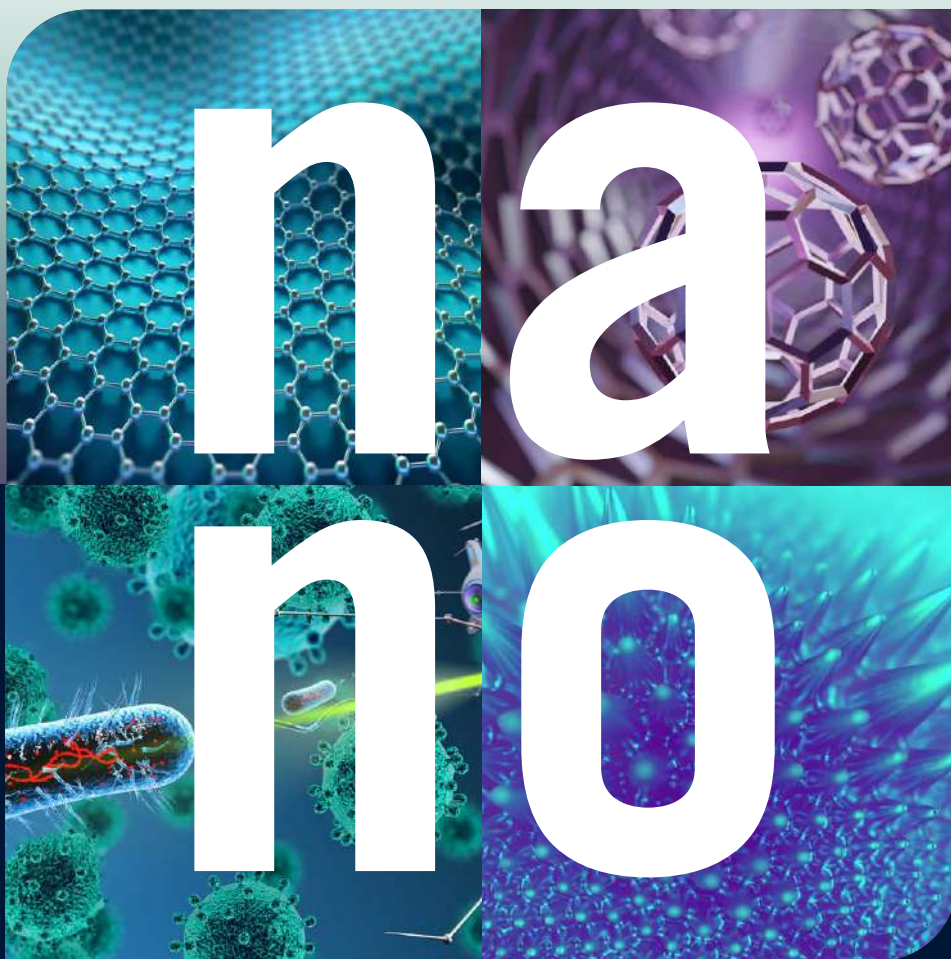


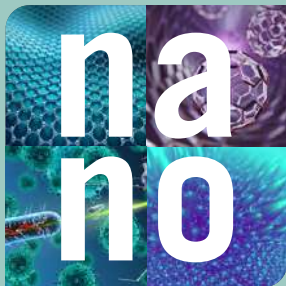
nanoscience
and nanotechnology:
small is different



annual
report **2024**

foreword

annual
report **2024**





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

Rodolfo Miranda

Director, IMDEA Nanociencia Institute

June 2025

During 2024, we successfully implemented the Research Programmes defined in the proposal that led to our second award as a “Severo Ochoa” Centre of Excellence for the period 2022–2025.

We continue to attract outstanding talent from abroad to develop emerging research areas, establish new laboratories, and consolidate our leadership in fields such as ultrafast time-resolved spectroscopies, advanced laser microscopies for ERC-funded projects, newly acquired optical tweezers equipment, and state-of-the-art nanofabrication instruments.

In 2024, we launched the IDEAL PhD programme, an initiative co-funded by the Marie Skłodowska-Curie Actions (MSCA) CO-FUND programme, aimed at attracting 12 talented predoctoral researchers through two open calls. Selected candidates will undertake a PhD research project within any of the Institute’s research programmes. The IDEAL PhD programme is designed to boost the careers of first-stage researchers by offering innovative, truly interdisciplinary and intersectoral training in nanoscience and nanotechnology, in collaboration with international academic and industrial partners.

In terms of quantitative output, in 2024 we reached a plateau with just over 200 published papers, more than 34% of which appeared in D1 journals. The total number of citations accu-

mulated by publications from IMDEA Nanociencia researchers approached 120,000 by year-end, and our institutional h-index has now reached 146. These figures help explain why IMDEA Nanociencia consistently ranks among the top research organisations in Spain.

In 2024, we also maintained a remarkable level of financial sustainability: 74% of our total expenditure was covered through competitive funding sources and contracts with companies, with only 26% coming directly from public administration. For comparison, in 2020 the share of competitive funding was below 50%. Despite these outstanding results, I am convinced that a further increase in baseline financial support is more necessary than ever to ensure the Institute’s long-term competitiveness. The Regional Government of Madrid must reaffirm its commitment in this regard.

IMDEA Nanociencia offers a highly competitive, world-class research environment, located within the UAM–CSIC Cantoblanco Campus of International Excellence (CEI) in Madrid, Spain. With a diverse research staff of over 223 members (representing 32 nationalities; gender balance m/f: 57:43; average age: 38), the fellows will join a dynamic and international scientific community. Doctoral candidates will benefit from a well-balanced combination of research independence and dedicated mentoring by an experienced team of scientists and managers, as well as access to cutting-edge infrastructure for the successful execution of their projects.

I am particularly proud that in 2024 we were finally able to offer job stability to most of our staff through permanent contracts, encompassing a well-balanced representation of researchers, technicians, managers, and administrative personnel—covering all key areas of the Institute. This recognition was fully deserved, given the exceptional talent, dedication, and resilience our team has consistently demonstrated. I am confident that this milestone will be followed in the coming years by new opportunities to complete the core structure of our workforce.

Since the foundation of IMDEA Nanociencia, the commitment of everyone involved has been the key to our success. May this continue in the years ahead. It remains an immense honour for me to be part of this extraordinary journey.

annual
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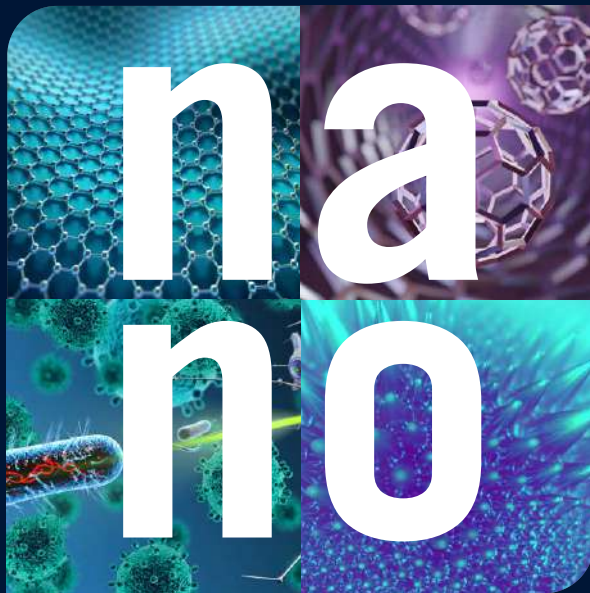


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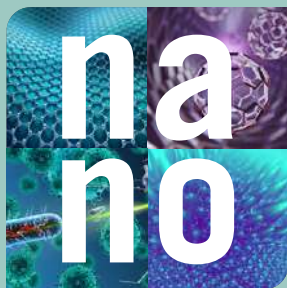


1

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.

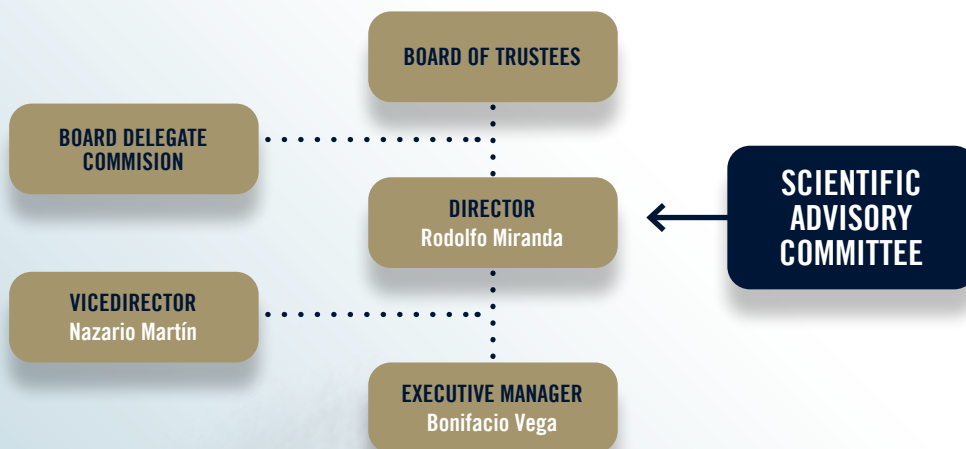
Most importantly, it is essential to be able to recruit and retain new talent and to repatriate young scientists working abroad, to train a new generation of technicians and scientists in a genuine interdisciplinary field, and to create and maintain new experimental equipment and advanced infrastructures.

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



na no



EXECUTIVE COMMISSION



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.

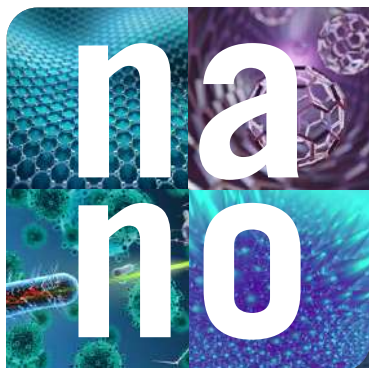
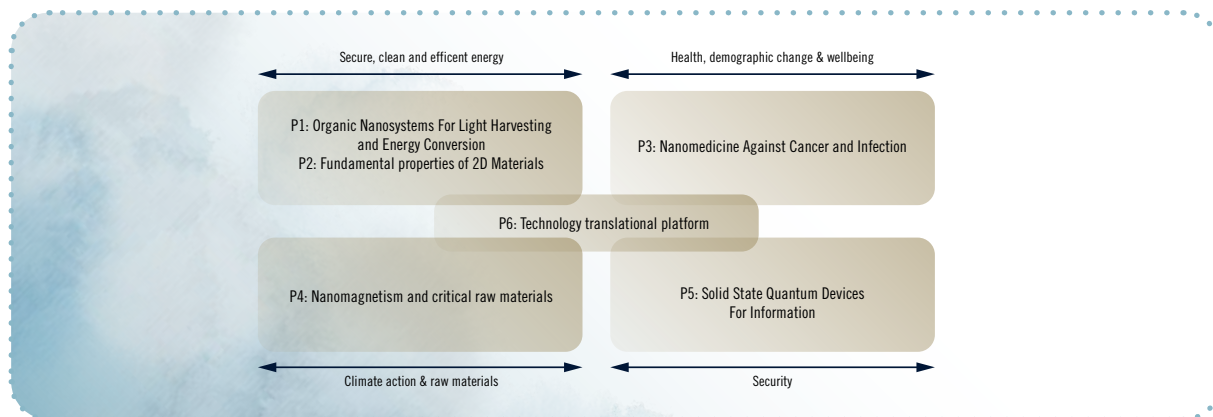
The funding provided by the Severo Ochoa award supports the strengthening of the existing interdisciplinary character of the centre and combines different types of expertise to find innovative solutions for social and economic challenges.

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 SOMM 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

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Viceconsejera de Universidades, Investigación y Ciencia

Ms. Laura Gutiérrez Barreno

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Ms. Bárbara Fernández-Revuelta Fernández-Durán

Subdirectora General de Investigación

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Madrid's Scientific-Technical Coordinator

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

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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

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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. Dr. Luisa de Cola

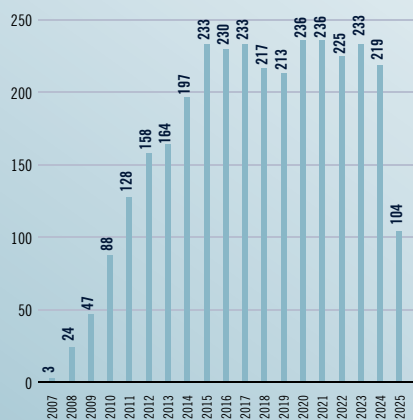
Accademia dei Lincei, Univ. Milano

7. IMDEA Nanociencia at a Glance

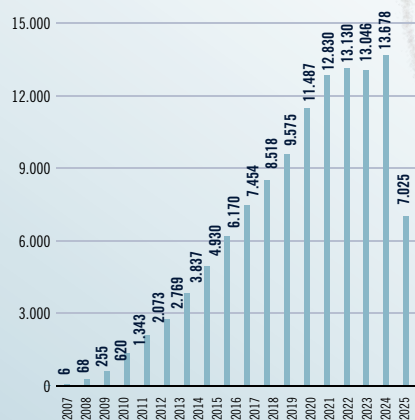
SCIENTIFIC PRODUCTION



Publications in each year



Citations in each year





HUMAN RESOURCES

Staff
254Researchers
223Nationalities
32Average age
38Gender balance (M/F)
57/43

NATURE INDEX

IMDEA Nanoscience Institute, Spain

⌚ Time frame: 1 March 2024 - 28 February 2025

Research

Overall research output

	⌚ Count	⌚ Share
Overall	65	15.70

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	0.45
■ Chemistry	39	8.34
■ Health sciences	1	0.31
■ Physical sciences	40	10.12

Note: Articles may be assigned to more than one subject area, as a result the sum of the subject research outputs may not equal the overall research outputs.

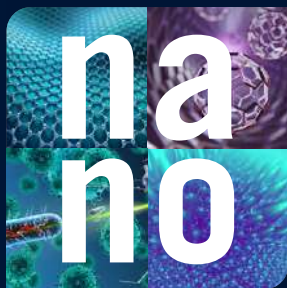


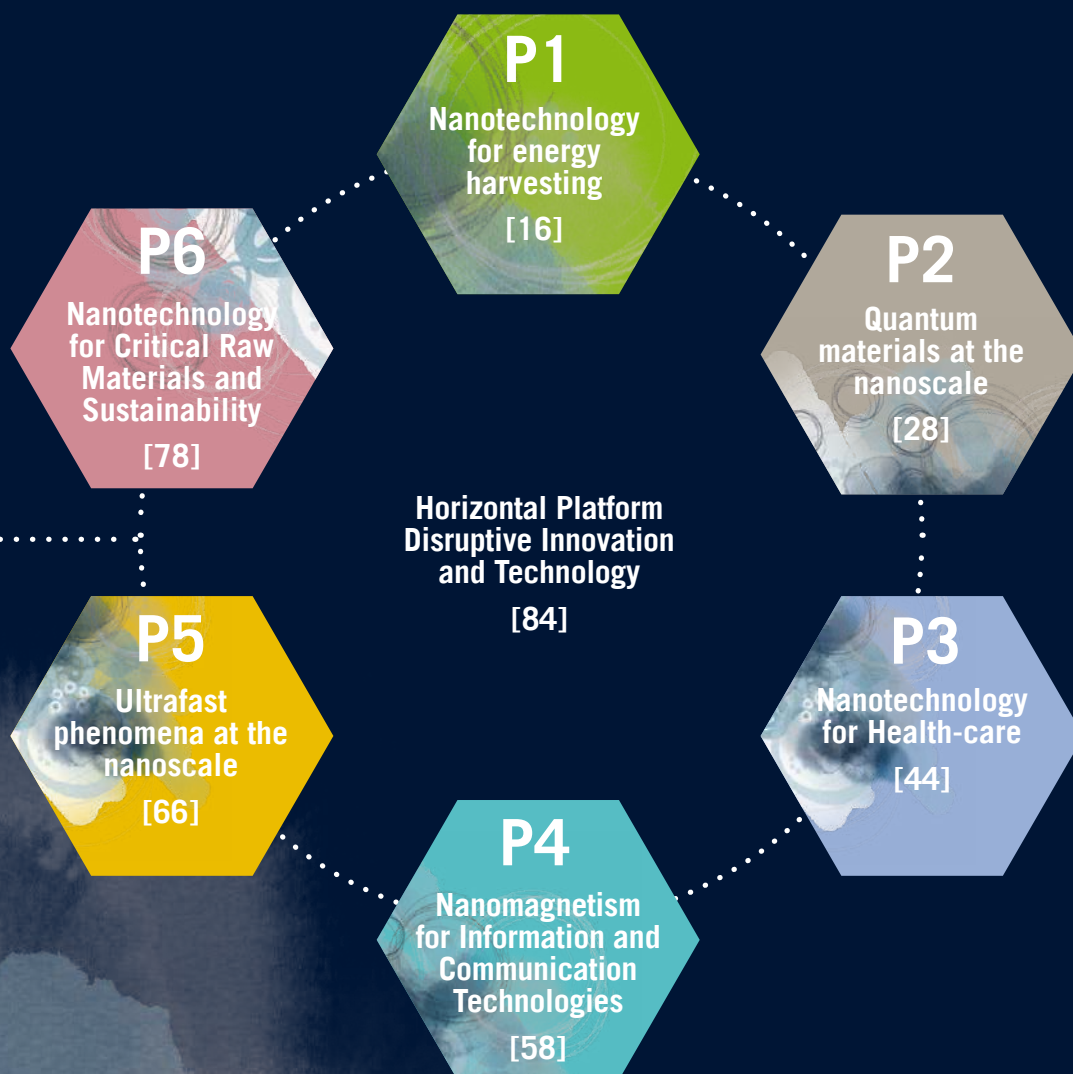
Note: Hover over the donut graph to view the Share for each subject.

2

research programmes and scientists

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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



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>



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www.nazariomartingroup.com

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South Korea

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Spain

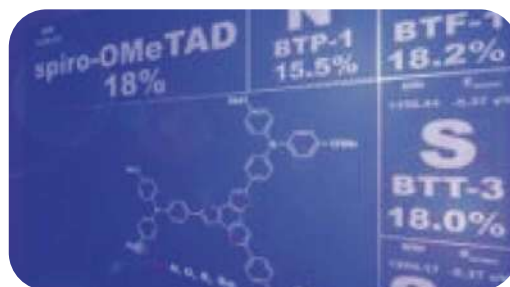
PhD STUDENTS

Jesús Galán
Jorge Gómez
Lorenzo Capone
Abdou Karim Darboe

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
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UK

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Dean Milanovic

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Dr. Silvia Miranda

Christine Marie Arenas

Dr. 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>



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

Dr. Beata Maria Szydłowska

Northwestern University, USA

PhD STUDENTS

Ana Martínez

Jorge Sangrador

Patricia Jimenez

Jaclyn Diane Parnell

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 of 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/advs.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.jpcllett.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>



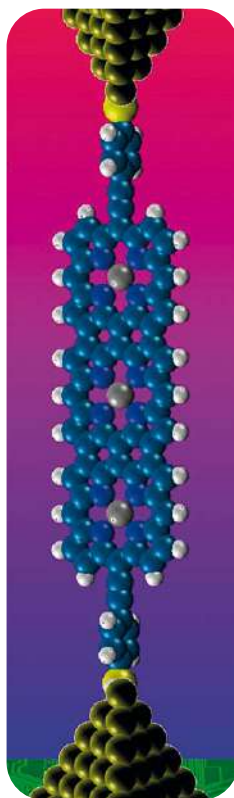
Dr. Edmund Leary
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Researcher ID:
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RESEARCH ASSISTANT
José Miguel Malagón



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>



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Indian Institute of Science
Education and Research
Kolkata, Kolkata, India

Dr. Alvaro López Acosta

RESEARCH STAFF

Dr. Helena Montes

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.com>



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Dr. José García Calvo
University of Geneva,
Switzerland

PhD STUDENTS

Juan Bautista Laforga Martin

RESEARCH STAFF

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: *Trends in Chemistry*. **2023**, 5, 353; *J. Am. Chem. Soc.* **2023**, 145, 9548-9563; *Chem. Soc. Rev.* **2022**, 51, 9482.

