted moiré lattices.

25/07/2023

XXXIII International Conference on Photonic, Electronic and Atomic Collisions

Ottawa, Canada

Poster communication(s)

Aaron Laforge, Debadarshini Mishra, Lauren Gorman, Sergio DíazTendero, Fernando Martín, Nora Berrah

Time-resolved imaging of an elusive molecular reaction: hydrogen roaming in acetonitrile

Adrian J. Suñer-Rubio, Roger Y. Bello, Christoph Lemell, Joachim Burgdörfer, Alicia Palacios, Fernando Martín

Theory of molecular photoionization time delays

Fabian Holzmeier, Alberto Gonzalez-Castillo, Thomas Baumann, Carlo Callegari, Michele Di Fraia, Matteo Lucchini, Michael Meyer, Danielle Doweck, Oksana Plekan, Kevin Prince, Eleonore Roussel, Rene Wagner, Alicia Palacios, Fernando Martin, Danielle Doweck

Ionization dynamics in H₂ by interference of one- and two-photon pathways employing VUV FEL Pulses

Francisco Fernández Villaloria, Jesús González Vázquez, Alicia Palacios, Fernando Martín
Time-Resolved Images of Intramolecular Charge Transfer in Organic Molecules

Francisco Fernández-Villoria, Federico Vismarra, Rocío Borrego-Varillas, Yingxuan Wu, Daniele Mocchi, Lorenzo Colaizzi, Maurizio Reduzzi, Fabian Holzmeier, Laura Carlini, Paola Bolognesi, Robert Richter, Lorenzo Avaldi, Jesús González-Vázquez, Alicia Palacios, José Santos, Matteo Lucchini, Luis Bañares, Nazario Martín, Fernando Martín, Mauro Nisoli

Ultrafast dynamics in donor-acceptor prototype molecules by XUV-IR attosecond spectroscopy

Kathryn R. Hamilton, Klaus Bartschat, Igor Bray, Andrew C Brown, Nicolas Douguet, Charlotte Froese Fischer, Jesus G. Vasquez, Jimena D. Gorfinkiel, Robert Lucchese, Fernando Martin, Sudhakar Pamidighantam, Barry I. Schneider, Armin Scrinzi

AMOS gateway: a portal for research and education in atomic, molecular, and optical science

03/08/2023

22nd International Symposium on Correlation, Polarization and Ionization in Atomic and Molecular Collisions (COPIAMC2023)

Toronto, Canada

Poster communication(s)

Fernando Martín

12/08/2023

International Conference on Advances in Functional Materials (AAAFM)

University of California, Los Angeles, USA

Invited/plenary talk

Tomás Torres

Subphthalocyanines: Singular, aromatic and chiral, non-planar compounds

27/08/2023

20th Congress of the European Society for Photobiology

Lyon, France

Oral communication(s)

Sara H. Mejías

Protein promoted chromophore excited state modulation

XIII Joint European Magnetic Symposia (JEMS2023)

Facultad de Medicina, Universidad Complutense de Madrid
Spain

Invited/plenary talk

L. Álvaro Gómez, A. Masseur, J. Hurst, S. Ruiz Gómez, C. Fernández González, M. Schöbitz, A. De Riz, N. Mille, M.W. Khaliq, J. Bachmann, M.Á. Niño, M. Weigand, S. Wintz, M. Foerster, L. Aballe, R. Belkhou, J.C. Toussaint, C.Thirion, L. Pérez, D. Gusakova, O. Fruchart.
Interplay of cersted field and curling structures in cylindrical nanowires

Rodolfo Miranda

MMN: Madrid, Magnetism and Nanotechnology

Oral communication(s)

A. Santana-Otero, M. E. Fortes-Brollo, C. Frade-González, M. P. Morales, D. Ortega

Microwave-assisted ultra-stable to oxidation nanopermalloys in aqueous media

A. Venegas-Gomez, E. Sanz-de Diego, S. H. Mejías, J. Leon-Moro, A. L. Cortajarena, A. Solé-Porta, A. Roig, F. J. Teran

Potencial of AC magnetometry to display protein conformational changes

C. Frade-González ;R. Fernández-Cisnal ;F. J. García-Cozar ;D. Ortega

Targetable thermomagneto-phoretic nanopumps for theranostics

D. Cabrera, T. Yoshida, M. M. Shams, G. Salas, A. Bollero, M..P. Morales, J.Camarero and F.J. Teran.
Novel methodology to determine the magnetic anisotropy of magnetic nanoparticles in colloidal suspension



E. Sanz-de Diego, P. Palacios-Alonso, N. Silvestri, E.J. Artés-Ibáñez, R. Delgado-Buscalioni, T. Pellegrino, A. L. Cortajarena, and F. J. Teran
Exploiting nanoparticle dynamic magnetization for biosensing in liquids

Iciar Arnay

Role of interface phenomena in the integration of ferroelectric thin films on graphene/Co/HM stacks

Ines Garcia Manuz

Tailoring exchange bias phenomena in V2O3/Co bilayers driven by ferromagnetic domains

J. Ortega-Julia ;D. Ortega ;J. Leliaert

Estimating the heat spatial distribution of complex nanoparticle aggregates for magnetic hyperthermia

J. Soler Morala, I. Arnay, G. Gzoukia, P. Pedraz, P. Perna, L. Alff, C. Navío, A. Bollero

Spin Reorientation Transition In Epitaxial Nd-Fe-B Thin Films With High Perpendicular Magnetic Anisotropy

Jose Sanchez Costa

Switchable spin crossover (SCO) material for passive control of temperature fluctuations in buildings

Paolo Perna

Rashba-like spin textures in graphene promoted by ferromagnet-mediated electronic-hybridization with heavy metal

Raúl Solís

Effect of size and Sr content on the detectivity of anisotropic magnetoresistive sensors patterned in LSMO thin films

S. O. Parreiras*, C. Martín-Fuentes, J. I. Urgel, V. Rubio-Giménez, B. Muñoz-Cano, D. Moreno, K. Lauwaet, M. Valvidares, M. A. Valbuena, P. Gargiani, J. Camarero, J. M. Gallego, R. Miranda, J. I. Martínez, C. Martí-Gastaldo, D. Écija
Engineering of a 2D Metal-organic network featuring a large unquenched orbital magnetic moment

Poster communication(s)

I.García-Manuz*, R. Solís, J.M. Diez, G. De Arana, J. L. F. Cuñado, A. Gudín, L.G. Enger, B. Guillet, L. Méchin, S. Flament, P. Perna and J.Camarero

Disentangling the magnetoresistance contributions of perovskites thin films

A. Guedeja-Marron1, M. Saura-Muzquiz1, S. Ruiz-Gomez3, C. Fernandez-Gonzalez3, I. Garcia-Manuz2, H. L. Andersen4, P. Perna2, L. Perez1 and M. Varela1

Atomic resolution studies of low dimensional Bi-doped Cu nanowires for spintronic applications

Adrián Gudín

Spin-charge current interconversion in high-quality epitaxial Co/Pt systems

F. Ajejas, S. Mallick, Y. Sassi, W. Legrand, S. Collin, A. Vecchiola, K. Bouzehouane, A. Thiaville, S. Pizzini, N. Reyren, V. Cros, A. Fert

Modulation of the DMI in Co based metallic trilayers using light and heavy elements

Gabriel Caballero, Ana Parente, Ignacio Figueruelo, Yako Irusta, Manuel R. Osorio, Iciar Arnay, Álvaro Muñoz-Noval, Paolo Perna, Elvira M. Gonzalez, Mariela Menghini

Magneto-transport properties and anomalous Hall effect in ferromagnet/nanostructured superconductor hybrid systems

Ines Garcia Manuz

Study of the magnetoresistive behaviour of LSMO thin films with different vicinal angles towards optimised AMR biosensors