1. One research line deals with the use of porphyrinoids as active components in solar cells and optical and magnetic materials. See for example: *Adv. Sci.* **2025**, 2414831; *Chem. Sci.*, **2025**, 16, 8783; *Sol. RRL* **2024**, 8, 2400371; *Angew. Chem. Int. Ed.* **2024**, 63, e202315064
2. We are also active in the preparation of photo- and electroactive conjugated systems. See for example: *Angew. Chem. Int. Ed.*, **2025**, 64, e202419832; *Angew. Chem. Int. Ed.*, **2025**, 64, e202506536; *J. Am. Chem. Soc.* **2024**, 146, 30272
3. Finally, our group is researching on the use of porphyrinoids in "On-surface synthesis". See for example: *Small* **2025**, 21, 2408085; *Angew. Chem. Int. Ed.*, **2025**, 64, e202420572; *J. Am. Chem. Soc.* **2022**, 144, 16579.

Electrochemical Nanobiosensors

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



**Prof. María
Encarnación Lorenzo**
Associate Research Prof.

PhD: Universidad Autónoma
de Madrid, Spain

Double Affiliation: Univer-
sidad Autónoma de Madrid,
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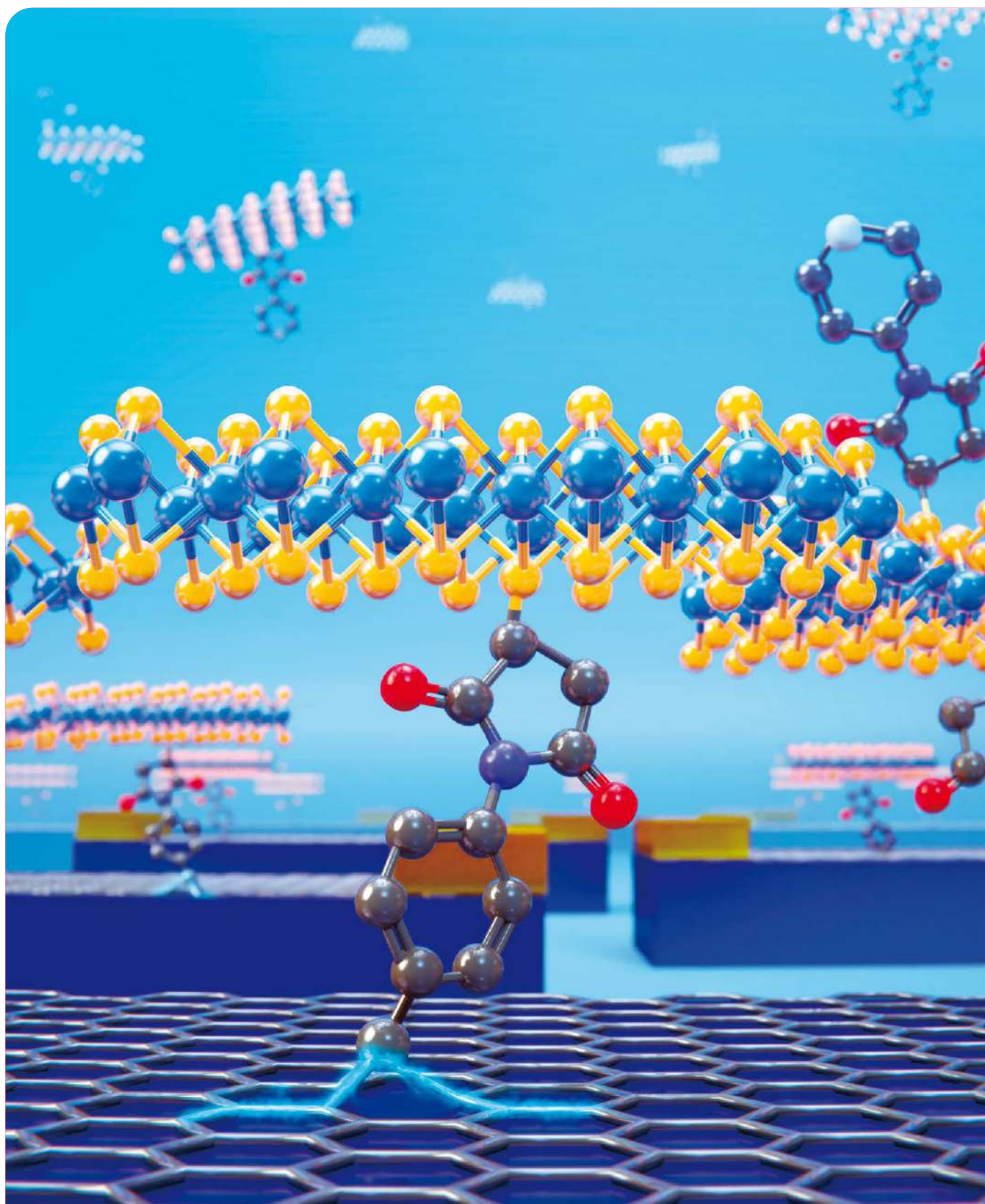
ORCID:
0000-0001-8432-9652

Researcher ID:
K-9825-2014

PhD STUDENT
Estefanía Enebral

Research lines

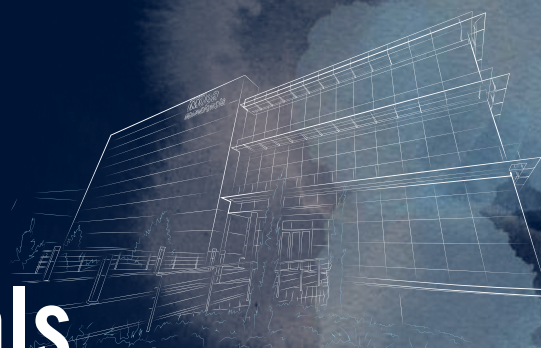
The Chemical Sensors and Biosensors Group of the Department of Analytical Chemistry and Instrumental Analysis at UAM is a consolidated research group whose research focuses on the design, construction, characterization and validation of electrochemical sensing platforms, based on efficient, reliable, 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.



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

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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Researcher ID:
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EMERITUS

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

RESEARCHER

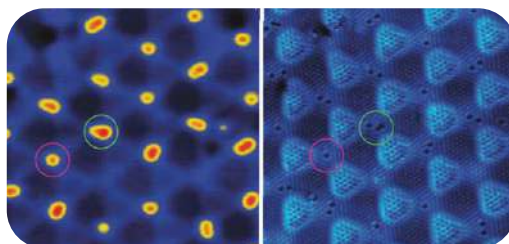
Dr. Jaime Sanchez-Barriga
Helmholtz-Zentrum Berlin (HZB), Germany

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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University of Manchester, UK

Dr. Adrián Ceferino

University of Manchester,
Great Britain

Dr. Zhan Zhen

Wuhan University, China

Dr. Alejandro Jimeno

Dr. Héctor Sainz

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

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Scopus Author ID:
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PHD STUDENTS

Julia García

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

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

RESEARCH ASSISTANT

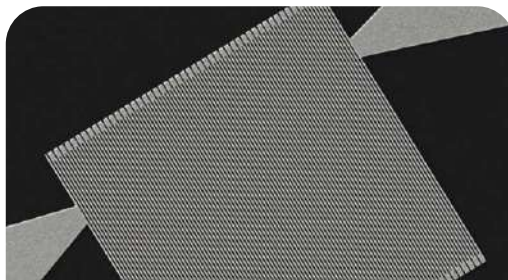
Juan Anastasio Martín

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

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.

*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*





Nanoarchitectures at Surfaces

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



Dr. David Écija

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Researcher
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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

Alba García Frutos

Gouri Sahoo

VISITOR

Dr. José María Gallego

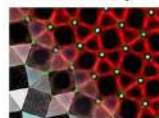
ICMM-CSIC, Spain

Research lines

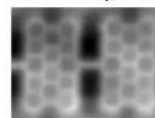
Our group is focused on the design of organic products and nanomaterials on surfaces, including three main lines of research:

- 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 Researcher

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

Researcher ID:
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PhD STUDENT

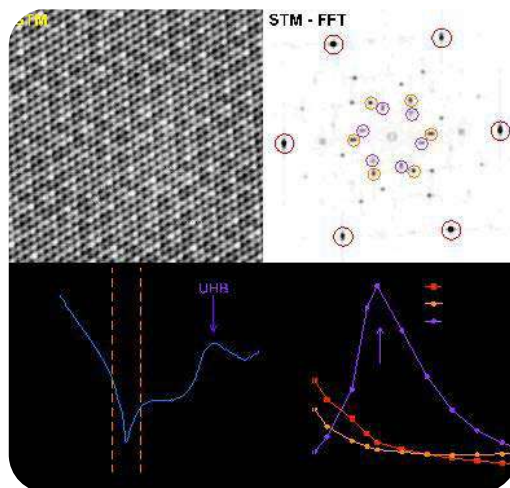
Ivan Martínez

(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
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POSTDOCS

Dr. Archit Dhingra

PhD STUDENTS

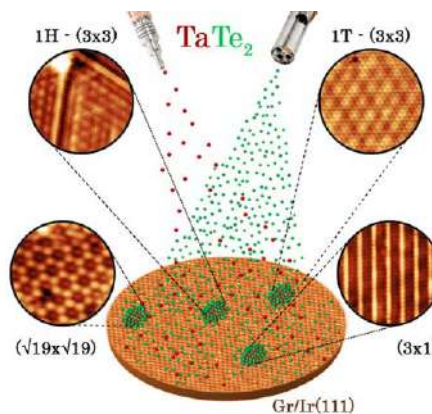
Alireza Amiri

Noor Ul Ain
(co-supervised with
Dr. Miguel Ángel Valbuena)

Research lines

Our research focuses on understanding and engineering structural and electronic phases in quantum materials. Using scanning probe techniques and advanced material synthesis, we investigate topological and correlated electronic states in Te-based quantum materials. Our key research lines include:

- Graphene-tellurium heterostructures
- Te-based topological insulators (e.g., Bi_2Te_3 , MnBi_2Te_4)
- Transition metal ditellurides.



On-surface Synthesis of Carbon-based Nanostructures

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



Prof. José Ignacio Urgel

Assistant Researcher

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PhD STUDENTS:

Elena Pérez Elvira

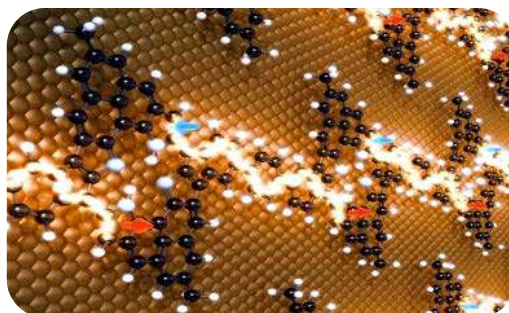
(co-supervised with Dr. David Écija)

Alberto Martínez Bajo

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
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PhD STUDENTS

Cristina García

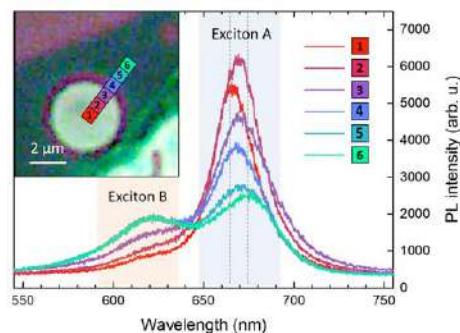
(co-supervised with
Dr. D. Daniel Granados)

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
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PhD: PhD: Universitat Autònoma de Barcelona, Spain.

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ORCID: 0000-0002-0483-5334

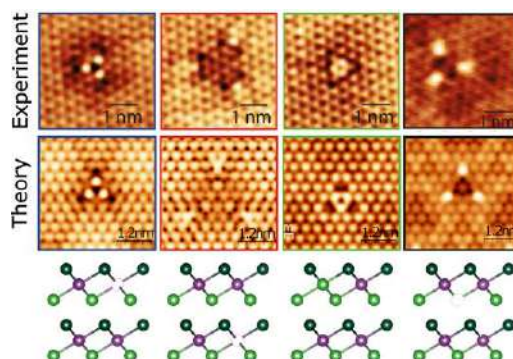
Researcher ID:
J-8636-2017

PHD STUDENT
Guillermo Parra
Gonzalo Nicanor

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.imdeananciencia.org/nanoscale-imaging-of-2d-materials/group-home>



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

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Dr. Iolanda di Bernardo
Monash University, Australia

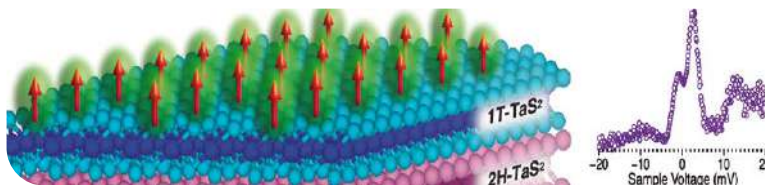
PhD STUDENT

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.

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Researcher ID:
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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.

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Dr. Alicia Gómez

PhD: Universidad
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INTA, Torrejón de Ardoz

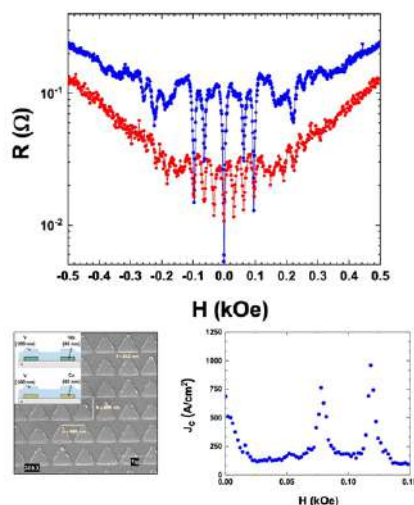
Dr. Álvaro Muñoz

PhD: Universidad Autónoma
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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

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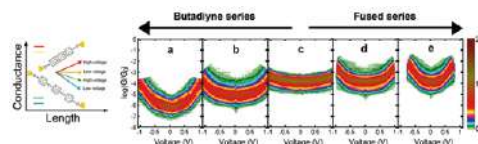
Researcher ID:
I-2207-2012

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 the 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.

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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.

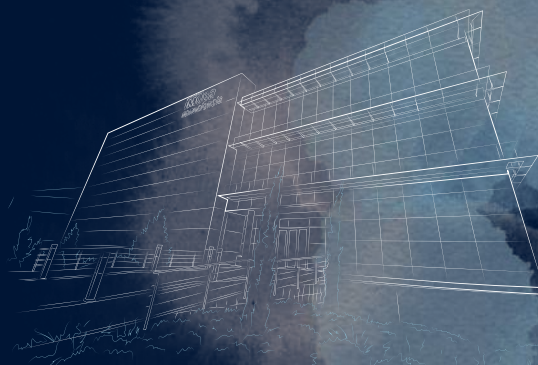
His current research lines are:

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



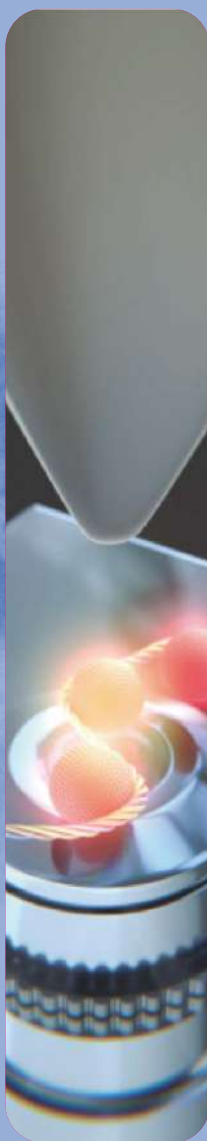
About the programme

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.

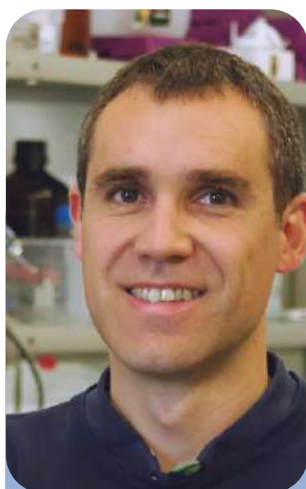
The generation of sensors based on nanoparticles for detection of targets of medical interest aims to exploit the higher sensitivity and specificity of nanostructure-based diagnostics platforms for Biological Threats (including emergent viruses). One example is the use of nucleic acid conjugated gold 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

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Molecular and Cellular Biology Institute (IBMC) for CNRS in Strasbourg, France

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PhD STUDENTS

Catarina Castanheira
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Vu Phong Dinh

RESEARCH ASSISTANTS

Eva Mar López
Guillermo Gutiérrez
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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.



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.

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POSTDOCS

**Dr. Carmen González
García**

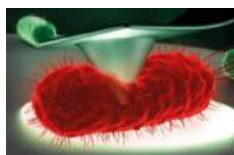
Universidad de Granada,
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**Dr. Álvaro Castells
García**

Medical Research
Department of the
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(South China University)

PhD STUDENT

Alexandru Hrehoret



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
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ASSOCIATE RESEARCHER

Dr. Francisco Javier Cao

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Double Affiliation:
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PhD STUDENTS

Ismael Plaza

María Ortiz

Brishti Bagchi

Lyra Zumeta

RESEARCH ASSISTANT

Beatriz de Vicente

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.

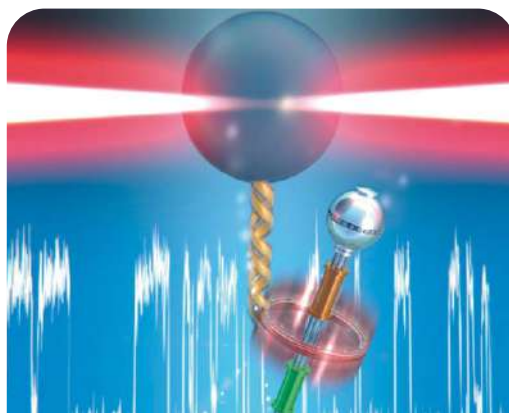
We have developed a single-molecule method to measure the dynamics of motor proteins involved in remodeling of cell membranes (*Nature Comms* 2019).

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
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Previous Position: University of Warwick, UK

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POSTDOC

Dr. Alfonso Annunziata
Sorbonne University, Parisian
Institute of Molecular
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PhD STUDENTS

Arturo Villechenous
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Alejandro Martín Hoyas

TECHNICIANS

Catarina Leis
Sergio Millán
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Research lines

Our main research interest lies in exploiting the extraordinary features of transition metal complexes inside the human cell to modulate its machinery: (i) at the molecular level, fully understanding metal-based chemistry inside the cell, (ii) at the organelle level, identifying chemistry confinement, and (iii) in a timeline.

Current research lines of the group focus on the following:

1. Effectively translate organometallic and coordination chemistry inside the human cell, for example, in transfer hydrogenation reactions, and in a biorthogonal manner.
2. Unveil the chemistry-at-the-mitochondria by some of our mitochondria-targeting transition metal compounds and find causality for interference with mitochondrial function.
3. Nanoimaging of location and chemical reactivity of metallo-drugs inside cells.
4. Exploiting metal coordination and organometallic chemistry principles to design potent candidate metallodrugs against cancer.

Magnetic Nanoparticles

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



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 Assistant Research Prof.

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Previous Position: CNRS,
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Dr. Ana Rodríguez
 IDIVAL, Instituto de
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 Spain

PHD STUDENT

Cristina María Montero
 Aguilar

RESEARCH ASSISTANTS

Lucía María Pardinas

TECHNICIAN

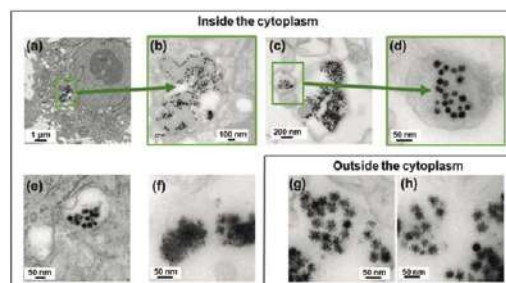
Monica Dhanjani

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>



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PhD STUDENTS

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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 Researcher

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Previous Position: Madrid
Microelectronics Institute,
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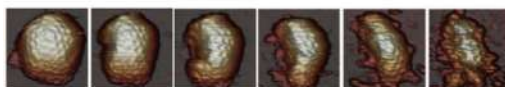
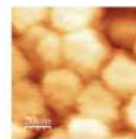
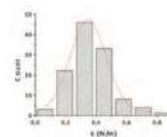
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Researcher ID:
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Research lines

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 Researcher

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Researcher ID:
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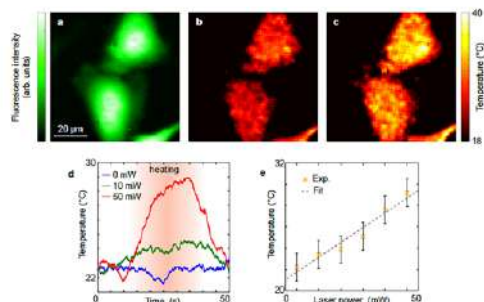
www.thompson-lab.net

RESEARCH ASSISTANT
Cristina Sánchez

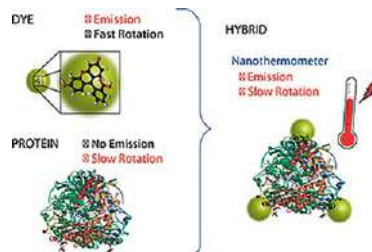
Research lines

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.