Lucía Gómez-Cruz, Claudia Fernández-González, Alba Guio, Alejandra Guedeja-Marrón, María Varela, Lucas Pérez, Sandra Ruiz-Gómez
Magnetic coupling in electrodeposited nanowires with radial modulation of composition

Pablo Ollerros, Adrián Gudín

Anatomy of the dynamics of the nucleation of skyrmions in nanodots via the voltage-controlled magnetic anisotropy

Paolo Perna

Inducing single spin-polarized flat bands in monolayer graphene

28/08/2023

36th European Conference on Surface Science (ECOSS)
Lodz, Poland

Oral communication(s)

M. Tenorio, S. K. Mathialagan, S. O. Parreiras, L. Černa, D. Moreno, B. Muñoz-Cano, K. Lauwaet, M. Valvidares, M. A. Valbuena, J. I. Urgel, P. Gargiani, R. Miranda, J. Camarero, J. I. Martínez, J. M. Gallego and D. Écija

On-surface synthesis of bis(benzenehexol) lanthanide sandwiches: chemical, electronic, and magnetic properties.

S. O. Parreiras*, C. Martín-Fuentes, J. I. Urgel, V. Rubio-Giménez, B. Muñoz-Cano, D. Moreno, K. Lauwaet, M. Valvidares, M. A. Valbuena, P. Gargiani, J. Camarero, J. M. Gallego, R. Miranda, J. I. Martínez, C. Martí-Gastaldo, D. Écija
Engineering of a 2D Metal-organic network featuring a large unquenched orbital magnetic moment

03/09/2023

9th International Symposium on Advances in Synthetic and Medicinal Chemistry (EFMC-ASM 2023)

Zagreb, Croatia

Poster communication(s)

Rebeca París, Valle Palomo

Design of diverse biosensors for visualizing cytoskeleton modulations and dynamics

04/09/2023

30th General Conference of the Condensed Matter Division of the European Physical Society (CMD30-FisMat 2023)

Milano, Italy

Invited/plenary talk

Edmund Leary

How Does Antiaromaticity Affect Single Molecule Conductance?

F. Guinea

Superconducting order parameter, and superconducting junctions in twisted bilayer graphene

Fernando Martín

Ultrafast dynamics in nitroaniline molecules initiated by isolated attosecond pulses



M. Teresa González

Quantum phenomena in single-molecule circuits: from nano-wires to nano-potentiometers

European School on Magnetism (ESM 2023)

Madrid

Oral communication(s)

Alberto Bollero

Permanent magnets and applications

Poster communication(s)

Paolo Perna

Study of magnetoresistive behaviour of LSMO thin films towards optimise AMR biosensors

Raúl Solís

Effect of size and Sr content on the detectivity of anisotropic magnetoresistive sensors patterned in LSMO thin films

S. K. Mathialagan, M. Tenorio, S. O. Parreiras, L. Černa, D. Moreno, B. Muñoz-Cano, K. Lauwaet, M. Valvidares, M. A. Valbuena, J. I. Urgel, P. Gargiani, R. Miranda, J. Camarero, J. I. Martínez, J. M. Gallego and D. Ćcija

On-surface synthesis of organolanthanide sandwich complexes

05/09/2023

45° Congreso de la Sociedad Española de Bioquímica y Biología Molecular (SEBBM)

Zaragoza

Invited/plenary talk

Álvaro Somoza

Combination therapies based on nanoparticles against cancer

Poster communication(s)

J.L. Baciredo, M. Castellanos, R. Bernardo-Gavito

Development of novel biodetection methodologies based on spectroscopy and nanotechnology

Iberian Joint Meeting on Atomic and Molecular Physics

Coimbra, Portugal

Invited/plenary talk

Juan Cabanillas Gonzalez

Ultrafast inter-system crossing in triply fused porphyrin - nanographenes

09/09/2023

11th International Brain Research Organization (IBRO) World Congress of Neuroscience