Previous position: Centro de Investigaciones Biológicas Margarita Salas CSIC

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PhD STUDENTS

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

TECHNICIAN

Tania Marugan

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-Requero 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

PhD: Universidad Autónoma de Madrid

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

PhD: Universidad del País Vasco, Spain.

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POSTDOC

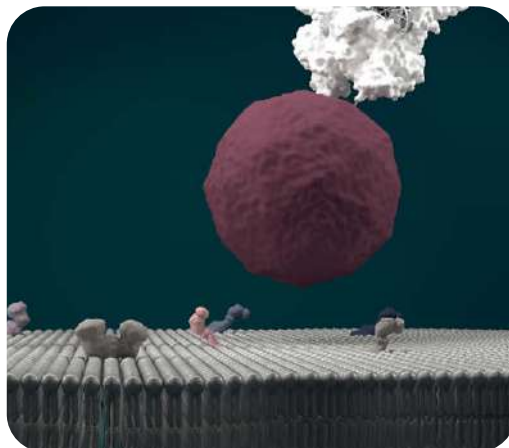
Dr. Hernán Alarcón
Universidad Autónoma de Madrid, Spain

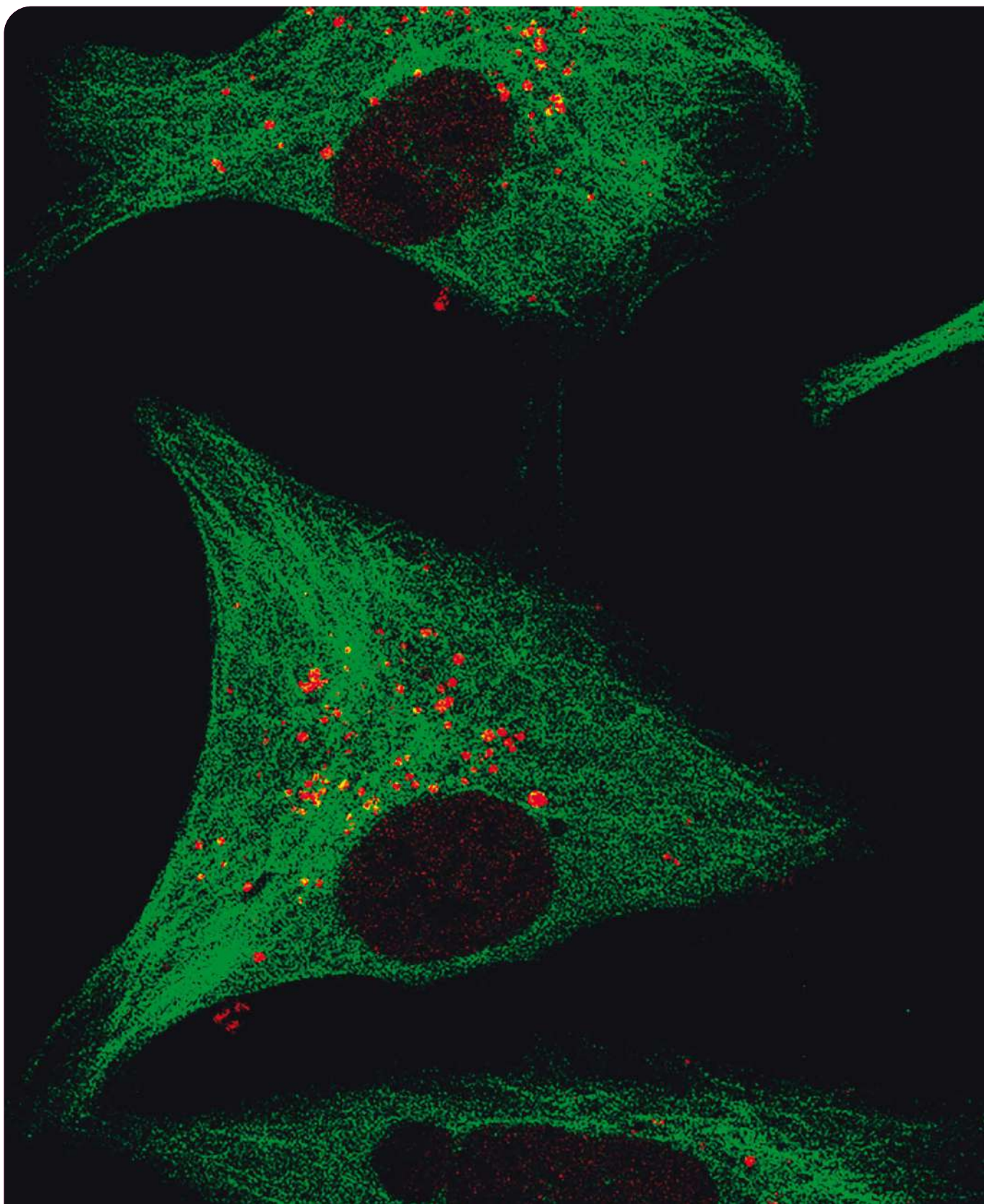
PhD STUDENT

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.

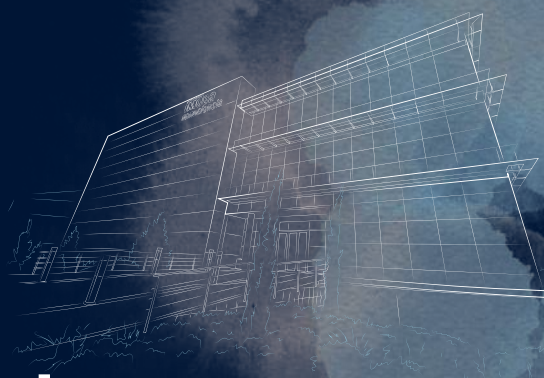




P4

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

New Emerging
Spintronics
Dr. Fernando Ajejas



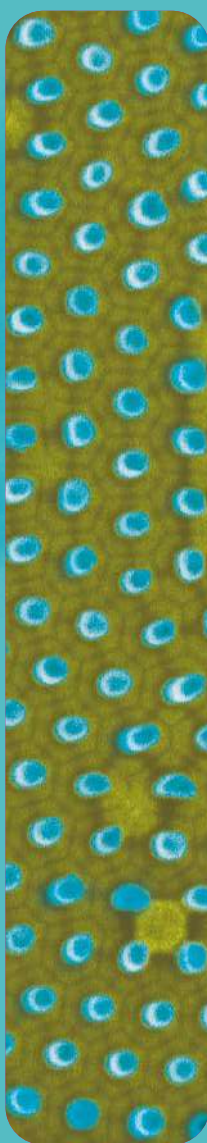
About the programme

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>



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EMERITUS

Prof. Antonio Hernando
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Dr. Adrian Gudin
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PhD STUDENTS

Rosalía López

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>



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POSTDOC

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PhD STUDENTS

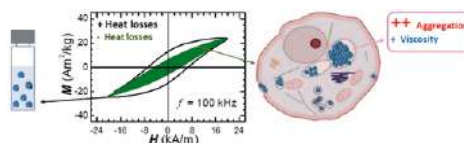
Alejandro Venegas

RESEARCH ASSISTANT

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.

PhD: University of Caen
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 University of Cassino, Italy
Previous Position: CNR-SPIN, Italy

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<https://sites.google.com/site/spinorbitronics/>

POSTDOCS

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Dr. Pablo Olleros
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Dr. Adrián Gudin
 IMDEA NANociencia, Spain

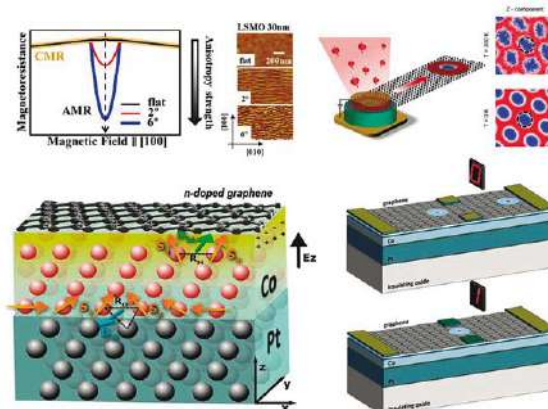
PhD STUDENT

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.

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

Prof. Elvira M. González
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)

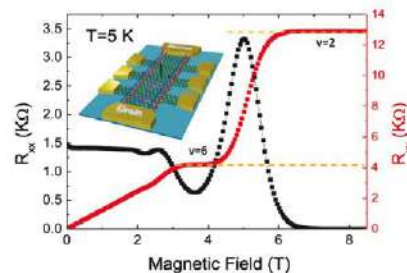
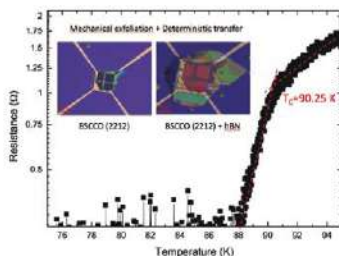
Sandra Martínez
(co-supervised with Dr. E. Cánovas)

Álvaro Blázquez

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 Researcher

PhD: Laboratoire, pour l'Utilisation du Rayonnement Électromagnétique (LURE, Orsay, France)

Previous position: ICN2, Barcelona, Spain

ORCID:
0000-0002-0585-5636

Researcher ID:
M-2196-2014

Scopus Author ID:
12785881400

PhD STUDENTS

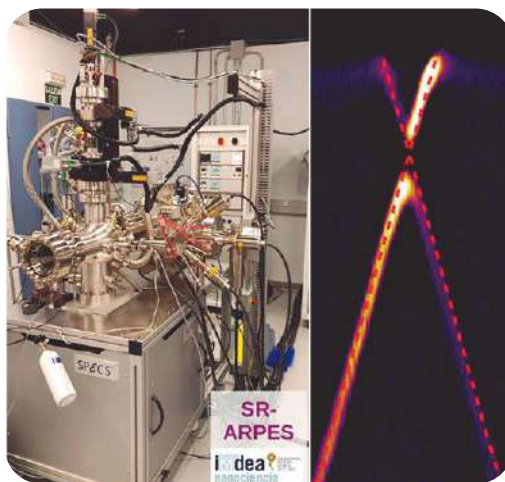
Beatriz Muñiz

Noor Ul Ain

(co-supervised with
Dr. Miguel Ángel Valbuena)

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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Researcher ID:
C-2362-2011

RESEARCH ASSISTANT

Lucía Gómez

Guillermo de Arana

(co-supervised with
Dr. D. Granados)

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.

New Emerging Spintronics

Webpage: <https://nanociencia.imdea.org/new-emerging-spintronics/home>



Dr. Fernando Ajejas
Assistant Researcher
(tenure track)

PhD: Universidad Autónoma
de Madrid

Previous position: University
of California San Diego

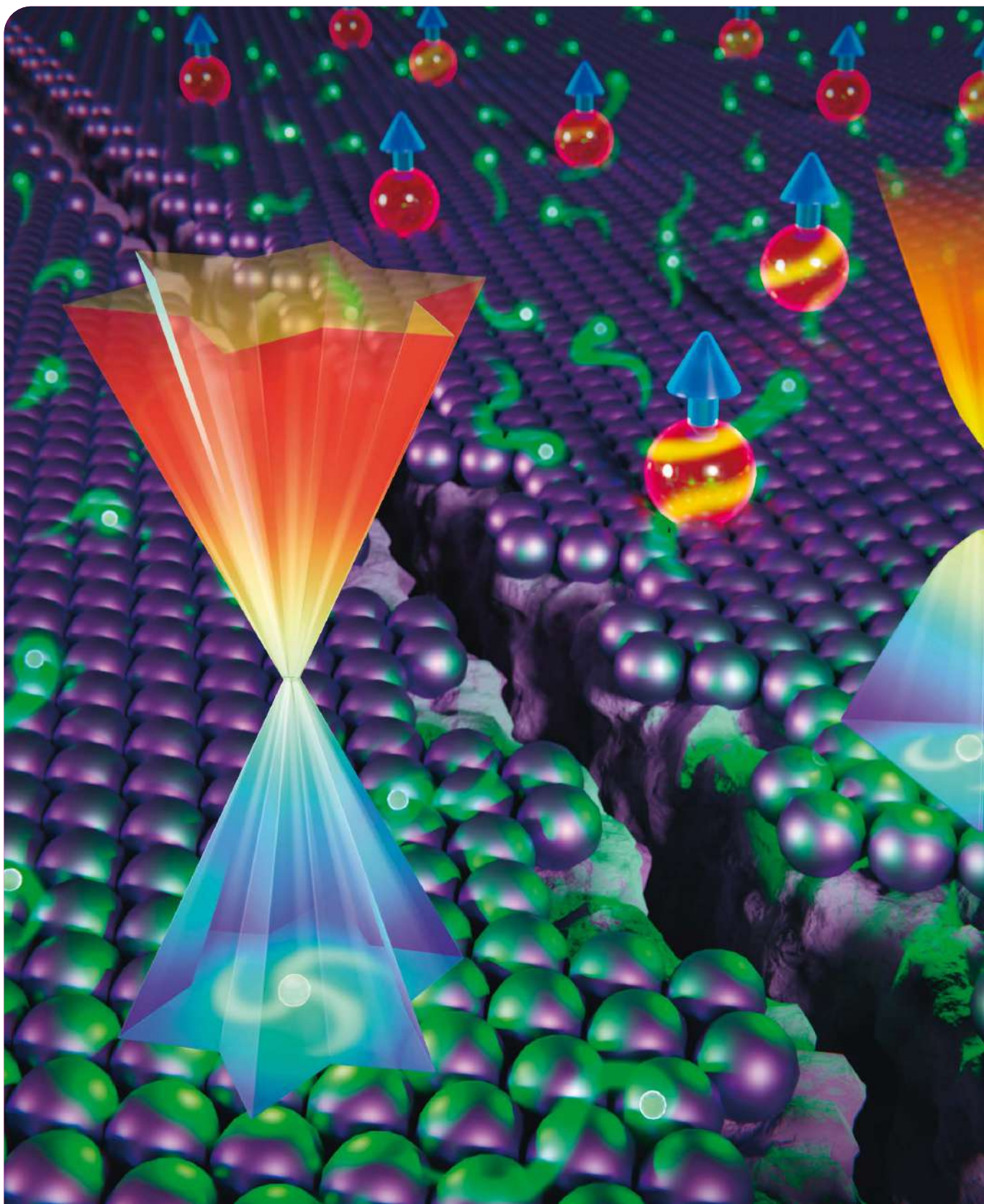
ORCID:
0000-0001-8980-4475

Researcher ID:
ABG-6094-2020

Research lines

The group is focused on novel spintronics phenomena such as antiferromagnetic spintronics, neuro-morphic computing, altermagnetism, goniopolarity or the emerging orbitronic field.

- Realization of artificial integrated neuronal and synapse network. The aim is to develop a new hybrid system composed by an Insulator-to-Metal-Transition (IMT) CO neuron and a SAF synapses. We will combine the spiking behavior of vanadates (as VO₂, V₂O₃) and tune the magnetic coupling with the adjacent magnetic layer to make an integrated neuron and synapse system.
- Development of bulk-AFM materials combined with large SOC materials such as HM. We will resort to spin-orbit interfacial phenomena generated at the interface to manipulate spins for neuromorphic computing or terahertz emission purposes. With external fields or applied currents we will finely tune AFM switching, nucleation and motion of DWs and AFM skyrmions, or exchange bias.
- Experimental development of the new field called Altermagnetism, which consists of a new type of magnetism. Electronic and structural characterization and transport measurements will be performed on oxide or fluoride materials.
- Starting the investigation of the new emergent field of goniopolar materials in thin films, which is a gap in the field. Goniopolar materials are those that in orthogonal preferred orientations and under the effect of electric fields can doped with electrons or holes respectively. The combination of goniopolar materials with others in which the doping effect is crucial, can open the pathway to new physics and properties.
- Orbital DMI. The last line of research to be developed is oriented towards the new field of orbitronics focused on the Dzyaloshinskii-Moriya interaction. In parallel with the phenomena occurring in spins, orbital interactions open a path where it is possible to stabilize and manipulate topological or chiral objects by combining materials with different orbital hybridizations.



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

Nonlinear Bulk and
Interfacial Liquid
Dynamics

Dr. Vasileios Balos

Optoelectronic Properties
of Two-Dimensional
Materials

Dr. Víctor Vega-Mayoral

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 ultra-short 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.

PhD: University of Tübingen, Germany

Previous Position: Univ. Mons, Belgium

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Researcher ID:
K-7938-2014

<https://www.uv.es/jogiers/>

VISITING RESEARCHER

Dr. Begoña Milian
Universidad de Valencia, Spain

POSTDOC

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

STUDENTS

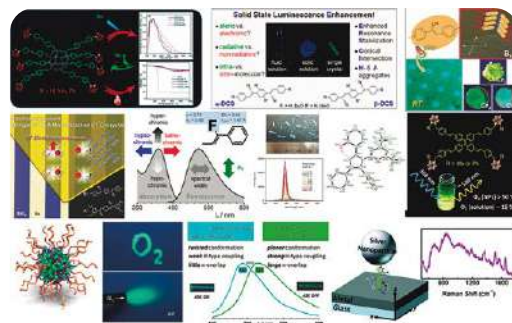
Liangxuan Wang
(co-supervised with Prof. Alfred Meixner, University of Tübingen)

María Fernanda Flórez

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**

Assistant Research Prof.

PhD: Imperial College London,
UK

Previous Position: Politecnico
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Orcid:
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ResearcherID:
M-1026-2014

[https://juancabanillas.
wixsite.com/research](https://juancabanillas.wixsite.com/research)

PhD STUDENTS

Alejandro M. Merinero

Saúl García

Marcos de Lucas

RESEARCH ASSISTANTS

Israel Callejas

Daniel Nieves

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

POSTDOC

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

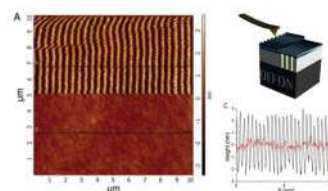
RESEARCH ASSISTANT

Israel Callejas

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
Senior Research Prof.

PhD: Universidad Politécnica de Madrid (UPM)

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

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POSTDOCS

Dr. Vasileios Balos
Fritz Haber Institute-Max Planck, Berlin, Germany

Dr. Marco Ballabio
University of Amsterdam, The Netherlands

Dr. Mohammad Soif Ahmed
University of Bern, Bern, Switzerland

Dr. Denis Paredes
UNED, Spain

PhD STUDENTS

Sergio Revuelta

Miguel Ángel Pulido

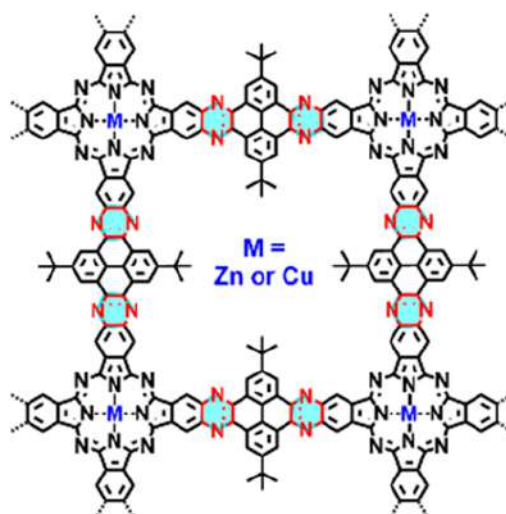
Sandra Martínez
(co-supervised with Dr. M. Menghini)

Christensen 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
Assistant Research Prof.
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Previous position: The
Institute of Photonic Science,
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POSTDOC

Dr. Sarkar Arnab

Indian Institute of
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Dr. Ricardo Arturo Rojas

University of Luxembourg

Dr. Carlos Gerardo

Torres

Northwestern University, USA

PhD STUDENT

Shreya Bvahcgi

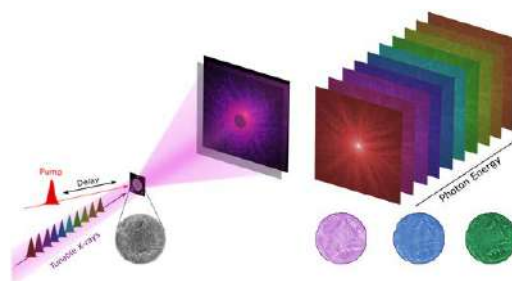
Maria Recasens

Ahsan Ali

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"





Bio-engineered Nanophotonics

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



Dr. Sara Hernández
Assistant Researcher
(tenure track)

PhD: University of the Basque Country (UPV/EHU)

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POSTDOCS

Angelo Alonzo Beratto
Universidad de Concepción,
Chile

Dr. Atikur Rahman
Institute of Nano Science
and Technology (INST),
Mohali (Punjab), India

PhD STUDENTS

Asier García

Adhil Kabeer

Claudia Flórez

Gonzalo Pérez

Sebastián Mesa

(co-supervised with
Victor Vega)

Upasana Das

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.