Granada

Poster communication(s)

Miguel Esteban Lucía, Jaime J. Hernández, Silvia García López, Alberto Martínez Serrano, Marta Pérez Pereira and Isabel Rodríguez

Neural stem cells behaviour on micro-nanostructured substrates module neural stem cell behaviour and differentiation

13/09/2023

Institut Català d'Investigació Química (ICIQ) School

Tarragona

Invited/plenary talk

Nazario Martín León

Towards the stereoselective synthesis of molecular nanographenes

International Max Planck Research School for Quantum Dynamics and Control (IMPRS-QDC)

Max Planck Institute for the Physics of Complex Systems, Dresden
Germany

Invited/plenary talk

Cánovas Enrique

Record-high charge carrier mobilities in 2D covalent- and metal- organic frameworks

18/09/2023

International Symposium on Bioorganometallic Chemistry 2023 (ISBOMC 23)

Braunschweig
Germany

Oral communication(s)

A. M. Pizarro

Potent tethered Osmium(ii) half-sandwich anticancer agents bearing phenylpyridine

International Workshop on Spin Research in Graphene Nanostructures (SPRING'23)

Donostia/San Sebastián

Poster communication(s)

Biswas, K., Urbani, M., Sánchez-Grande, A., Soler-Polo, D., Lauwaet, K., Mat j, A., Mutombo, P., Veis, L., Brabec, J., Pernal, K., Gallego, J. M., Miranda, R., Ćcija, D*, Jelínek, P*, Torres, T*, & Urgel, J. I*. Interplay between π -conjugation and exchange magnetism in one dimensional porphyrinoid polymers

The European Materials Research Society (EMRS) Fall Meeting 2023 'Exploring the Potential of 2D Materials for Energy and Optoelectronics' Symposium

Warsaw, Poland

Invited/plenary talk

Juan Cabanillas Gonzalez

Excited state dynamics of nanographenes: from cove-edge to triply fused porphyrin-nanographenes

19/09/2023

International Conference on Neurodegenerative Diseases (CIBERNED)

Málaga

Poster communication(s)

Valle Palomo

Dysregulated microRNAs in immortalized lymphocytes from ALS patients as potential clinical biomarkers

20/09/2023

European Mechanics Society (EUROMECH) Colloquia 'Modulation of physico-chemical processes by elastic strain engineering'

Besançon, Francia

Invited/plenary talk

F. Guinea

Twistronics of 2D materials: from modelling to real systems

Manchester, United Kingdom

Invited/plenary talk

F. Guinea

Superconductivity in graphene stacks

Oral communication(s)

Pierre A. Pantaleón Peralta

Designing moiré patterns by strain

Poster communication(s)

Adrián Ceferino

Continuum description of fully relaxed tBLG and tTLG

Alejandro Jimeno Pozo

Superconductivity from electronic interactions in few layers of graphene

G. Parra, F. Guinea, J. A. Silva Guillén

Electronic properties of twisted TMDs using Wannier based Tight-Binding model

Pierre A. Pantaleón Peralta

Interaction enhanced topological Hall effects in twisted bilayer graphene.

21/09/2023**XI Jornadas de Jóvenes Investigadores del Instituto de Cerámica y Vidrio (ICV-CSIC)**

Madrid

Oral communication(s)

Mónica Dhanjani, César del Valle, Gorka Salas

Benign and versatile synthesis of iron oxide nanoparticles and their study in biomedical applications

23/09/2023**Reunión anual del Club Español de Magnetismo - Capítulo Español de la IEEE Magnetics Society**

Madrid

Poster communication(s)

Cristina M. Montero, Mónica Dhanjani, Alejandro Martín, Gorka Salas, Alberto Bollero

Production of magnetic nanoparticles by recycling industrial steel manufacturing residues

24/09/2023**4th Open Science Fair**

Madrid

Poster communication(s)

Elena Alonso, Laura Lorente, Mark Davies, Marije Villa

Supporting scholar dissemination with an institutional repository for research outputs in the fields of Chemistry, Physics and Biology: challenges and opportunities

5th European Conference on Metal Organic Frameworks and Porous Polymers (EUROMOF 2023)

Granada

Oral communication(s)

Jose Sanchez Costa

Playing with the weakest supramolecular interactions in a 3D crystalline hexakis[60] fullerene induces control over hydrogenation selectivity

Poster communication(s)

Jose Sánchez Costa

How does the spin ransition affect electrical transport in 3D crystalline MOFs?

Jose Sánchez Costa

Covalent post-synthetic modification of switchable iron-based coordination polymers by vapor diffusion

Jorge Sangrador Pérez, Jose Sánchez Costa

Lanthanide-based metal-organic frameworks as luminescent sensors of atmospheric pollutants

Marco Ballabio*, Renhao Dong, Peng Han, Himani Arora, Melike Karakus, Chandra Shekhar, Peter Adler, Petko Petkov, Artur Erbe, Stefan Mannsfeld, Claudia Felser, Thomas Heine, Mischa Bonn, Xinliang Feng, Enrique Cánovas
High-mobility band-like charge transport in asemiconducting two-dimensional Fe₃THT₂ MOF Vasileios Balos*, Lukas Sporrer, Guojun Zhou, Mingchao Wang, Sergio Revuelta, Kamil Jastrzembski, Markus Löffler, Petko Petkov, Thomas Heine, Angieszka Kuc, Enrique Cánovas, Zhehao Huang, Xinliang Feng and Renhao Dong b,h
Cu₂(OHPTP): a near IR bandgap semiconducting 2D conjugated metal-organic framework with rhombic lattice and high mobility

Sandra. M. Estévez, Gabriel Caballero, Fernando Jiménez, Julia García, Ignacio Figueruelo, Daniel Granados, Zhiyong Wang, Xinliang Feng, Renhao Dong, Mariela Menghini and Enrique Cánovas

Electrical characterization of Cu-BHT MOF monolayer and bilayer

25/09/2023**24th International Conference on Non-contact Atomic force Microscopy (NCAFM2023)**

Singapore

Oral communication(s)

A. Gallardo*, B. Mallada, K. Biswas, J. I. Urgel, P. Jelínek, D. Ěcija

Real-space imaging of charge distributions by means of Kelvin probe force microscopy

Ana Barragán

Generating antiaromaticity: thermally-selective skeletal rearrangements at interfaces

Kalyan Biswas, Maxence Urbani, Ana Sánchez-Grande, Diego Soler, Pingo Mutombo, Koen Lauwaet, José M. Gallego, Rodolfo Miranda, David Ěcija, Pavel Jelínek, Tomás Torres, José I. Urgel*

On-surface synthesis of porphyrinoid- and hemiporphyrazine-based polymers

26/09/2023**Stanford Synchrotron Radiation Lightsource - Linac Coherent Light Source (SSRL/LCLS) Users Meeting - Workshop on First Tender X-ray Spectroscopy Experiments at LCLS**
Menlo Park, CA, USA

*Invited/plenary talk*

Wojciech Gawelda

Scientific opportunities for chemical dynamics using time-resolved tender X-ray spectroscopy

27/09/2023

Microscopy at the Frontiers of Science**Conference**

Braga, Portugal

Oral communication(s)

A. Guedeja-Marron, M. Saura-Muzquiz, S. Ruiz-Gomez, C. Fernandez-Gonzalez, I. Garcia-Manuz, H. L. Andersen, P. Perna, L. Perez and M. Varela

In-situ atomic resolution studies of Bi-doped Cu nanowires for spintronic applications morphology

28/09/2023

6th Spanish Conference on Biomedical Applications of Nanomaterials (SBAN)

Madrid

Invited/plenary talk

Valle Palomo

Improving sensing methodology for drug selection in neurodegenerative diseases

Oral communication(s)