Nonlinear Bulk and Interfacial Liquid Dynamics

Webpage: <https://nanociencia.imdea.org/nonlinear-bulk-and-interfacial-liquid-dynamics/home>



Dr. Vasileios Balos

Assistant Researcher
(tenure track)

PhD: Johannes Gutenberg
University Mainz (Germany)
Previous Position: Fritz Haber
Institute of the Max Planck
Society (Germany)

ORCID:
0000-0001-7606-6653

Researcher ID:
A-9686-2019

Research lines

Our research focuses on unravelling ultrafast molecular dynamics in both the bulk and at interfaces of molecular liquids, using advanced nonlinear spectroscopic techniques.

1. Nonlinear THz Spectroscopy

We investigate the fundamental dynamics of liquids by driving low-frequency molecular motions with intense THz pulses (~ 3 MV/cm). Using Terahertz Kerr Effect (TKE) spectroscopy we explore energy transfer pathways in the low frequency regime. Additionally, ultrabroadband THz probes extending up to ~ 15 THz, allow us to explore the communication between rotational and translational modes of liquids in a THz-pump/THz-probe configuration.

2. Surface-Sensitive Nonlinear Vibrational Spectroscopy

We employ Sum and Difference Frequency Generation (SFG/DFG) spectroscopy to probe interfacial water dynamics during in situ photocatalytic water splitting. By photoexciting the system and tracking vibrational responses at the water/photocatalyst interface, we aim to correlate molecular-level water behavior with the properties of emerging photocatalytic materials.



Optoelectronic Properties of Two-Dimensional Materials

Webpage: <https://nanociencia.imdea.org/optoelectronic-properties-of-two-dimensional-materials/home>



Dr. Víctor Vega-Mayoral
Assistant Researcher
(tenure track)

PhD: Jozef Stefan institute
(F7, complex matter
department)

Previous Position: Trinity
College Dublin (School of
physics)

ORCID:
0000-0001-8626-0775

Researcher ID:
B-9187-2019

PhD STUDENTS

Sebastián Mesa Apetegui

Gonzalo Pérez
(Co-supervised with
S. Hernández)

Research lines

1. Photophysics of bidimensional materials: We study the nature of photoexcited states in nanomaterials, with a particular focus on two-dimensional systems, using femtosecond transient absorption spectroscopy. By probing the relaxation dynamics of excitons and photoexcited carriers, we aim to understand their influence in the material's potential for applications such as optical gain, catalysis, and energy conversion.

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

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



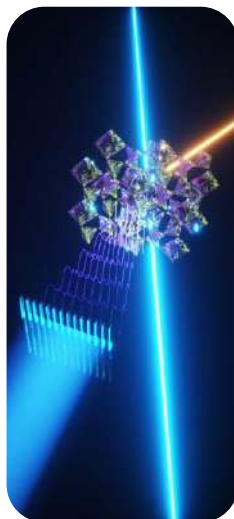
Prof. Cristian Svetina
Assistant Research Prof.
(tenure track)

PhD: Università degli Studi di Trieste, Italy

Previous position: Athos, SwissFEL

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0000-0003-2399-4426

POSTDOC
Dr. Ankit Udai



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 and application of nonlinear methods. In particular we are interested in:

1. Development of Extreme Ultraviolet (EUV) and X-ray wave-mixing methodologies at Free Electron Lasers (FELs) and High Harmonic Generation (HHG) table-top sources to reach ultrafast time and nanometer spatial scales
2. Application of nonlinear optics in the optical, EUV and X-rays to study 2D materials, quantum materials, nano-magnetic systems, semiconductors and materials for light harvesting and efficient energy storage and conversion.
3. Light-induced control of materials' properties and applications for novel devices
4. Measurement of charge-lattice-spin transport and quasi-particle dynamics in condensed matter systems by means of optical transient grating spectroscopy at IMDEA's laser laboratory



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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Researcher ID:
C-3972-2014

POSTDOCS

Dr. Gilbert Grell
Universität Rostock,
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Dr. Bruno Nunes
Danmarks Tekniske
Universitet: Lyngby, DK

Dr. Laura Rego
Universidad de Salamanca,
Spain

Dr. Marc Alias
Aix-Marseille University,
France

PhD STUDENTS

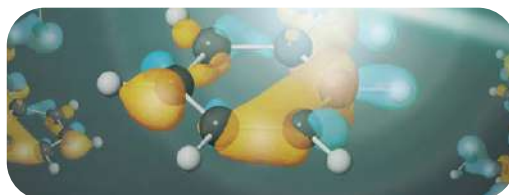
Francisco Fernández
Juan Reino
Pranjal Prateek

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>



Prof. Luis Bañares
Associate Research Prof.

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

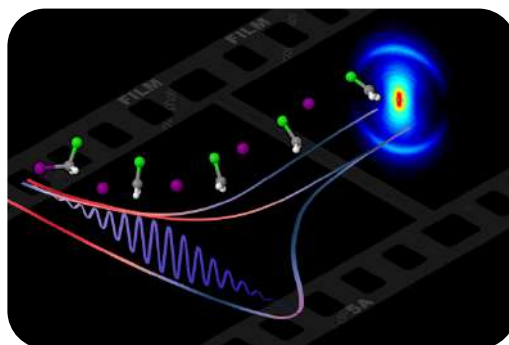
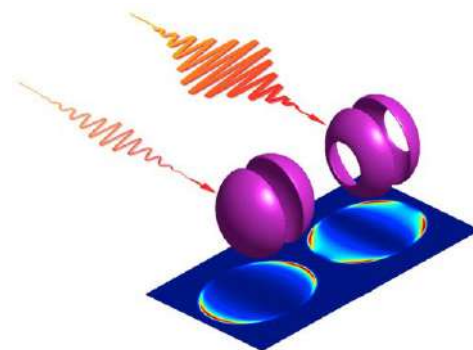
ORCID:
0000-0002-0777-2375

Researcher ID:
B-7922-2014

PhD STUDENT
Shaw Kushal Kumar

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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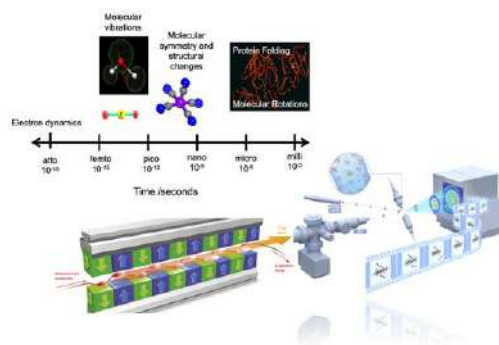
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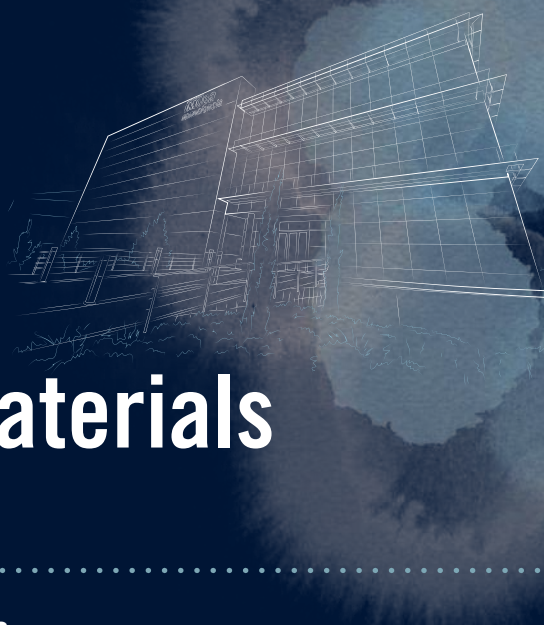
Research lines

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. Rodolfo Miranda

Research lines

Epitaxial Growth Lab
Dr. Cristina Navío

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.

Epitaxial Growth Lab



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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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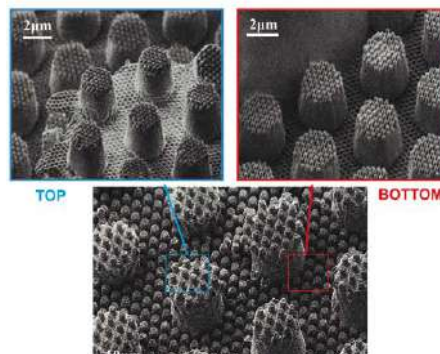
Research lines

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

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

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IMEDEA 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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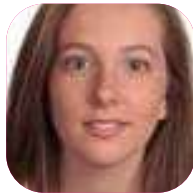
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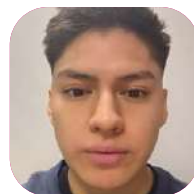
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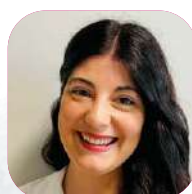
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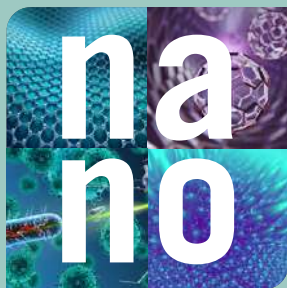
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Network and Systems
Technician

3

scientific report

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- 1. Benzenehexol-Based 2D Conjugated Metal–Organic Frameworks with Kagome Lattice Exhibiting a Metallic State;** Wang Z., St. Petkov P., Zhang J., Liang B., Revuelta S., Xiao K., Tiwari K., Guo Q., Li Z., Zhang J., Qi H., Zhou S., Kaiser U., Heine T., Cánovas E., Parkin S.S.P., Feng X., Dong R.; *Adv. Funct. Mater.*; 2024; 34; 42; 2404680; DOI: [10.1002/adfm.202404680](https://doi.org/10.1002/adfm.202404680)
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- 12. On-Surface Synthesis of Organolanthanide Sandwich Complexes;** Mathialagan S.K., Parreiras S.O., Tenorio M., erna L., Moreno D., Muñoz-Cano B., Navío C., Valvidares M., Valbuena M.A., Urgel J.I., Gargiani P., Miranda R., Camarero J., Martínez J.I., Gallego J.M., Écija D.; *Adv. Sci.*; 2024; 11; 24; 2308125; DOI: [10.1002/advs.202308125](https://doi.org/10.1002/advs.202308125)

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27. **Deuterium Isotope Effect in Single Molecule Photophysics and Photochemistry of Hypericin;** Wang L., Liu Q., Buchwald A., Wackenhut F., Brecht M., Gierschner J., Meixner A.J.; *ChemPhysChem*; 2024; 25; 18; e202400374; DOI: 10.1002/cphc.202400374
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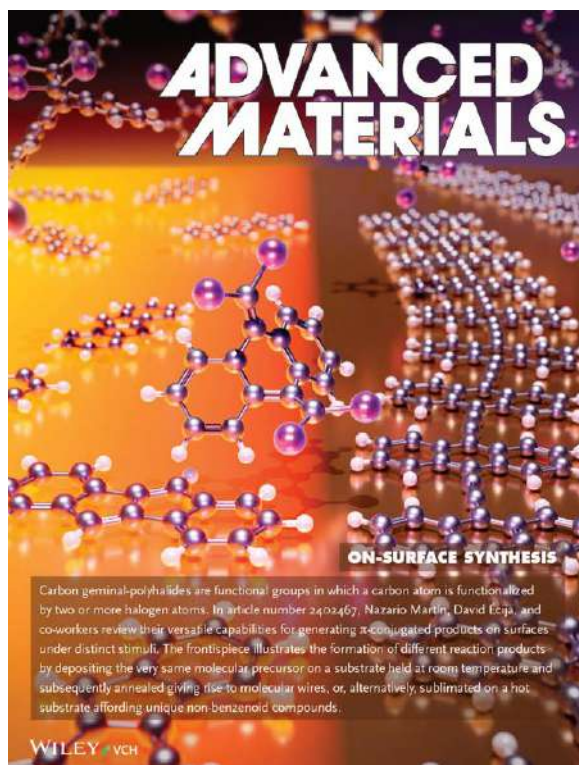


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32. **Laser-Induced Periodic Surface Structures in Polymers with Tailored Laser Fields;** de Nalda R., Corrales M.E., Recio P., Casasús I.M., Bañares L., Ezquerro T.A., Rebollar E.; *Phys. Status Solidi A Appl. Mater. Sci.*; 2024; 221; 15; 2300721; DOI: [10.1002/pssa.202300721](https://doi.org/10.1002/pssa.202300721)
33. **Probing the Phase Transition to a Coherent 2D Kondo Lattice;** Ayari C.G., Pissarra M., Ibarburu I.M., Garnica M., Miranda R., Calleja F., Martín F., Vázquez de Parga A.L.; *Small*; 2024; 20; 8; 2303275; DOI: [10.1002/smll.202303275](https://doi.org/10.1002/smll.202303275)
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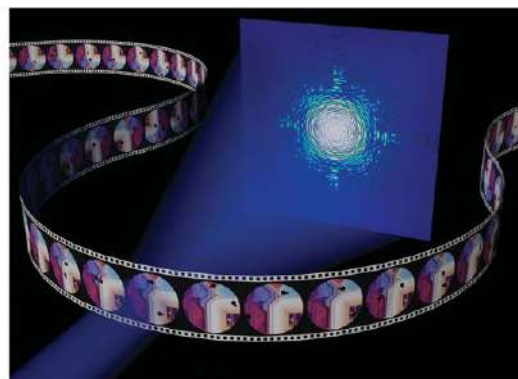
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Coherent X-ray imaging of stochastic dynamics

In this work, we demonstrate a method to separate the contribution of stochastic and deterministic contributions to a coherent X-ray scattering pattern, returning real space images of the deterministic contributions and the momentum spectrum of the stochastic contributions. We demonstrate this approach by numerically simulating the imaging of different typical and important classes of fluctuations, like polaron separation, vortex nucleation or fluctuating domain walls.

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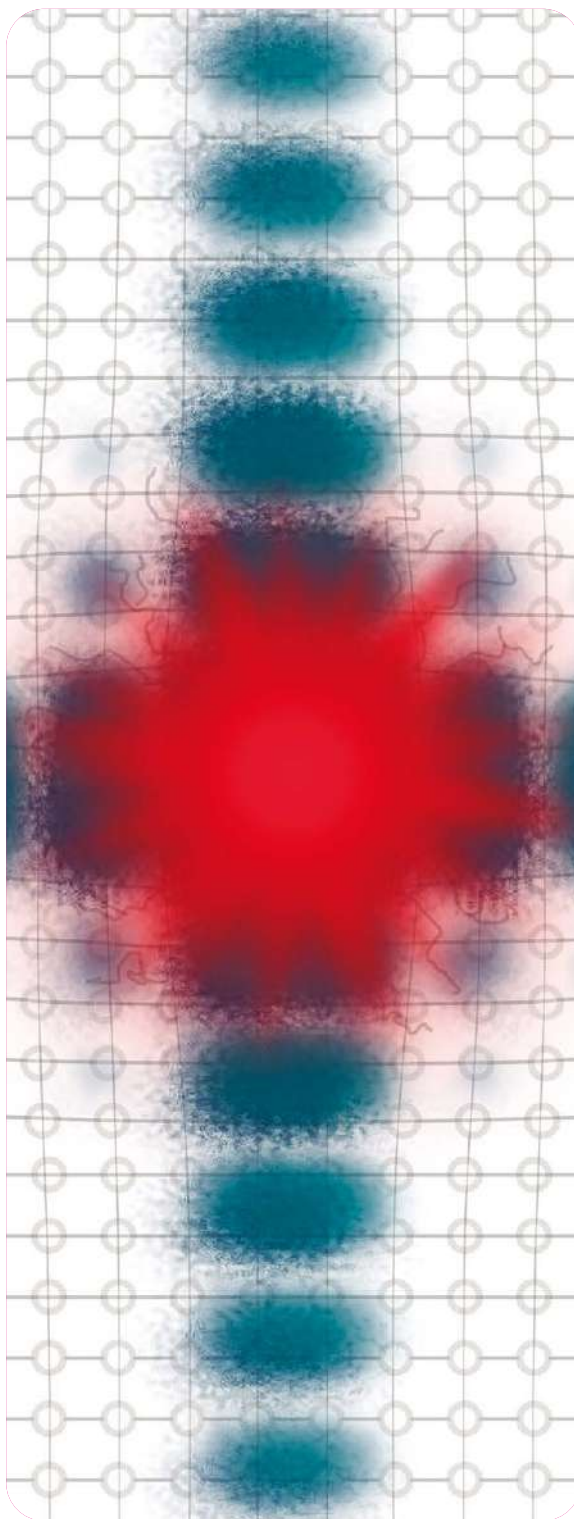
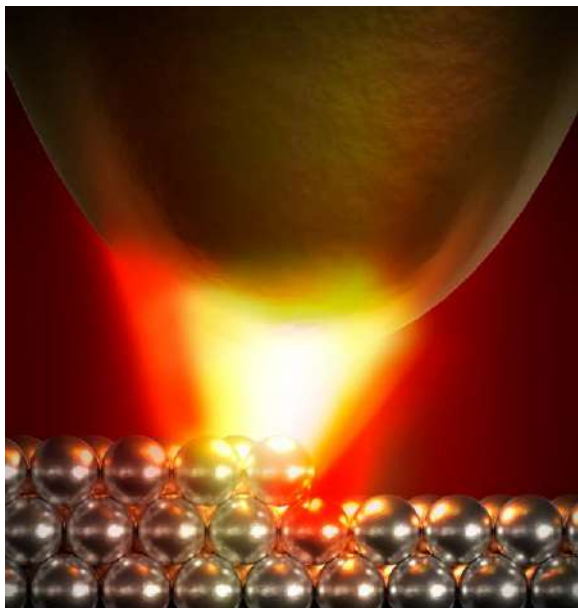
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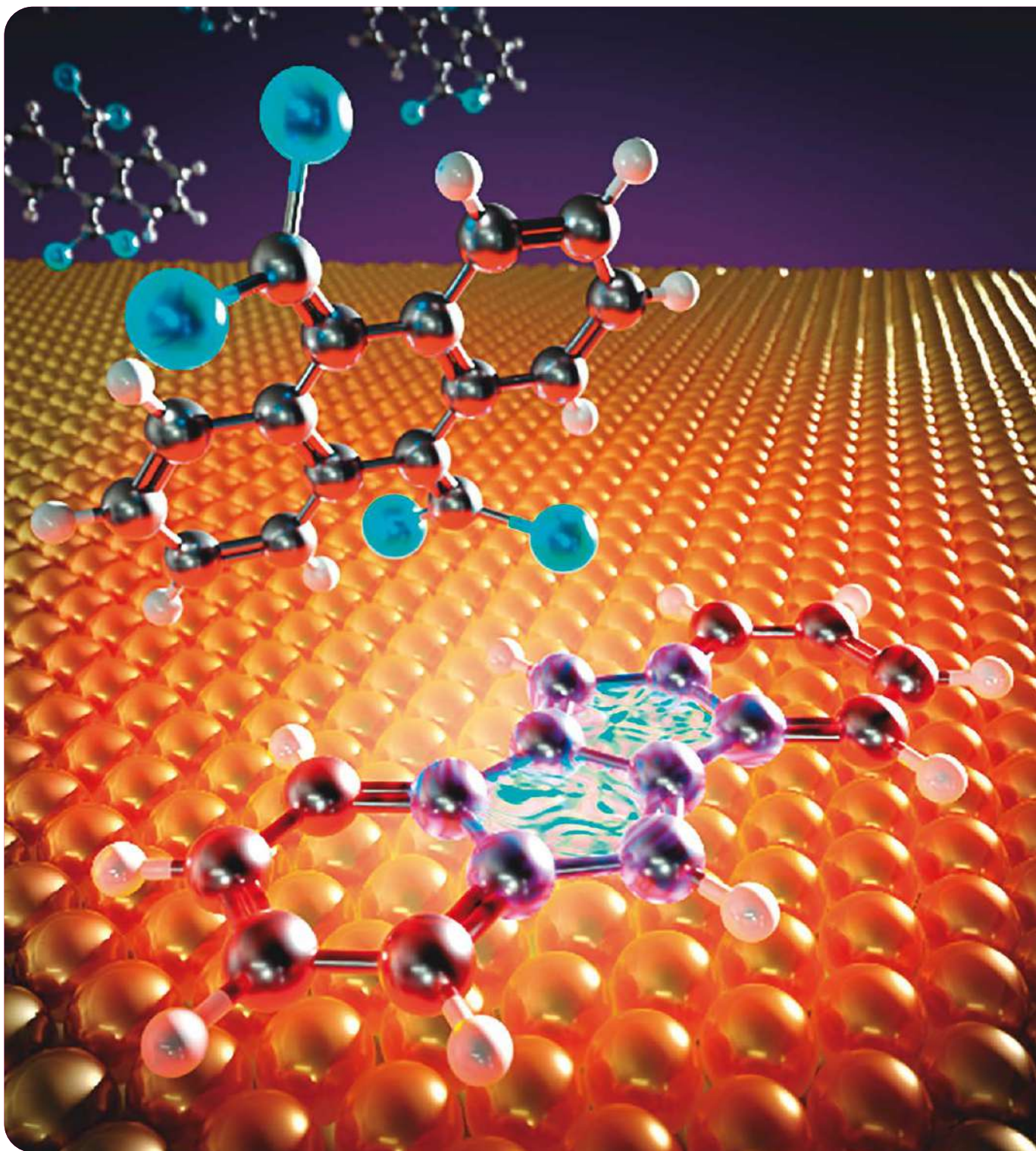