R. López-Méndez, J. Reguera, A. Fromain, E. S. A. Serea, E. Céspedes, F.J. Teran, F. Zheng, A. Parente, M. A. García, E. Fonda, J. Camarero, C. Wilhelm, A. Muñoz-Noval, A. Espinosa

Nanoscale temperature of photoactivated nanoparticles in 3D tumour cells using X-ray nanothermometry

Poster communication(s)

Catarina Coutinho, Nuria Lafuente-Gómez, Irene de la Iglesia, Luis A. Campos, Demián Pardo, Irene Pardo, Jorge Royes, Milagros Castellanos, Álvaro Somoza

Visual and multiplexed detection of microRNAs using gold nanoparticles and lateral flow-based systems

J. Alejandro Bueso, Carmen Pérez

Study of extracellular vesicles produced by a cellular model derived from ALS patients

Mónica Dhanjani, César del Valle, Gorka Salas
Magnetoplasmonic nanoparticles synthesized in non-toxic environment

01/10/2023

68th Annual Conference on Magnetism and Magnetic Materials (MMM 2023)

Dallas, USA

Invited/plenary talk

Paolo Perna

Spin orbit driven effects in graphene/ferromagnet interfaces

04/10/2023

30th Annual Congress of the European Society of Gene and Cell Therapy

Brussels, Belgium

*Poster communication(s)*María López-Valls, Miguel Gisbert-Garzarán, Álvaro Somoza and Begoña Sot
CRISPR/Cas13-RNP knockdown of oncogenic proteins: A promising approach for cancer therapy

08/10/2023

6th International Symposium on Synthetic Carbon Allotropes

Erlangen, Germany

Invited/plenary talk

Nazario Martín León

Stereoselective synthesis of bilayer molecular nanographenes

09/10/2023

14th International Conference Conference on Optical Probes of Organic and Hybrid Semiconductors (OP2023)

Como, Italy

Oral communication(s)

Johannes Gierschner

Deciphering charge transfer state photophysics for tailor-made luminescent organic materials

6th Erlangen Symposium on Synthetic Carbon Allotropes (SCA)

Erlangen, Germany

Invited/plenary talk

Tomás Torres

Nonplanar aromatic chiral porphyrinoids

International Summer School on the Science of Light ICFO-KNUST

Kumasi, Ghana

Invited/plenary talk

Allan Johnson

Ultrafast lasers and their applications to (quantum) materials

15/10/2023

1st European School of Advanced Materials (ESAM2023)

Gandía

Invited/plenary talk

Nazario Martín León

Molecular nanographenes

22/10/2023

The Mathematics and Physics of Moiré Superlattices

Banff International Research Station for Mathematical Innovation and Discovery, Canada

Invited/plenary talk

F. Guinea

Superconductivity in graphene stacks

24/10/2023

Collaborative Congress of the European Society of Gene and Cell Therapy, the French Society for Gene and Cell Therapy and the Netherlands Society of Gene and Cell Therapy (ESGCT/SFTCG/NVGCT)

Brussels, Belgium

*Poster communication(s)*

Carmen Escalona-Noguero, Nuria Lafuente Gomez, Hernán Alarcón-Iniesta, María López-Valls, Álvaro Somoza, Begoña Sot

Application of CRISPR/Cas12a technology in the edition and detection of pathogenic mutations.

26/10/2023

XI Congreso Nacional de la Sociedad Española de Oncología Radioterápica
Madrid

Invited/plenary talk

D. Ortega

Nanoradiosensibilización: ¿dónde estamos?