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218. **Influence of final state interactions in attosecond photoelectron interferometry;** Luo S.; Weissenbilder R.; Laurell H.; Bello R.Y.; Marante C.; Ammitzböll M.; Neori i L.; Ljungdahl A.; Squibb R.J.; Feifel R.; Gisselbrecht M.; Arnold C.L.; Martín F.; Lindroth E.; Argenti L.; Busto D.; L'Huillier A.; *Phys. Rev. Res.*; 2024; 6; 4; 043271; DOI: [10.1103/PhysRevResearch.6.043271](https://doi.org/10.1103/PhysRevResearch.6.043271)
219. **Guidance and Position of RINN22 regarding Precision Nutrition and Nutriomics;** Ramos-Lopez O.; Assmann T.S.; Astudillo Muñoz E.Y.; Baquerizo-Sedano L.; Barrón-Cabrera E.; Bernal C.A.; Bressan J.; Cuevas-Sierra A.; Dávalos A.; De La Cruz-Mosso U.; De La Garza A.L.; De Luis D.A.; Díaz De La Garza R.I.; Dos Santos K.; Fernández-Condori R.C.; Fernández-Quintela A.; García Diaz D.F.; Gonzalez-Becerra K.; Lopes Rosado E.; López De Las Hazas M.-C.; Marín Alejandro B.A.; Angel Martin A.; Martinez-Lopez E.; Martínez-Urbistondo D.; Milagro F.I.; Hermsdorff H.H.M.; Muguerza B.; Nicoletti C.F.; Obregón Rivas A.M.; Parra-Rojas I.; Portillo M.P.; Santos J.L.; Steemburgo T.; Tejero M.E.; Terán A.C.; Treviño V.; Vizmanos B.; Martinez J.A.; *Lifestyle Genomics*; 2024; 18; 1; 1; 18; DOI: [10.1159/000542789](https://doi.org/10.1159/000542789)

Book chapter

1. **Mechanically Interlocked Materials: Polymers, Nanomaterials, MOFs, and more;** Pérez E.M.; *Mechanically Interlocked Mater.: Polymers, Nanomaterials, MOFs, and more*; 2024; 1; 282
2. **Mechanically Interlocked Nanotubes;** López-Moreno A.; Pérez E.M.; *Mechanically Interlocked Mater.: Polymers, Nanomaterials, MOFs, and more*; 2024; 83; 20; DOI: [10.1002/9783527828975.ch3](https://doi.org/10.1002/9783527828975.ch3)
3. **Scaling and Flow Profiles in Magnetically Confined Liquid-In-Liquid Channels;** Dev A.A.; Sacarelli F.; Bagheri G.; Joseph A.; Oleshkevych A.; Bodenschatz E.; Dunne P.; Hermans T.; Doudin B.; *Top. Appl. Phys.*; 2024; 120; 41; 14; DOI: [10.1007/978-3-031-58376-6_5](https://doi.org/10.1007/978-3-031-58376-6_5)
4. **Angle-resolved photoemission of topological materials;** Sánchez-Barriga J.; Clark O.J.; Rader O.; *Encyclopedia of Condensed Matter Phys.*; 2024; DOI: [10.1016/B978-0-323-90800-9.00274-2](https://doi.org/10.1016/B978-0-323-90800-9.00274-2)
5. **Toward Multiple Conductance Pathways with Heterocycle-Based Oligo(phenyleneethynylene) Derivatives;** Miguel D.; de Cienfueeos L.Á.; Martín-Lasanta A.; Morriilo S.P.; Zotti L.A.; Leary E.; Bürkle M.; Asai Y.; Jurado R.; Cárdenas D.J.; Rubio-Bollinger G.; Agraït N.; Cuerva J.M.; González M.T.; *Quantum Theory of Transport Properties of Single Molecules*; 2024; 139; 24





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	Diez 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 Espí Pablo Luis [Es] Pereira González Emiliano [Es] Lastra Sedano Alberto [Es] Missous Mohamed [Gb] Sexton James [Gb] Muttalak 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

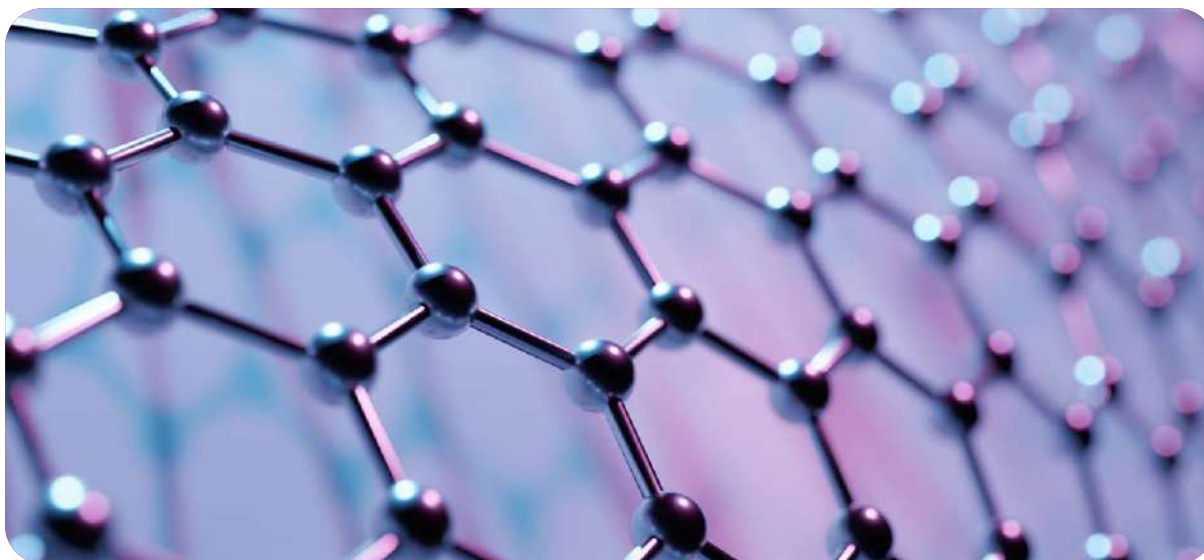


Nº	Title	Inventors	Applicants	Publication number	Publication date
4	Catalyst Anchoring Method, Oligomeric Ruthenium-Ligand Compositions Therefrom/And Their Use In Water Oxidation	Llobet Dalmases Antoni [Es] Gimbert Suriñach Carolina [Es] Maseras Cuni Feliu [Es] Moonshiram Dooshaye [Es] Gil Sepulcre Marcos [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 Madrilenio 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] Jelinek 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] Viala 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]	Univ 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 Doblaré 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

108 conferences

246 contributions
57 invited talks
87 oral contributions
102 poster contributions



instituto ikerbasque

5. Anexos 179

1. Contributions to conferences

108 conferences
246 contributions:
57 invited talks
87 oral contributions
102 poster contributions

16/01/2024

 TwiStronics and Moiré Materials: Bridging Theory and Experiments
Trieste, Italy

Oral communications

 Designing moiré patterns by strain
Piero A. Fontana, Federico Escudero, Andrés Simón, Chen Zhan and Francisco Guinea

Poster communications

 Electronic properties of twisted TMDs using Wannier based Tight-Binding model
Guillermo Parra-Martínez, José Ángel Silva-Gutiérrez, Francisco Guinea

19/01/2024

 Reunión Técnica y Foro Colaborativo TERAV CIBER/ASEBIO Aplicaciones de vectores no virales en terapia y edición génica: retos de la academia y la industria
Madrid, Spain

Invited talk

 Nanotransplantes basados en ácidos nucleicos para el tratamiento de la distrofia muscular de Duchenne
Álvaro Somoza

 VI Simposio de la Unidad de Excelencia de Química de la Universidad de Granada
Granada, Spain

Invited talk

 Láseres de attosegundos: la cámara superior de la Física, la Química y ... ¿la Biología?
Fernando Martín García

 Síntesis enantioselectiva de nanografenos moleculares
Núria Martín León

02/02/2024

 XIX Jornada de Recerca - Societat Catalana de Física
Barcelona, Spain

Invited talk

 Novel wave-mixing schemes at X-ray Free Electron Lasers
Cristian Sestini

 XXIII Liez Winter Workshop 2024 "Advances in Single-Molecule Research for Biology & Nanoscience & Medicine"
Liez, Austria

Oral communications

 Conformational dynamics of influenza A virus ribonucleoprotein complexes during RNA synthesis revealed by HS-AFM
Benja Ibarra*, Diego Carlier, Shingo Fukuda, Rebecca Baccagna, Yoshio Ando, Jaime Martín-Benito

11/02/2024

 Biophysical Society Annual Meeting
Philadelphia, USA

Poster communications

 Characterization of the real-time kinetics of the activities of the human mitochondrial DNA helicase at the single-molecule level
Ismael Plaza-G.A*, Fernando Cerdán, Rafael Fernández-Leiro, Grzegorz L. Cieślowski and Borja Ibarra*

14/02/2024

 Nanomaterials Applied to Life Sciences (NALS2024)
Granada, Spain

Invited talk

 Extracellular Temperature Measurements
Thompson S

Oral communications

 Exploiting the potential of AC magnetometry to display thermal conformational changes of proteins
P. Palacios-Alonso, A. Vasegas Gómez, J. León-More, E. Saez-de Diego, S. H. Mejías, A. L. Cortajarena, R. Delgado-Buscalioni, and F. J. Torres

Poster communications

 Controlled synthesis of magnetoplasmonic aggregate nanoparticles for biomedicine
Mónica Dhanyani, César del Valle, and Gorka Salas

 Superparamagnetic nanoprobes for magneto-inductive sensing
Rodrigo Ramos A., Dhanyani M., Salvador M., Prieto V., Frohlich, Rivas M. & Salas G.

 Synthesis of Magnetic Nanoparticles by the Recycling of Industrial Steel Waste and its application on CPWO
Cristina M. Montero, Mónica Dhanyani, Alejandro Martín, Neus López-Arago, Macarena Muñoz, Zahara M. de Pedro, José A. Casas, Alberto Bolívar, Gorka Salas

Workshop MAD-20

Madrid, Spain

Invited talk

 Bridging the Gap: Transforming Molecule-based Coordination Polymers into 2D Materials
Jose Sanchez Costa

 XV Spanish-Portuguese Conference on Controlled Drug Delivery
Lisboa, Portugal

Poster communications

 Albumin-Based Nanostructures as Carriers of Nucleic Acids and Drugs
Álvaro Somoza



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



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

ELEC nano

Electrically Tunable Functional Lanthanide Nanoarchitectures on Surfaces

Grant Agreement number: 766555

From 2018 to 2023

Principal Investigator: **Dr. David Écija**

COLLABORATIVE PROJECTS

PL00T0



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/>

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**

<https://site.unibo.it/tclock4ad/en>

EURAMET – EMPIR



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/>

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](#)

EQUIPAMIENTO CIENTÍFICO-TÉCNICO 2024

Mass spectrometry for the characterization of biomolecules and modified nanoparticles

Ref: EQC2024-008913-P

From 2024 to 2026

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

PROYECTOS DE «PRUEBA DE CONCEPTO» 2023 (PERTE CHIP)

2DLANTHAPHOTON

2D lanthanide-based photonic sensors

Ref: PDC2023-145871-I00

From 2024 to 2026

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

PROGRAMA ESTATAL PARA DESARROLLAR, ATRAER Y RETENER TALENTO

CLIPIS

Controlling light-induced phases and imaging superconductivity

Ref. EUR2022-134052

From 2022-2024

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

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**

FLUOMECBAC

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**

ECoS0x

Electric COnTrol of Spin Orbit interactions and magnetic nanotextures

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](#)

Call 2023

MORE-N

Non-contact time resolved electrical characterization of N-type silicon photovoltaic technology

Ref.: PID2023-1483690B-C44

From 2024 to 2027

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

NANOCUBISM

Multidimensional Approach to Nanochemistry: Exploring Carbon Nanotubes, 2D Materials, and Single-molecule Supramolecular Chemistry

Ref.: PID2023-152267NB-I00

From 2024 to 2027

Principal Investigator: [Dr. Emilio Perez](#)

RENASCENCE

Redesigning Exogenous Metal-based Chemistry in the Human Cell

Ref.: PID2023-149490NB-I00

From 2024 to 2027

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

HetCatFlow

Enabling the use of heterogenous catalyst powders in wall-less flow reactors

Ref.: PID2023-1476340B-I00

From 2024 to 2027

Principal Investigator: [Dr. Thomas Herman](#)

**NANORARE**

Therapeutic and diagnostic nanobiotools for rare cancers and neuromuscular diseases based on nucleic acids and CRISPR

Ref.: PID2023-146982OB-I00

From 2024 to 2027

Principal Investigators: [Dr. Alvaro Somoza](#) & [Dr. Begoña Sot](#)

NEURALFLEX

Flexible implantable neural probes integrating nanostructured electrodes

Ref.: PID2023-1531800B-I00

From 2024 to 2027

Principal Investigator: [Dr. Teresa Gonzalez](#)

CANASTA

Fabrication of innovative carbon-based nanomaterials: on-surface synthesis and chemical stability

Ref.: PID2023-152793NA-I00

From 2024 to 2027

Principal Investigator: [Dr. J.I.Urgel](#)

MagACIn

Nanomateriales magnéticamente activados contra cáncer e infecciones

Ref.: PID2023-1529440B-I00

From 2024 to 2027

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

X-WAVE

Experimental demonstration and application of wave-mixing methods in the X-ray range

Ref.: PID2023-152154NB-C21

From 2024 to 2028

Principal Investigator: [Dr. Cristian Svetina](#)

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 funtionalized 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**

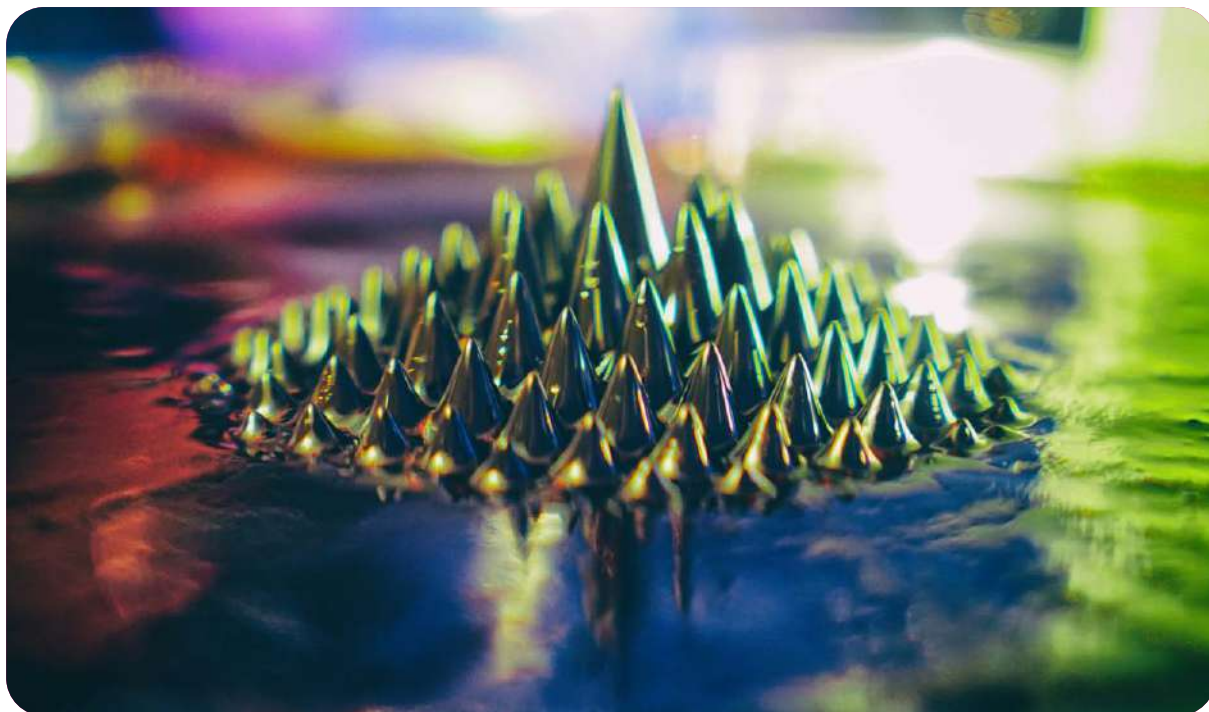
PICANTE

**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 nanospacio 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 multi-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](#)

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.

Preparación y gestión de Proyectos Europeos (GPE2023)

ESCALA

Strategy for the Sustainability and Consolidation of IMDEA

Nanociencia's Activity in Horizon Europe

Ref: GPE2023-001309-P

From 2024 to 2026

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

Proyectos «Europa Excelencia» 2022

CLIPIS

Controlling light-induced phases and imaging superconductivity

Ref. EUR2022-134052

From 2022-2024

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

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 2022

DECOSMOL

Design and Control of Single Molecule Junctions

EIG Concert-Japan 2022

Reference: PCI2023-143389

From 2023 to 2026

Principal Investigator: [Dr. Teresa González](#)

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](#)



Call 2023

RTQUEST

Room-Temperature Quantum Effects in Single-Molecule Circuits

Ref.: CNS2023-145464

From 2024 to 2026

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

3D4ENERGY

Developing 3D-printed electrodes for high-performance and sustainable energy storage devices

Ref.: CNS2023-145011

From 2024 to 2026

Principal Investigator: [Dr. Ester Palmero](#)



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 2024

Principal Investigator: [Dr. Sebastian A. Thompson](#)

LA CAIXA RESEARCH HEALTH



Call 2021

Drugs4ALS

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

Coordinator: CIB-CSIC

From 2021 to 2025

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

Call 2024

Mito4Neuro

Integrative characterization of the mitochondrial DNA replisome in health and disease

Coordinator: CNIO

From 2024 to 2027

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

ASSOCIATION FRANÇAISE CONTRE LES MYOPATHIES



AFM-Téléthon

Functionalized nanoparticles for targeted genome editing in Duchenne Muscular Dystrophy

From 2022 to 2025

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

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

FUNDACIÓN LUZÓN: UNIDOS CONTRA LA ELA

Fundación Francisco Luzón

Investigating Extracellular Vesicles in ALS: from mechanisms to biomarkers

From 2024 to 2027

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

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. Álvaro Somoza](#)

CONVOCATORIA ADQUISICIÓN EQUIPAMIENTO CIENTÍFICO-TÉCNICO LABORATORIOS REDLAB CM 2024

Perfilómetro Óptico 3D S Neox

2024-REDLAB/TEC-33867

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



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 Industrial opportunity. These are spread across several research areas: Aerospace, Security & Defence; Health & Food; Nanomaterials, 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)



TSUNAMI

From 2020 to 2023

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

Airbus Defence and Space SAU (Spain)



GONDOLA

From 2021 to 2024

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

Bosch (Germany)



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) | H2020

Kinetic Exponent Network Analysis

HORIZON-MSCA-2021-PF-01

Grant Agreement number: 101155395

From 2024 to 2026

Fellow: [Dr. Alexander Willem Peter Blokhuis](#)

Co-CaReD

In-cell Redox Catalysis by Co(III) Metallodrugs as New Tools for Cancer

Treatments HORIZON-MSCA-2022-PF-01-01

Grant Agreement number: 101108027

From 2024 to 2026

Fellow: [Dr. Alfonso Annunziata](#)

KENA

Kinetic Exponent Network Analysis

HORIZON-MSCA-2021-PF-01

Grant Agreement number: 101155395

From 2024 to 2026

Fellow: [Dr. Alexander Willem Peter Blokhuis](#)

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](#)

IDEAL Postdoc

2nd Call: [Dr. Gloria Tobajas](#), [Dr. Aurelio Gallardo](#), [Dr. Alvaro Artiga](#), [Dr. Alvaro Castells](#), [Dr. Ankit Udai](#), [Dr. Atikur Rahman](#), [Dr. Beata Maria Szydłowska](#)

1st Call Fellows: [Dr. Felipe Viela](#), [Dr. Marc G. Cuxart](#), [Dr. Andrés Burgos](#), [Dr. Indranil Bhattacharjee](#), [Dr. Zhan Zhen](#)

IDEAL PHD

1st Call: [Lenka Cerna](#), [Adhil Kabeer Kurukkan](#), [Abdou Karim Darboe](#), [María Fernanda Florez](#), [Noor Ulain Iqbal](#), [Vu Phong Dinh](#)

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 2023 [Drs. Natalia Martín & José A. Silva](#)

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](#)

Contratos predoctorales para la formación de doctores (FPI Programme)

Call 2023 [Ahsan Ali](#), [Alba García](#), [Gonzalo Molina](#)

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

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

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

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

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 **Dr. Edmund Leary**

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 2024 **Dr. Víctor Vega**

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 2024 **Iván Zumeta**

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 **Beatriz de Vicente, Cristina Sánchez, Eva Mar López, Sergio Millán (tech)**

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

4.5.4. Others Programmes



Postdoctoral Junior Leader fellowships (Junior Leader)

Call 2021 **Dr. Sara Hernandez**

Doctoral INPhINIT fellowships

Call 2020 **Alonso José Campos**



Becas Leonardo

Call 2024 **Dr. Allan Johnson**

Call 2023 **Dr. Sara Hernandez**

5. Training

5.1. Seminars

5.1.1. 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 open to the public.

48 seminars were given by speakers from IMDEA Nanociencia (17) and other institutions (31 institutions, 13 countries).

16/01/2024

Dr. Gesa Welker

Leiden University, Netherlands

Spins as study tools and study objects: Studying palladium surface magnetism using muon implantation and scanning tin-vacancy microscopy

23/01/2024

Prof. Shengjun Yuan

Wuhan University, China

Large-scale numerical methods based on wave propagation

30/01/2024

Dr. Akashdeep Kamra

Instituto de Física de la Materia Condensada, Universidad Autónoma de Madrid

Nonreciprocal magnonic spin transport

31/01/2024

Pablo Jarillo Herrero

Massachusetts Institute of Technology USA

The magic of moiré quantum matter



05/02/2024

Prof. Henk Bolink

Instituto de Ciencia Molecular – ICMol, Spain

Perovskite based photovoltaic devices

13/02/2024

Nicoletta Liguori

The Institute of Photonic Sciences ICFO, Spain

Photosynthetic proteins in action! Towards a real-time investigation of how light-harvesting is regulated in plants

19/02/2024

Dr. Patricia Mora-Raimundo

Israel Institute of Technology Israel

My scientific journey around the elderly: How I went from bone to brain delivery



20/02/2024

Dr. Borja Ibarra

IMDEA Nanociencia, Spain

Tracking flu virus genome replication in real-time with high-speed atomic force microscopy

Prof. Dr. Yanina Fasano

Instituto Balseiro y CONICET, Argentina

Imaging of confined vortex matter as a probe for anisotropic order parameter in superconductors

23/02/2024

Dr. Matteo Jugovac

Elettra – Sincrotrone Trieste, Italy

Single-spin flat bands in cobalt-supported graphene

05/03/2024

Dra. Begoña Sot

CIEMAT-IMDEA Nanociencia, Spain

Combining CRISPR and nanotechnology for the detection and treatment of diseases

12/03/2024

Prof. Michel Rickhaus

University of Geneva, Switzerland

Unlocking supramolecular synthesis? The strategic design of curved polyaromatics for self-assembly

19/03/2024

Francisco Terán

IMDEA Nanociencia, Spain

Exploiting dynamical magnetization for probing the interactions between nanoparticles and biological entities

02/04/2024

Dr. Adolfo G. Grushin

Institut Néel, Grenoble, France

Non-crystalline topological matter

09/04/2024

Dr. Elisabet Romero

Institut Català d'Investigació Química ICIQ, Spain

Engineering bio-inspired chromophore-protein assemblies for solar-energy conversion to fuel

18/04/2024

Eduardo Anaya

Aalto University, Finland

Electrostatic self-assembly of photoactive protein biohybrid materials

22/04/2024

Dr. Jesús Jimenez-Barbero

Center for Cooperative Research in Biosciences CIC bioGUNE, Spain

Breaking the limits in understanding glycan recognition by NMR

30/04/2024

Prof. María José Alonso

CIMUS/IDIS Research Institutes, Uni. Santiago de Compostela, Spain

Impact of nanomaterials in the development of new vaccines and advanced therapies

07/05/2024

Reinhold Wannemacher

IMDEA Nanociencia, Spain

Photophysics of some carbon nanomaterials

10/05/2024

Dr. Paulina Nowak

Abbelight, France

Single Molecule Localization Microscopy and Automated TIRF

14/05/2024

Dr. Ramón Bernardo Gavito

IMDEA Nanociencia, Spain

Harnessing the nonlinearities of 2D drum resonators

28/05/2024

Dr. Mariela Menghini

IMDEA Nanociencia, Spain

An itinerary along the roads of Transport in Quantum Materials

11/06/2024

Jornada de tecnologías, sistemas y servicios de Grupo Álava

18/06/2024

Johannes Gierschner

IMDEA Nanociencia, Spain

Erosion of scientific integrity fueled by quantitative evaluation metrics

25/06/2024

Prof. Paolo Samori

ISIS, University of Strasbourg & CNRS, France

Dress them with molecules! Elevating 2D materials to a new dimension

05/07/2024

Prof. Manuel Alcarazo

Institut für Organische und Biomolekulare Chemie, University of Göttingen, Germany

Cationic phosphines for efficient synthesis of helixes

22/07/2024

Thomas Deckert

University of Luxembourg

Many-body interactions in semiconductors revealed by two-dimensional electronic spectroscopy

24/07/2024

Jon Marangos

Imperial College London, UK

Ultrafast electronic dynamics and electron-nuclear coupling via linear and non-linear x-ray probing

11/09/2024

Naveen Shetty

Chalmers University of Technology, Sweden

Towards scalable graphene (quantum) electronics

17/09/2024

M. Ángeles Canales Mayordomo

Universidad Complutense de Madrid, Spain

New NMR methods for the study of glycan conformation and glycan protein interactions

23/09/2024

Dr. Melanie Müller

Fritz Haber Institute, Germany

Ultrafast scanning tunneling microscopy and spectroscopy of solid surfaces

27/09/2024

Chris Hunter

University of Cambridge, UK

Synthetic Information Molecules

30/09/2024

Sebastián Thompson

IMDEA Nanociencia, Spain

Clinical nanothermometers

15/10/2024

Prof. Jorge Méndez

Universidad de La Laguna, Spain

Blas Cabrera y las “tierras raras”: uno de los “padres” de la física cuántica

16/10/2024

Steven De Feyter

KU Leuven, Belgium

On-surface synthesis of synthetic organic 2D materials at the liquid-solid interface: a close-up with scanning probe microscopy

29/10/2024

Dr. Jaime Hernández

IMDEA Nanociencia, Spain

Nanoimprint lithography for the development of multifunctional surfaces at IMDEA Nanociencia

30/10/2024

Prof Capitolina Díaz

Universidad de Valencia, Spain

Sesgos inconscientes de género en investigación

31/10/2024

Prof Capitolina Díaz

Universidad de Valencia, Spain

Unconscious gender biases in research

12/11/2024

Vasileios Balos

IMDEA Nanociencia, Spain

Depth profiling at interfaces by combining phase-sensitive sum and difference frequency generation spectroscopies

14/11/2024

Prof. José Luis Vicent

UCM/IMDEA Nanociencia, Spain

Condiciones iniciales y de contorno

**20/11/2024****Dana D. Medina-Tautz**

Ludwig-Maximilians-Universität München, Germany

*On-surface molecular frameworks – synthesis, properties and function***26/11/2024****Rebeca Bocanegra**

IMDEA Nanociencia

*Optical Tweezers at IMDEA Nanociencia***04/12/2024****Ester Palmero**

IMDEA Nanociencia

*Advanced fabrication of permanent magnets: from the synthesis of tuned composites to additive manufacturing (SustainableNano seminar)***11/12/2024****Carmen Alvarez-Lorenzo***Institute of Materials iMATUS Universidad Santiago Compostela**Materials for Health Research at iMATUS (USC Institute of Materials)*

5.1.2. Highlights seminar IMDEA Nanociencia

The 'Highlights' seminars features recently published articles by researchers from IMDEA Nanociencia. Additionally, the Dissemination and Communication Office prepares popular summaries to give maximum visibility to the publications.

16/04/2024**Cristina Flors**

(Advanced Fluorescence Nanoscopy group)

In situ single-cell bacterial imaging provides mechanistic insight into the photodynamic action of photosensitizer-loaded hydrogels**El artículo:** <https://pubs.acs.org/doi/full/10.1021/acsami.3c17916>**Resumen:** <https://nanociencia.imdea.org/home-en/news/item/advanced-microscopy-technique-visualizes-bactericidal-effect-on-hydrogel-patches-in-real-time> (ENG) <https://www.nanociencia.imdea.org/es/imdea-nanociencia/noticias/item/advanced-microscopy-technique-visualizes-bactericidal-effect-on-hydrogel-patches-in-real-time> (ESP)**Ana Barragán**

(Nanoarchitectures on Surfaces group)

Generating antiaromaticity in polycyclic conjugated hydrocarbons by thermally selective skeletal rearrangements at interfaces**El artículo:** <https://www.nature.com/articles/s44160-023-00390-8>**Resumen:** <https://www.nanociencia.imdea.org/home-en/news/item/generating-antiaromatic-moieties-on-surfaces> (ENG) <https://www.nanociencia.imdea.org/es/imdea-nanociencia/noticias/item/generating-antiaromatic-moieties-on-surfaces> (ESP)

21/05/2024

Edmund Leary

(Molecular Electronics group)

Ballistic Conductance through Porphyrin Nanoribbons.

The paper:

J. Am. Chem. Soc. **146**, 3651 (2024)<https://pubs.acs.org/doi/10.1021/jacs.3c07734>

Popular summary: <https://www.nanociencia.imdea.org/home-en/news/item/ballistic-transport-in-long-molecular-wires-porphyrin-nanoribbons>

Miguel Angel Valbuena

(Spin resolved-ARPES laboratory)

Experimental Demonstration of a Magnetically Induced Warping Transition in a Topological Insulator Mediated by Rare-Earth Surface Dopants.

The paper:

Nano Lett. **23**, 6249 (2023)<https://pubs.acs.org/doi/10.1021/acs.nanolett.3c00587>

Popular summary: <https://www.nanociencia.imdea.org/home-en/news/item/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>

Allan Johnson

(Ultrafast Science of Quantum Materials group)

All-optical seeding of a light-induced phase transition with correlated disorder.

The paper:

Nature Physics (2024)<https://www.nature.com/articles/s41567-024-02474-4>

Popular summary: <https://www.nanociencia.imdea.org/home-en/news/item/efficiency-boost-dual-light-pulses-minimize-energy-for-phase-transitions>

10/09/2024

Nacho Figueruelo-Campanero

(Transport in Quantum Materials group).

Apparent color and Raman vibrational modes of the high-temperature superconductor Bi₂Sr₂CaCu₂O exfoliated flakes.

The article: <https://iopscience.iop.org/article/10.1088/2053-1583/ad349e>

Popular summary: <https://www.nanociencia.imdea.org/es/imdea-nanociencia/noticias/item/optical-characterization-of-bscco-a-high-temperature-superconducting-2d-material>

Gorka Salas

(Magnetic Nanoparticles group).

Multicore iron oxide nanoparticles for magnetic hyperthermia and combination therapy against cancer cells.

The article: <https://www.sciencedirect.com/science/article/pii/S0021979724010178?via%3Dihub>

Popular summary: <https://www.nanociencia.imdea.org/es/imdea-nanociencia/noticias/item/a-combination-of-magnetic-nanoparticles-and-chemotherapy-drugs-achieves-greater-efficacy-against-cancer-cells>

Juan Cabanillas-González

(Energy Harvesting group)

High Q ultra-low threshold lasing in conjugated polymer blend microspheres promoted by FRET.

The article: <https://onlinelibrary.wiley.com/doi/10.1002/adom.202400161>

Popular summary: <https://www.nanociencia.imdea.org/es/imdea-nanociencia/noticias/item/ultra-low-threshold-lasing-in-organic-polymer-blend-microspheres-with-the-highest-q-factor>

08/10/2024

Jorge S. Valera

(Systems Chemistry Laboratory group)

Photoinitiated transient self-assembly in a catalytically driven chemical reaction cycle.

The article: <https://onlinelibrary.wiley.com/doi/10.1002/anie.202406931>

Popular summary: <https://nanociencia.imdea.org/es/imdea-nanociencia/noticias/item/real-time-control-over-a-chemical-reaction-network-by-light>

Alberto Martín Jiménez

(Photon STM group)

Directional picoantenna behavior of tunnel junctions in the presence of atomic-scale defects.

The article: <https://www.science.org/doi/10.1126/sciadv.adn2295>

05/11/2024

Ion Isasti

(Chemistry of Low-Dimensional Materials group)

Reinforcement of Polyimine Covalent Adaptable Networks with Mechanically Interlocked Derivatives of SWNTs

The article: <https://onlinelibrary.wiley.com/doi/10.1002/adfm.202408592>

Popular summary: <https://nanociencia.imdea.org/home-en/news/item/plastics-are-stronger-and-lighter-thanks-to-carbon-nanotubes-derivatives>



Francisco Fernández Villoria

(Modelling Physical Properties of Nanostructures group)

Few-femtosecond electron transfer dynamics in photoionized donor- π -acceptor molecules

The article: <https://www.nature.com/articles/s41557-024-01620-y>

Popular summary: <https://nanociencia.imdea.org/home-en/news/item/ultra-high-speed-camera-for-molecules-attosecond-spectroscopy-captures-the-electron-transfer-dynamics-in-organic-molecules>

28/06/2024

How to get published

Dr Siddharth Jethwa

(IOP Publishing)

01/07/2024

IDEAL Postdoc Summer School

Introduction to IMDEA Nanociencia Research Programmes

Emilio M Pérez

5.2. Training programmes

Masterclasses organised by the Projects Office for IMDEA Nanociencia staff.

29/01/2024

From a research idea to a company, an interactive discussion

Dr. Thomas Biellman

(CFO Qfluidics), Prof. Thomas Hermans

29/02/2024

Open Science info session: focus on Open Access and the Institutional Repository

Elena Alonso

(Dissemination and Communication Office, IMDEA Nanociencia)

15/04/2024

IMDEA Nano Coffee Break: NCP and ERC grantees' insights

Estefanía Muñoz

(National Contact Point FECYT)

27/06/2024

Jornada sobre Acceso Abierto: Publicaciones, derechos de explotación y licencias

Remedios Melero

(Instituto de Agroquímica y Tecnología de los Alimentos, IATA-CSIC)



Leadership in diverse research environments for aspiring researchers
Diversity

04/07/2024

Citizen science, present and future of research in Europe

Fermin Serrano

(Fundación Ibercivis)

30/10/2024

Sesgos inconscientes de género en investigación

Capitolina Díaz

(Universidad de Valencia)

The banner features the IMDEA Nanociencia logo on the left, followed by the text "repositorio institucional" and "IMDEA Nanociencia". In the center, the main title "Open Science info session: focus on Open Access and the Institutional Repository" is displayed in large, bold letters. To the right, the date "29th 2024 feb" and time "10:00" are shown, along with the location "Hinarejos room". At the bottom right, it says "Delivered by Dr. Elena Alonso". Logos for "EXCELENCIA" and "FECYT" are also present.

18/11/2024

PhD welcome academic year 2024-2025

Emilio Pérez

IDEAL PhD Programme Welcome Day

Mark Davies, Mercedes Hernandez

(Competitive Projects Office, IMDEA Nanociencia)



21/11/2024

Patents and industrial property rights: the essentials at a glance

Francisco Armero Abad

(Oficina Española de Patentes y Marcas)

20/11/2024

Lumicks C-trap MasterClass on Experiment Automation

Maria Ortiz

25/11/2024

Identifying Opportunities in Horizon Europe

Seán McCarthy

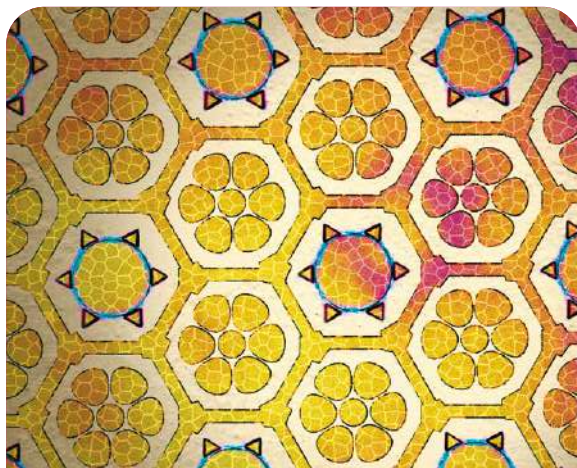
(Hyperion Ltd.)