02/11/2023

Workshop 2023 ‘Topological Matter – Applications to Metrology’ of the TOCHA project ‘Dissipationless topological channels for information transfer and quantum metrology’

Braunschweig, Germany

Poster communication(s)

I. Figueruelo-Campanero, A. Jimeno, J. García, E. Cánovas, R. Miranda, F. Guinea, D. Granados, P. Pantaleon and M. Menghini

Role of disorder in the robustness of the Quantum Hall Effect

05/11/2023

6th International Conference on Memristive Materials, Devices & Systems (MEMRISSYS 2023)

Torino, Italy

Poster communication(s)

G. Caballero, J. García Pérez, F. J. Urbanos, F. Aguirre, R. Bernardo-Gavito, E. Miranda, M. Menghin, D. Granados

Tailoring MoS₂ memtransistors by direct nanopatterning

07/11/2023

Beilstein Organic Chemistry Symposium ‘Pi-conjugated molecules and materials’

Limburg an der Lahn, Germany

Invited/plenary talk

Nazario Martín León

Amazing molecular nanographenes

European Molecular Biology Organization (EMBO) Workshop ‘CRISPR/Cas: from biology to therapeutic applications’

Sevilla, Spain

Poster communication(s)

Carmen Escalona-Noguero, Nuria Lafuente Gomez, Hernán Alarcón-Iniesta, María López-Valls, Álvaro Somoza, Begoña Sot

Applications of DNA-targeting Cas nucleases and nanovehicles in disease therapy and diagnosis

20/11/2023

1er Simposio de Nanomedicina y Terapias Avanzadas IBIMA – Plataforma BIONAND

Malaga

Invited/plenary talk

Álvaro Somoza

Non-coding RNAs and nanosystems for advanced therapeutics

22/11/2023

Single-Molecule Sensors and NanoSystems International Conference (S3IC 2023)

Barcelona

Oral communication(s)

Jose Sanchez Costa

Non-porous coordination polymers acting as porous as a versatile platform for reversible opto-electronic read-outs displays

23/11/2023

7th Young Researchers in Magnetism Conference (YRinM 2023)

El Escorial

Oral communication(s)

A. Guedeja-Marron, M. Saura-Muzquiz, S. Ruiz-Gomez, C. Fernandez-Gonzalez, I. Garcia-Manuz, H. L. Andersen, P. Perna, L. Perez and M. Varela
Atomic resolution insights into in-situ heating and biasing effects in Bi-doped Cu nanowires for spintronics

27/11/2023

Sustainable Industrial Processing Summit (SIPS 2023) - Echegoyen International Symposium - 8th International Symposium on Synthesis & Properties of Nanomaterials for Future Energy Demands

Panama City, Panama

Invited/plenary talk

Tomás Torres

Subphthalocyanines: A new class of nanomaterials

28/11/2023

Porthos Workshop: Science Opportunities at a Fully Coherent XFEL

Baden, Switzerland

Invited/plenary talk

Allan Johnson

Imaging material dynamics

13/12/2023

Sesión de Invierno de las Jornadas conjuntas de los programas de Doctorado en Física y en Astrofísica 2023-2024

Madrid

Oral communication(s)

G. Caballero, J. García Pérez, F. J. Urbanos, F. Aguirre, R. Bernardo-Gavito, E. Miranda, M. Menghin, D. Granados

3-terminal memtransistor devices based on 2D materials

Noelia Rodriguez Diez y M.Teresa Gonzalez

Desarrollo de implantes neuronales nanoestructurados basados en nanotecnología



14/12/2023

13th Early Stage Researchers Workshop in Nanoscience

IMDEA Nanociencia

Opening by Rodolfo Miranda

Oral communication(s)

C. Cardozo*, A. M. Pizarro

New families of highly cytotoxic ruthenium- and osmium-arene tethered complexes as anticancer agents

Carmen Escalona-Noguero, Hernán Alarcón-Iniesta, María López-Valls, Luis Paul del Carpio, Josep M. Piulats, Álvaro Somoza, Begoña Sot
Detection of cancer-associated mutations using CRISPR/Cas12a technology

Cristina García Pérez, Julia García Pérez, Fernando Jiménez Urbanos, María Acebrón Rodicio, María Teresa Magaz, Alicia Gómez, Daniel Granados, Ramón Bernardo-Gavito
Development of Superconducting Single-Photon Detectors based on NbTiN and Graphene

E. Pérez-Elvira

Generating antiaromaticity in polycyclic conjugated hydrocarbons by thermally selective skeletal rearrangements at interfaces

Jorge Sangrador Pérez, Jose Sánchez costa
Lanthanide-based metal-organic frameworks as luminescent sensors of atmospheric pollutants

Poster communication(s)

A. Amiri*, M. G. Cuxart, B. Muñoz Cano, M. A. Valbuena, A. L. Vázquez de Parga, M. Garnica
Growth and characterization of MnTe₂ mono- and bilayer

A. Martín Hoyas, A. M. Pizarro

Novel tether rhenium half-sandwich complexes as anticancer agents

A. Villechenous, S. Infante-Tadeo, V. Rodríguez-Fanjul, A. M. Pizarro

Potent anticancer rhodium(iii) and iridium(iii) piano-stool

Catarina Coutinho, Nuria Lafuente-Gómez, Irene de la Iglesia, Luis A. Campos, Demián Pardo, Irene Pardo, Jorge Royes, Milagros Castellanos, Álvaro Somoza

Visual and multiplexed detection of microRNAs using gold nanoparticles and lateral flow-based systems

Claudia Flórez, Sara H. Mejías

Studying photosystem conformation landscape by protein loop engineering

Cristina M. Montero

Obtaining cagnetic nanoparticles through the processing of industrial steel manufacturing residues

E. Resines-Urien, I. L. Piñeiro-López, I. E. Fernandez-Bartolome, I. A. Gamonal, I. M. Garcia-Hernandez² and J. Sánchez Costa^{1*}

Covalent post-synthetic modification of switchable iron-based coordination polymers by vapor diffusion

G. Caballero, J. García Pérez, F. J. Urbanos, F. Aguirre, R. Bernardo-Gavito, E. Miranda, M. Menghin, D. Granados

Tailoring MoS₂ memtransistors by direct nanopatterning

G. Parra, F. Guinea, J. A. Silva Guillén

Electronic properties of twisted TMDs using Wannier based Tight-Binding model

Gonzalo Pérez, Sara H. Mejías

Designing model photosystems for tracking protein dynamics in chromophore's light harvesting properties

J.L. Baciredo, M. Castellanos, R. Bernardo-Gavito

Early diagnosis of HPV-orpharyngeal cancer based on spectroscopy and nanotechnology.

Julia García-Pérez, Ramón Bernardo-Gavito and Daniel Granados

The beats of MoS₂ microdrum resonators

Lenka Černa, Zdeňek Jakub and Jan Čechal
On-surface synthesis of Ni-TCNQ on chemically gated graphene on Ir(111)

Marco Ballabio*, Alejandro Núñez López, Eugenio Coronado and Enrique Cánovas

Conductive Me-THT Layered Metal-organic Frameworks

Miguel Ángel Pulido, Enrique Cánovas

Univocal determination of electron transfer rates on dye-sensitized metal oxides: a methodological proposal

Noelia Rodríguez-Díez, * Ana Arché-Núñez, Beatriz L.Rodilla, Lucas Pérez, and M. Teresa González

Optimization of Pt electrodeposition parameters in nanostructured electrodes for neural interfacing

Rebeca Paris-Ogayar, Carlota Tosat-Bitrian, Oliva MA, Fernando Diaz, Valle Palomo

Development and evaluation of quantum dots probes for monitoring motor proteins in ND

Rocha Aperador, Christiensen

Collapse of the Drude conductivity model in silicon at low temperature

S. K. Mathialagan, M. Tenorio, S. O. Parreiras, L. Černa, D. Moreno, B. Muñoz-Cano, K. Lauwaet, M. Valvidares, M. A. Valbuena, J. I. Urgel, P. Gargiani, R. Miranda, J. Camarero, J. I. Martínez, J. M. Gallego and D. Écija

On-surface synthesis of organolanthanide sandwich complexes

Sergio Revuelta Martínez

Exciton formation dynamics at the SiO₂/Si interface

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