05/12/2024

IMDEA Nano Coffee Break: Funding Innovation and MSCA Staff Exchanges

Mercedes Hernández

(Competitive Projects Office, IMDEA Nanociencia)



5.3. Academic lectures

Alejandro Lopez

*Master Graduated School of Human and Environmental Studies, Kyoto.**'Carbon nanotubes: fundamentals and applications'*

Álvaro Somoza

'Nanoquímica', Grado de Química, Universidad Autónoma de Madrid

Borja Ibarra

*Biomolecules and Cellular Dynamics Master, Universidad Autónoma de Madrid, 'Fronteras en el Estudio de las Biomoléculas'**Máster en Biotecnología, UAM, 'Diseño en Biocatálisis y Nanobiotecnología'*

Borja Ibarra, Rebeca Bocanegra

*Biomolecules and Cellular Dynamics Master, Universidad Autónoma de Madrid, 'Biomolecular Machines'**Physics of Condensate Matter and Biological Systems. Universidad Autónoma de Madrid, 'Experimental techniques in the Physics of Condensate Matter and Biological Systems'*

Cristina Flors

Master en Física de la Materia Condensada y Sistemas Biológicos (UAM), 'Fluorescence Microscopy'

Gorka Salas

*Bachelor in Energy Engineering, Universidad Carlos III de Madrid, 'Chemical Basis of Engineering'**Máster en Tecnología Aplicada a Nanomateriales, Universidad Carlos III de Madrid, 'Synthesis and characterization of nanomaterials', and 'Nanomedicine'*

Isabel Rodriguez

Máster de Biotecnología, Programa de Posgrado en Biociencias, Universidad Autónoma de Madrid, 'Mechanical modulation of cell behavior by engineered surfaces'

Johannes Gierschner

University of Tübingen, 'Photophysics of Conjugated Organic Materials' European Master in Theoretical Chemistry and Computational Modelling, 'Theoretical methods for Simulation of Materials' Course on 'Theoretical Methods for Simulation of Materials', within the European Master in Theoretical Chemistry and Computational Modelling (TCCM), 'Targeted Materials Design'

**Luis Alberto Campos**

Máster en Biomoléculas y Dinámica Celular (UAM), asignatura 'Nanomáquinas moleculares', Universidad Autónoma de Madrid, 'Rational engineering for the creation and control of protein nanostructures' lecture
Máster en Física de la Materia Condensada y de los Sistemas Biológicos (UAM), asignatura 'Técnicas experimentales avanzadas en nanofísica y biofísica', 'Single molecule FRET technique: theory and in vitro applications'

Lucas Perez

Master en Nanofísica y Materiales Avanzados, Universidad Complutense de Madrid, Asignatura 'Nanodispositivos'
Universidad para los Mayores (UCM), Curso de 75 horas: Los años que revolucionaron la Física: Historia de la Física Cuántica

Miguel Ángel Valbuena

Máster Interuniversitario en Nanociencia y Nanotecnología Molecular, 'Physical characterization techniques'

Milagros Castellanos, Carmen Escalona Noguero

Grado de Biotecnología, Universidad Alfonso X, Madrid

Nazario Martín León

Máster Interuniversitario en Química Orgánica, Universidad Complutense de Madrid, 'Materiales Moleculares Orgánicos'

Paolo Perna

Asignatura 'Física de sistemas bidimensionales', Máster Universitario en Física de la Materia Condensada y de los Sistemas Biológicos, Universidad Autónoma de Madrid, 'Magnetic Anisotropy at Interfaces'

Rodolfo Miranda

VII Escuela de Espectroscopias de Sólidos Inorgánicos, Sede Antonio Machado de Baeza (Jaén) de la Universidad Internacional de Andalucía (UNIA), 'Microscopias y Espectroscopias avanzadas para el estudio de materiales: Microscopias y Espectroscopia de túnel a escala atómica'

Sara H Mejias

Physics of Condensed Matter and Biological Systems, Universidad Autónoma de Madrid, 'Model photosystems development for addressing challenges in light conversion'

Sebastian Thompson

Universidad Francisco de Vitoria, Madrid, 'Nanomedicine'

Valle Palomo

Máster Universitario en Biología Sintética Integrativa, Universidad Internacional Menéndez Pelayo, Madrid, 'How to write a paper'

5.4. PhD Theses**25/01/2024****Joan Ripoll Sau**

Scanning tunneling microscopy characterization of epitaxially grown two-dimensional transition metal ditellurides

Supervisor(s): Amadeo L. Vázquez de Parga, Manuela Garnica Alonso

06/03/2024**Sergio Revuelta Martínez**

Dynamics of photo-induced free charge carriers, excitons and phonons in silicon

Supervisor(s): Enrique Cánovas

15/04/2024**Lucía Martín Pérez**

Electron transport in magnetic van der Waals materials and their heterostructures

Supervisor(s): Enrique Burzurí

19/04/2024**Álvaro Corrochano Fernández**

Alkyne-bridged cyclopenta[h,i]aceanthrylene dimers: Synthesis, self-assembly, and spectroscopic studies

Supervisor(s): Giovanni Bottari, Tomás Torres

22/04/2024**Óscar Fernández Vera**

Stimuli-responsive subphthalocyanine- and anthracene-based multicyno systems: Structural, electrochemical and photophysical properties

Supervisor(s): Giovanni Bottari, Tomás Torres

25/04/2024**Arturo Vera García**

Desarrollo de sensores magnéticos para la medida de señales neuronales

Supervisor(s): Rubén Guerrero, Lucas Pérez

26/04/2024**Claudia Lozano**

Estudio de la terapia fototérmica mediada por nanopartículas magnéticas y sus efectos en modelos celulares tumorales

Supervisor(s): Francisco José Terán Garcinuño, Francisco Sanz Rodríguez

26/04/2024

Kilian Artega Gutierrez

Attosecond two-photon double ionization of the H₂ molecule in full dimensionality.

Supervisor(s): Alicia Palacios Cañas, Fernando Martín García

17/05/2024

Manuel Buendía Mateos

Stereoselective Synthesis of Chiral Molecular Nanographenes: Electronic, Chiroptical and Supramolecular Properties

Supervisor(s): Nazario Martín León, Salvatore Filippone

12/06/2024

Jorge Delgado Guerrero

Attosecond dynamics of photoionized organic molecules

Supervisor(s): Alicia Palacios Cañas, Fernando Martín García

04/07/2024

Patricia Izquierdo García

Chiral Molecular Nanographenes: Synthesis and properties

Supervisor(s): Nazario Martín León, Jesús Manuel Fernández García

18/07/2024

Óscar Jover Arrate

Electronic and optical properties of organic molecules at metal surfaces studied by scanning tunnelling microscopy

Supervisor(s): Roberto Otero Martín

24/07/2024

Catarina Castanheira Coutinho

Cancer diagnosis and therapy based on nucleic acids and nanotechnology

Supervisor(s): Álvaro Somoza, Milagros Castellanos

16/09/2024

Carlos Rodríguez Pulido

Caracterización A Nivel De Moléculas Individuales De Las Propiedades Mecánicas Y Plegamiento Del ARN De Cadena Sencilla

Supervisor(s): Borja Ibarra; Rebeca Bocanegra

01/10/2024

Beatriz Muñoz Cano

Emerging phenomena induced by spin-orbit coupling in two-dimensional quantum materials studied by spin- and angle- resolved photoemission spectroscopy

Supervisor(s): Miguel Ángel Valbuena

17/10/2024

Alicia Naranjo Chacón

Patterning of graphene: exploring emulsions and Langmuir-Blodgett methods

Supervisor(s): Emilio M. Pérez

04/11/2024

Héctor Sáinz Cruz

Superconductivity, Majorana modes and disorder in graphene stacks

Supervisor(s): Francisco Guinea

21/11/2024

Ana Martínez Martínez

Engineering multifunctional spin crossover materials with porous architectures

Supervisor(s): Jose Sánchez Costa

29/11/2024

Alejandro Jimeno Pozo

Interactions and superconductivity in twisted and untwisted graphene stacks

Supervisor(s): Francisco Guinea

10/12/2024

Miguel Esteban Lucía

Micro/Nanoscale Topographical Cues in Stem Cell Differentiation and Alignment

Supervisor(s): Isabel Rodríguez

16/12/2024

Siyang Feng

Photophysics of Innovative Organic Charge-Transfer Systems by Combining Optical Spectroscopy and Quantum Chemistry

Supervisor(s): J. Gierschner, R. Wannemacher

18/12/2024

Arturo Villechenous Rojo

Tethered Rhodium(III) Cyclopentadienyl Half-Sandwich Complexes for Biological Applications

Supervisor(s): Ana M. Pizarro



5.5. Master Theses

30/06/2024

Antonio J Vidal Estrugo

Effect Of Temperature On The Real-Time Kinetics Of The Human Mitochondrial Dna Polymerase

Supervisors: Borja Ibarra

01/07/2024

José Antonio Fernández Cepero

Síntesis de redes orgánicas covalentes (COFs) basadas en subftalocianinas hidroxiladas

Supervisors: Giovanni Bottari, Ignacio Romero Muñiz

05/07/2024

Jesús Domingo Navarro Nuñez

Síntesis de nanografenos helicoidales bicapa con carácter dador-aceptor

Supervisors: Nazario Martín León, Jesús Manuel Fernández García

Natalia Honrubia Rodríguez

Conjugados de Glicofullereno-Porfirina para Aplicaciones Biológicas

Supervisors: Nazario Martín León, Beatriz Illescas

08/07/2024

Iskandar To'lanboyev

Unbiased Computational Engineering of Polymer Bandgaps by Hybrid DFT-TDDFT

Supervisors: B. Milián-Medina J. Gierschner

12/07/2024

Nerea Fuertes

Smart nanoparticles for cancer therapy

Supervisors: Prof. Álvaro Somoza and Dr. Mario Martínez

05/09/2024

Xiaoyu Gong

Characterization of the real-time DNA replication kinetics of the human mitochondrial DNA pol

Supervisors: Borja Ibarra; Rebeca Bocanegra

10/09/2024

Asier Garcia

Elucidation of photostability mechanisms in engineered photosystems

Supervisors: Sara H Mejías

Carlos Arcos

Towards an aptamer against EMMPRIN (CD147) and Podoplanin

Supervisors: Prof. Álvaro Somoza and Dr. Luis Alberto Campos

Teresa González

Development of charged networks on proteins for tuning chromophore's excited state transitions

Supervisors: Sara H Mejías

17/09/2024

Alfredo Jimenez

Sistemas de detección de ncRNAs basados en nanopartículas de oro

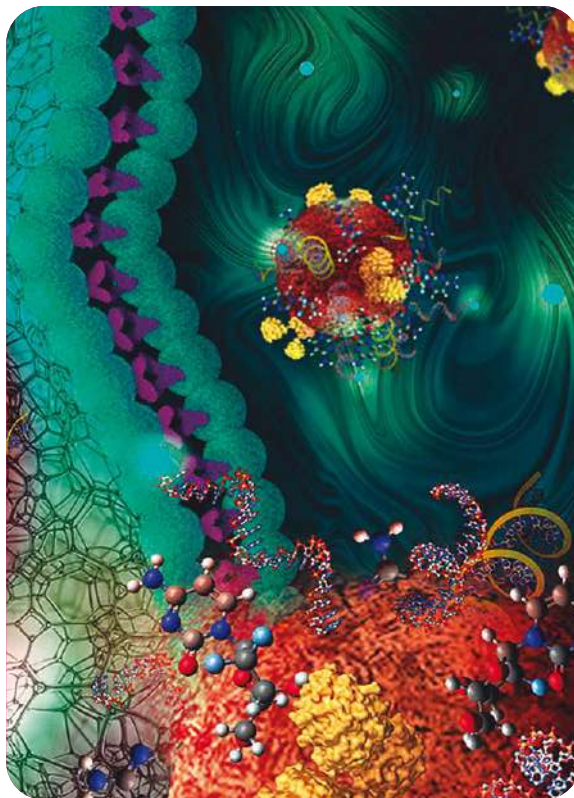
Supervisors: Prof. Álvaro Somoza and Dr. Luis Alberto Campos

18/09/2024

Susana Aberturas López

Growth and optimization of a Cu buffer layer for NiFe ultra-thin films systems

Supervisors: Cristina Navío



5.6. Final degree projects

19/01/2024

Claudia Coronel

Evaluación de potenciales fármacos contra la Esclerosis Lateral Amiotrófica

Supervisors: Valle Palomo

15/06/2024

Mario González Sánchez

Síntesis, caracterización y propiedades fisicoquímicas de nuevos derivados de "cyanostars"

Supervisors: Giovanni Bottari, Miguel Martínez García

26/06/2024

Ana García Rubio

Vesículas extracelulares de pacientes de esclerosis lateral amiotrófica: caracterización fenotípica y estudio del impacto en transporte intracelular de células SH-SY5Y empleando nanosensores fluorescentes

Supervisors: Valle Palomo

30/06/2024

Enrique Cristobal

Desarrollo de fotosistemas multicrómicos basados en proteínas diseñadas

Supervisors: Sara H Mejías

04/07/2024

Marina Iglesias Rabadán

Síntesis y caracterización de precursores aromáticos de nanografenos moleculares

Supervisors: Nazario Martín León, Jesús Manuel Fernández García

17/07/2024

Aitor Rivas Cobollo

Extracellular Temperature Measurements

Supervisors: Sebastián Thompson

18/07/2024

Javier Campos Herrero

Síntesis de Nanoflores Magnéticas para Aplicaciones en Biomedicina

Supervisors: Ana Rodríguez, Gorka Salas

5.7. Conferences, workshops and courses co-organised

28/02/2024

Reunión científica de la Red Avanzada de Fotovoltaica (MICINN)

Instituto Catalán de Nanociencia y Nanotecnología ICN2, Barcelona

Nazario Martín León

17/04/2024

Jornada de presentación de resultados del programa Tecnologías 2018 y presentación de nuevas bases reguladoras de proyectos I+D

IMDEA Nanociencia

Rodolfo Miranda

17/04/2024

Difusión de Resultados científicos de la convocatoria de programas de I+D Tecnologías 2018 y presentación de la nueva orden de bases de programas de actividades I+D' de la Comunidad Madrid

IMDEA Nanociencia

Rodolfo Miranda, chair del evento



25/04/2024

Seminario de Detección de Fugas

Conference room, IMDEA Nanociencia

Daniel Granados

26/04/2024

Curso de Microscopía y Aplicaciones

Online

C. Flors



13/05/2024

Quantum Materials for Advanced Computing

Miraflores de la Sierra (Madrid)

Lucas Pérez

26/05/2024

245th Electrochemical Society Meeting (ECS) - Symposium B-10

San Francisco

Nazario Martín León

27/05/2024

COST/ZCAM School on New Computational Methods for Attosecond Molecular Processes

Zaragoza

C. Svetina

17/06/2024

Symposium at the 37th European Conference on Surface Science

Harrogate

Alberto Martín

08/07/2024

1st WavemiX 2024 - NEXT" meeting

Conference room, IMDEA Nanociencia

Cristian Svetina



15/07/2024

New spin textures in magnetism

San Sebastián

Lucas Pérez

19/09/2024

7th Spanish Conference on Biomedical Applications of Nanomaterials (SBAN 2024)

Madrid

Fernando Herranz, Puerto Morales, Lucía Gutiérrez, and Gorka Salas

23/09/2024

Light-Matter Interaction at Nanoscale' Workshop

IQF Blas Cabrera

Alberto Martín

24/07/2024

Curso de Verano UCM "Siliconomy"

San Lorenzo del Escorial

Daniel Granados

18/10/2024

Acto de entrega de los Premios a las Mejores Tesis Doctorales defendidas en 2023 organizado por el Grupo Especializado en Nanociencia y Materiales Moleculares RSEF/RSEQ

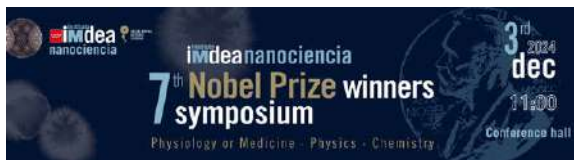
Conference room, IMDEA Nanociencia

04/12/2024

7th Nobel Prize Winners Symposium

Lola Fernández Messina (UCM), Jorge Bravo Abad (UAM), Marta Martínez (CNB-CSIC)

Conference room, IMDEA Nanociencia



17/12/2024

14th Early Stage Researchers Workshop in Nanoscience

Conference room, IMDEA Nanociencia

Emilio Pérez, Manuela Garnica, Valle Palomo, José Ángel Silva, Sara Hernández, Elena Alonso, Marije Villa



5.8. Mentoring

Researchers Beyond Academia REBECA by EURAXESS

Elena Alonso

Mentor of a PhD student for 6 months



GOBIERNO
DE ESPAÑA

MINISTERIO
DE CIENCIA, INNOVACIÓN
Y UNIVERSIDADES



Prácticas de alumnos de la Fundación Dadoris

Enrique Cánovas, Borja Ibarra, Valle Palomo, Juan Cabanillas,
Milagros Castellanos, Angelo Beratto, Sara Mejías, José Silva



STEM Talent Girl

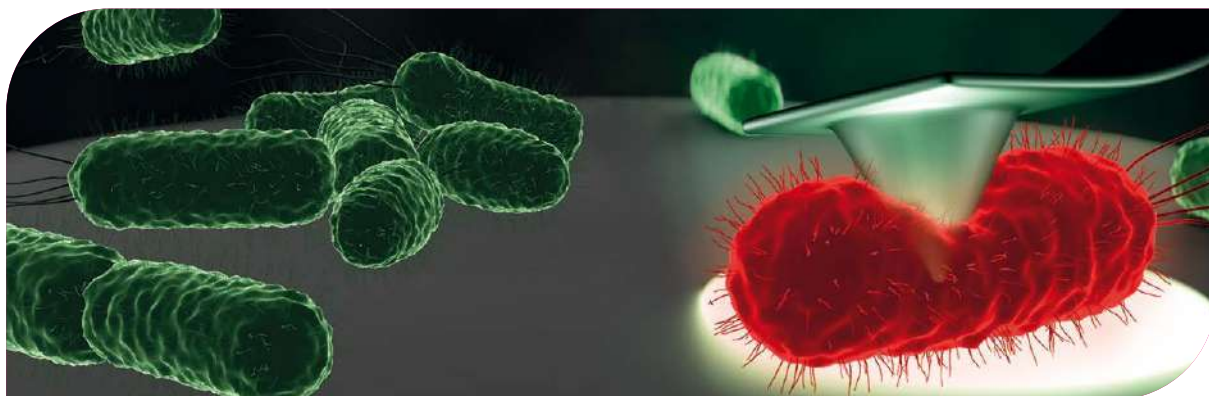
Natalia Martín Sabanés

5.9. Alumni

Every year, new researchers enrol with us while others are leaving us in order to take up positions in the international arena. The aim of the Alumni Programme is to connect former researchers as well as non-scientific staff all over the world - regardless of where they are - by setting up a global network of former employees across the scientific disciplines, a platform for sharing both professional and personal experiences.

The activities of the Alumni Programme include:

- Regular newsletter with information on open positions, news and training opportunities at IMDEA Nanociencia.
- Career prospects, a series of talks by alumni to give their view of their stay as researchers at IMDEA Nanociencia and their subsequent professional careers, with the objective of providing PhD students a vision for their professional development.





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



CEM CENTRO ESPAÑOL
DE METROLOGÍA

21/11/2024

Elena Alonso y Laura Lorente participan en el Grupo de Trabajo e-ciencia del Consorcio Madroño, que agrupa a bibliotecarios y gestores de repositorios de universidades y centros de investigación de la Comunidad de Madrid.



29/05/2024

Daniel Granados asiste a la Asamblea General Anual de la European Semiconductor Regions Alliance (ESRA) en Dresden

02/12/2024

Patricia López and Laura Ortega from the IMDEA Nanociencia's Project Office were present at the first meeting of EARMA's thematic group on Equity, Culture, Diversity and Inclusion

6. Awards and honours

Emilio M. Pérez

26/04/2024

Premio de la Real Sociedad Española de Química a la Excelencia Investigadora

<https://nanociencia.imdea.org/es/imdea-nanociencia/noticias/item/emilio-perez-receives-the-award-for-research-excellence-from-the-spanish-royal-society-of-chemistry>



Tomás Torres Cebada

01/07/2024

Premio Nacional de Investigación «Enrique Moles», en el área de ciencia y tecnología químicas, otorgado por el Ministerio de Ciencia, Innovación y Universidades

Borja Ibarra

12/11/2024

Entrega de becas de la Fundación la Caixa **Health** a Borja Ibarra por su proyecto “Avances en la comprensión de las enfermedades neurodegenerativas relacionadas con la replicación del ADN mitocondrial”.





IMDEA Nanociencia

05/09/2024

Entrega de la acreditación Excelencia Severo Ochoa a IMDEA Nanociencia. Recoge el galardón Fernando Martín.



Fundación Dádoris

27/09/2024

Julio Camarero entrega el "Diploma Julio Camarero" de la Fundación Dádoris, que reconoce a jóvenes con talento en las ramas de ciencias naturales e ingeniería, en honor al apoyo y dedicación del Prof. Camarero hacia los fines de la fundación.



Luis Bañares

11/12/2024

Premio Humboldt de Investigación Científica



Sara Hernández Mejías

07/05/2024

Reconocimiento a científicas e innovadoras de prestigio en el ámbito nacional e internacional.

El Ministerio de Ciencia, Innovación y Universidades, a través de su Unidad de Mujeres y Ciencia y en colaboración con FECYT.



Esther Resines Urien

21/05/2024

Premio a la Mejor Comunicación Oral del V Congreso de Materiales Multifuncionales.

Grupo Especializado de Nanociencia y Materiales Moleculares de la Real Sociedad Española de Química y la Real Sociedad Española de Física





Angelo Beratto

05/07/2024

Poster Prize

Physical Chemistry Symposium UAM

Saül García Orrit

12/09/2024

Best Poster Communication Prize

Franco-Iberian Conference on Photochemistry



Sebastián Mesa Apestegui

08/11/2024

Best Poster at the V Ultrafast Science and Technology Spain Conference

USTS2024

Grupo Especializado en Láseres Ultrarrápidos de la Real Sociedad Española de Física



7. Communication and Outreach

Figure summary as of 05/12/2024



7.1. Invited talks

03/01/2024

Condensed Matter Physics Center (IFIMAC), Universidad Autónoma de Madrid

Johannes Gierschner

Scientific Integrity Decline in Current Materials Research: Insights & Vistas beneath the Tip of the Iceberg

12/01/2024

Fernando Martín

Attosecond lasers: the super slow-motion camera of physics and chemistry

Facultad Ciencias UAM

18/01/2024

Chair - ALBA II Symposium at Universidad Autónoma de Madrid

Rodolfo Miranda

19/01/2024

VI Simposio de la Unidad de Excelencia de Química, Universidad de Granada

Fernando Martín

Láseres de attosegundos: la cámara superlenta de la Física, la Química y ... ¿la Biología?

Nazario Martín

Síntesis enantioselectiva de nanografenos moleculares

24/01/2024

Physical Chemistry Colloquium LMU, Munich

C. Flors

Advanced combinations of fluorescence and atomic force microscopy to study Biology at the nanoscale

01/02/2024

Nanoseminar Catalan Institute of Nanoscience and Nanotechnology, Bellaterra

Cristina Flors

Advanced combinations of fluorescence and atomic force microscopy to study biology and materials at the nanoscale



09/02/2024

Invited department seminar,

Thomas Hermans

Controlling self - assembly by chemical fuels and light

Universitat Barcelona

14/02/2024

Sebastian Thompson

"Novedades y avances en investigación en cáncer" para la Escuela de Voluntariado de la Asociación Española Contra el Cáncer, Online

27/02/2024

Seminar at Universidad Alfonso X el Sabio

Gorka Salas

Universidad Alfonso X el Sabio, Madrid

28/02/2024

Invited seminar LivMats Center

Thomas Hermans

Controlling self - assembly by chemical fuels and light

University of Freiburg

01/03/2024

Johannes Gierschner

Scientific Integrity Decline in Current Materials Research: Insights&Vistas Beneath the Tip of the Iceberg

IFIMAC (UAM)

04/03/2024

Online lecture, nationally broadcast, for the Institute of Chemistry (Beijing) of the Chinese Academy of Sciences

Thomas Hermans

06/03/2024

Blas Cabrera institute seminar series

Sara H Mejias

Protein promoted chromophore excited state decay modulation

Madrid

20/03/2024

Ponencias - Premios Nobel de Física y de Química 2023, en la Real Academia de Ciencias Exactas, Físicas y Naturales

Fernando Martín

Ciencia de attosegundos (o cómo observar el movimiento de los electrones en tiempo real)

20/03/2024

Department of Organic Chemistry, Faculty of Chemistry, University of Murcia

Johannes Gierschner

Charge Transfer State Engineering for Tailor-Made Luminescent Organic Materials

22/03/2024

Organic Chemistry Unit, Institute for Bioengineering,

Johannes Gierschner

'Solving a 25 Years Old Riddle on Solid State Luminescence Enhancement & Quenching of Conjugated Organic Compounds' and 'Scientific Integrity Decline in Current Materials Research: Insights & Vistas beneath the Tip of the Iceberg'

University of Elche

04/04/2024

Los Jueves Complutense, San Lorenzo del Escorial

Nazario Martín

Pero... ¿qué es la nanociencia?

05/04/2024

Charla de Viernes en IRICA-UCLM - Instituto Regional de Investigación Científica Aplicada de la Universidad de Castilla La Mancha, Ciudad Real, Spain

Juan Cabanillas

Conjugated Polymer Lasers: Strategies for Boosting the Stimulated Emission Properties

05/04/2024

Weekly seminar, DESY Photon Science Division, Hamburg

C. Svetina

Communitarian efforts to develop and apply X-ray Transient Grating

12/04/2024

Department of Chemistry, University of Parma

Johannes Gierschner

Charge Transfer State Engineering for Tailor-Made Luminescent Organic Materials

22/04/2024

Video talk for the Beilstein-Institut zur Förderung der Chemischen Wissenschaften

Nazario Martín: *Molecular Nanographenes: the Search for Enantioselectivity*

25/04/2024

VIII Jornada de Promoción de la Investigación Básica para Estudiantes de Ciencias e Ingeniería de la Universidad Rey Juan Carlos

Víctor Vega

Seeing with light (time resolved spectroscopy)

25/04/2024

Acto Académico de Investidura como doctor Honoris Causa UAM de los Profesores Dr. Eugenio Coronado y Dr. Pedro Miguel Echenique

Rodolfo Miranda

29/04/2024

Seminar at the School of Medicine, University of Birmingham, UK

A. M. Pizarro

Potent Tethered Osmium(II) Half-Sandwich Anticancer Agents Bearing Phenylpyridine

Birmingham

06/05/2024

Inaugural Symposium of the Regensburg Center for Ultrafast Nanoscopy 'The Nanoworld in motion'

Fernando Martín García

Attosecond chemistry: imaging and controlling electronic motion in molecules.

Regensburg

14/05/2024

Pint of Science en la Taberna Hamburg Exargia, Madrid

Iolanda di Bernardo

La física rota de las películas

21/05/2024

Seminar in the University of Milano, Department of Pharmaceutic Science, Milano

Nazario Martín León

Molecular Nanographenes: The Search for Chiral Defects

31/05/2024

Taller ASEICA-Fundación 'la Caixa' en Caixa Forum, Madrid

Valle Palomo

Introducción a la Innovación y Transferencia en Biomedicina y Salud

31/05/2024

Invited Talk, DIPC Donostia

Valle Palomo

06/06/2024

Real Academia de Ciencias de España. Programa Ciencia para Todos

Nazario Martín León

Del Benceno al Grafeno: un viaje alucinante

Madrid

07/06/2024

Instituto de Ciencia de Materiales (ICMM-CSIC), Madrid, Spain

Daniel Granados

10 years of nanofabrication at the CEI UAM+CSIC: History and resources of the NanoFabLab

14/06/2024

Engineering Health Seminar Series 2024, Lund University's Biomedicinskt centrum (BMC)

Isabel Rodriguez

Recapitulation of the Solid Stress in Tumours Through Tumor-on-a-Chip Devices for Nanomedicine Delivery

20/06/2024

Milagros Castellanos

Nanobiosystems for Health Challenges in Diagnosis and Treatment

UAX, Madrid

25/06/2024

Thomas Hermans participa en el Encuentro de los beneficiarios del programa ATRAE con Diana Morant, Ministra de Ciencia e Innovación, en el Jardín Botánico de Madrid.



26/06/2024

Nanobiosystems for Health Challenges in Diagnosis and Treatment

Milagros Castellanos

ISCIII, Madrid

02/07/2024

Seminar at GREYC Laboratory

Paolo Perna

Towards a deeper understanding of the role of doping in perovskite-based AMR sensors

Caen

09/07/2024

Cutting-edge Nanotechnologies for Good Health and Well-being, Chulalongkorn University (Thailand)

Isabel Rodriguez

Nanomedicine at IMDEA Nanoscience: Cancer Therapies and Tumor on a Chip

24/07/2024

Curso de Verano UCM 'Siliconomy'

Daniel Granados

More than Moore



02/08/2024

Invited Institute Seminar

Johannes Gierschner

Scientific Misconduct in Current Materials Research: Aspects, Conditions and Perspectives

Donostia International Physics Center, San Sebastian

15/08/2024

Ciclo de Seminarios del Instituto de Nanosistemas, Buenos Aires, Argentina

Sebastián Thompson

Nanotermómetros fluorescentes: una herramienta innovadora para la medición precisa de la temperatura intracelular

04/09/2024

Invited seminar

Ismael Plaza G.A. Borja Ibarra

In singulo characterization of the real time kinetics of the human mitochondrial DNA replisome

Leipzig

05/09/2024

Acto de reconocimiento de las acreditaciones de Severo Ochoa y María de Maeztu, en

Rodolfo Miranda

Caixa Forum Madrid

19/09/2024

CiQUS (Centro Singular de Investigación en Química Biolóxica e Materiais Moleculares) lecture

Thomas Hermans

Life-like artificial materials powered by chemical fuels or light

Santiago de Compostela

24/09/2024

Día Mundial de Investigación en Cáncer, evento organizado por la Asociación Española Contra el Cáncer en las Las Cuatro Torres Business Area (Madrid)

Sebastian Thompson



25/09/2024

China-Spain Science meeting; Technology Cooperation Day, Universidad de Zaragoza

Nazario Martín León

Molecular nanographenes the search for enantioselectivity

07/10/2024

Premios De Ciencia En Español, otorgados por la Comunidad de Madrid

Rodolfo Miranda

10/10/2024

Alternative Theory Seminar

Fernando Martín García

Attochemistry: chemistry at the attosecond time scale
Instituto de Ciencia de Materiales (ICMM-CSIC), Madrid

17/10/2024

Cazacracks, la feria de oferta formativa en torno al videojuego del Ayuntamiento de Madrid, en Pabellón de Convenciones de la Casa de Campo, Madrid

Elena Alonso

'Nanocar Racing', un ejemplo pionero de divulgación científica con videojuegos



18/10/2024

Acto de entrega de los Premios a las Mejores Tesis Doctorales defendidas en 2023, en IMDEA Nanociencia

Rodolfo Miranda

18/10/2024

Charla durante la Entrega Premios a las Mejores Tesis Doctorales defendidas en 2023 GENAM

Manuela Garnica

Scanning probe characterization of 2D Materials

28/10/2024

Charla "Magnetízate" para la iniciativa AloveCiencia en Alovera

José Luis F. Cuñado

30/10/2024

Sesión en la Real Academia de Doctores de España

Nazario Martín León

20 Años de Grafeno: ¿Se están cumpliendo las expectativas?

06/11/2024

Homenaje al Profesor Miguel Ángel Alario y Franco en la UCM

Rodolfo Miranda

23/11/2024

Jornadas de Divulgación Innovadora, Etopia, Zaragoza

Elena Alonso

Microcharla “Nanocar Racing’, un ejemplo pionero de divulgación científica con videojuegos”, y actividad “Nanocar Race, la carrera más pequeña del mundo”.



29/10/2024

Semana de la Ciencia en Torrelaguna

Fernando Martín García

Ciencia de Atosegundos

Torrelaguna

10/11/2024

Student Seminar, Institute for Physical and Theoretical Chemistry, University of Tübingen

Johannes Gierschner

Seminar: Scientific Integrity Decline in Current Materials Research: Insights & Vistas beneath the Tip of the Iceberg

Tübingen

18/11/2024

Invited Talk

Valle Palomo

USC

Santiago de Compostela

19/11/2024

Invited Seminar Rutgers University

Ismael Plaza G.A. Borja Ibarra

Characterization of the real-time kinetics of the human mitochondrial DNA replicative helicase (Twinkle)

Online

21/11/2024

Molecular Spectroscopy Department (M. Bonn), Max Planck Institute Mainz

Johannes Gierschner

Bright or Dark - Regulation of Radiative vs. Nonradiative Processes in Novel Organic Materials

Mainz

02/12/2024

INTA

Jose Sanchez Costa

Switchable spin crossover material for passive control of temperature fluctuations in buildings

Madrid

04/12/2024

Jornada del Instituto de investigación en Química de la Universidad de La Rioja (IQUR)

Nazario Martín León

Molecular Nanographenes: The Search for Enantioselectivity



INNOVATION FORUMS

18/01/2024

Science for Industry fair, Madrid, Spain

Participants: Mercedes Hernández, Daniel Granados, Emilio Pérez, Isabel Rodríguez, Jaime Hernández.

20/03/2024

Feria Transfiere, Málaga

Mercedes Hernández



Transfiere
14th European Meeting on Science, Technology and Innovation

Málaga
12 - 14 Mar
2025

29/05/2024

Asistencia a la Asamblea General Anual de la European Semiconductor Regions Alliance (ESRA) en nombre del Clúster de Semiconductores de Madrid, Dresden, Germany

Daniel Granados

06/06/2024

South Summit, La Nave, Madrid

Rodolfo Miranda

Mesa redonda sobre 'Experiencias en transferencia de tecnología en el sector científico', en el stand de Comunidad de Madrid



08/07/2024

Spain-Thailand Innovation Forum: Harnessing the potential of nanotechnology for Future Health, Personalized Medicine and Wellbeing, Bangkok, Thailand.

Isabel Rodríguez



7.2. Exhibitions

16/01/2024

Visita del Consejo de Educación, Universidades e Innovación de la Comunidad de Madrid a IMDEA Nanociencia

01/02/2024

Semana de la Ciencia en el Colegio Virgen de los Remedios, Colmenar Viejo

Victor Vega Mayoral, Andres Burgos Caminal, Sebastián Mesa Apestegui

01/03/2024

Visita Escuela IDEO

Valle Palomo

18/03/2024

Visita a IMDEA Nanociencia de Emilio Viciano, Consejero de Educación, Ciencia y Universidades, Rocío Albert, consejera de Economía, Hacienda y Empleo de la Comunidad de Madrid, Mercedes Caballero, secretaria general de Fondos Europeos de la delegación de la Comisión Europea en Madrid



7-9/03/2024

Feria Madrid Es Ciencia

Joint stand of IMDEA institutes at IFEMA (Madrid)

Participants: Victor Vega, Juan Cabanillas, Enrique Cánovas, Marco Ballabio, Gorka Salas, David Écija, Ana Barragán, Elena Pérez, Valle Palomo, Koen Lauwaet, José Sanchez Costa, Esther Resines, María Tenorio, Alba García, Noelia Rodríguez, Mariela Menghini, Sofia Oliveira, Daniel Granados, Ana Pizarro, Sebastian Thompson.



27/05/2024

VIII Concurso Tesis en Tres Minutos UAM

Julia García Pérez

31/05/2024

Nanoscience fair: 15 years of outreach

IMDEA Nanociencia

Organiser: Patricia López, Marije Villa (Research Support Office)



03/06/2024

Visita del Estado Mayor de la Defensa

21/06/2024

Anne L'Huillier, Nobel Prize in Physics 2023, visits IMDEA Nanociencia



11/07/2024

Tour to the IMDEA Nanociencia labs during NEXT annual meeting for the network fellows

Participants: Emilio Pérez, Sofia Oliveira, Lenka Cerna, Milagros Castellanos



NANOCIENCIA PARA TODOS

We believe that one of our duties is to contribute to the creation of links between Science and Society in our region. For this purpose, through this programme, Nanociencia para Todos, we showcase the Nanoscience directly from our labs.

16/02/2024

Visita del alumnado de 1º de Ed. Primaria del Colegio Príncipe de Asturias

Participants: Ana Pizarro, Alejandro Martín, Rebeca Paris, Isabel Rodríguez, Fabián Calleja, Mario Martínez, Tania Marugán, Marina Garrido

09/04/2024

Festival 10alamos9. Visita del alumnado del colegio Sagrado Corazón (1º y 2º bachillerato) y Fontenebros School (1º bachillerato), 58 estudiantes.

Participants: Ana Pizarro, Valle Palomo, José Ángel Silva, Sofía Oliveira, Marina Garrido, Carmen García, Mónica Dhanjani, Lucía Pardinas, Ana Rodríguez, Catarina Leis, Alejandro Martín

09/04/2024

Visita de estudiantes Universidad Autónoma de Madrid

Organiser: Roberto Otero

09/04/2024

Festival 10alamos9. Visita del Colegio Sagrado Corazón (1º y 2º bachillerato) y Fontenebros School (1º bachillerato)

Participants: Ana Pizarro, Valle Palomo, José Ángel Silva, Sofía Oliveira, Marina Garrido, Carmen García, Mónica Dhanjani, Lucía Pardinas, Ana Rodríguez, Catarina Leis, Alejandro Martín

17/04/2024

Visita del alumnado de la Universidad Sant Louis (20 estudiantes).

Organiser: Emilio M. Pérez

20/05/2024

Visita de los alumnos y familias del colegio Virgen del Rosario (Soto, Madrid)

Participants: Rodolfo Miranda, Emilio Pérez, Jaime Hernández, Mario Martínez, Vanessa Rodríguez, Alberto Martín, Catarina Leis, Alejandro Martín, José Luis Casillas, Marije Villa, Laura Ortega, Laura Lorente, Álvaro Somoza, Miguel Varea

25/11/2024

Día de puertas abiertas para el alumnado de la asignatura Nanoelectrónica y Nanofotónica del Grado de Física de la Universidad Carlos III de Madrid

Participants: Enrique Cánovas, Allan Johnson, Marco Ballabio, Noelia Rodríguez

27/11/2024

Visita del alumnado de la Universidad Sant Louis (30 estudiantes).

Participants: Emilio Pérez, Manuela Garnica, Fabián Calleja, Clara Rebanal, Zulay Pardo, Fernando Jiménez, Manuel Rodríguez, Dwight Bruzon.

INTERNATIONAL DAY OF WOMEN AND GIRLS IN SCIENCE



09/02/2024

Taller de nanociencia –grafeno y nanopartículas– con el alumnado de 1º de Educación Infantil en el Colegio Príncipe de Asturias.

Manuela Garnica, Ana Pizarro, Catarina Leis, Alejandro Martín, Vanesa Rodríguez, Ainhoa González, María Tenorio, Elena Pérez, Laura Ortega, Elena Alonso



16/02/2024

Taller de experimentos: partículas fluorescentes, grafeno, STM, superficies nanoestructuradas, ferrofluido para el alumnado de 2º de Ed. Primaria del colegio Príncipe de Asturias en IMDEA Nanociencia.

Participants: Ana Pizarro, Alejandro Martín, Rebeca Paris, Isabel Rodríguez, Fabián Calleja, Mario Martínez, Tania Marugán, Marina Garrido.

08/02/2024

Sara Hernández

IES Gabriel García Márquez (Madrid)

09/02/2024

Sara Hernández

Charla con motivo del 11F

Instituto Santa María de Vedruna (Madrid)

13/02/2024

Thomas Hermans

Taller de experimentos: tónica fluorescente, helado de nitrógeno líquido e inflado de globos con hielo seco

14/02/2024

Marina Garrido

Charla con motivo del 11F

Colegio Rural Agrupado Campos Castellanos (Segovia)

15/02/2024

Julia García

Charla con motivo del 11F*Colegio Cardenal Spinola*

16/02/2024

Valle Palomo

Charla con motivo del 11F*Colegio Mirasierra*

NANOCIENCIA TO-GO

Nanociencia to-go is an initiative to bring Nanoscience and Nanotechnology to an older generation of students. After a visit to our facilities, we carry out some simple nanoscience experiments together. They are then able to carry the experiments with them to pass on to their families what they have learned.

11/04/2024

Visita del alumnado de la Universidad de Mayores de la Universidad Autónoma de Madrid, Cursos Avanzados (50 estudiantes).

Participantes: Juan Cabanillas, Fabián Calleja, Manuela Garnica, Alejandro Martín, Catarina Leis, Saül García, Cristina Carrizo

25/04/2024

Visita del alumnado de la Universidad de Mayores de la Universidad Autónoma de Madrid (39 estudiantes).

Participantes: Ana Pizarro, Fabián Calleja, Milagros Castellanos, Pierre Pantaleón

10/05/2024

Visita del alumnado de la Universidad Complutense de Madrid - Universidad de Mayores (58 estudiantes).

Participantes: Lucas Pérez, Juan Cabanillas, Gorka Salas, Isabel Rodríguez, Ramón Bernardo, Álvaro Somoza, Valle Palomo

Charlas interactivas aloveCIENCIA

Alovera, Spain

Participantes: José LF Cuñado, Sebastian Thompson, Cristina Flors, Milagros Castellanos, Rebeca Bocanegra

14/02/2024

Observación del Sol con un telescopio refractor

José Luis F. Cuñado

29/02/2024

“Ven a explorar la nanoescala”

Cristina Flors

28/10/2024

“Magnetizate”

José Luis F. Cuñado

EUROPEAN RESEARCHERS' NIGHT

27/09/2024

En IMDEA Nanociencia

Visita del alumnado de los centros educativos Marqués de Santillana (Colmenar Viejo), Alameda de Osuna, Colegio Virgen de Europa (Madrid), 105 estudiantes.

Participantes: Rocío Mesa, Alejandro García, Eider Abarrategui, Andrés Burgos, Elisa Collet, Marion Le Meur, Jesús Alejandro Bueso, Carmen Pérez, Valle Palomo, Alex Blokuis, Dwight Bruzon, Thomas Hermans, Gloria Tobajas, Natalia Martín, Emilio Pérez, Alvaro Castells, Patricia Pedraz, Carmen García, Fernando Martín, Juan Reino, Fabián Calleja, Manuela Garnica, Ana Barragán, Elena Pérez, Saul Orrit, Víctor Vega



Institutos IMDEA.

La ciencia que ayuda al planeta (I) en la Residencia de estudiantes Sebastian Thompson
La investigación a escena en CaixaForum Madrid

Microcharla de Sara Mejías, Asier García, Teresa Espinosa.





SEMANA DE LA CIENCIA

07/11/2024

Competición Nanocar Race 'Copa Antraceno' - 2024

Visita del alumnado de bachillerato de los centros educativos Areteia, Luis García Berlanga (Vicálvaro) y San Isidro (74 estudiantes).

Participantes: Sebastián Thompson, Fabián Calleja, Manuela Garnica, Zulay Pardo, Cristina Arenas, Miguel Ángel Valbuena, Elena Pérez, David Écija, Manuel Rodríguez, Fernando Jiménez, Jaime Hernández, Rocío Mesa, Alejandro García, Isabel Rodríguez, Noelia Rodríguez

13/11/2024

Visita del alumnado de 4º de Primaria de los colegios Blas de Otero (Coslada) y Príncipe de Asturias (96 estudiantes).

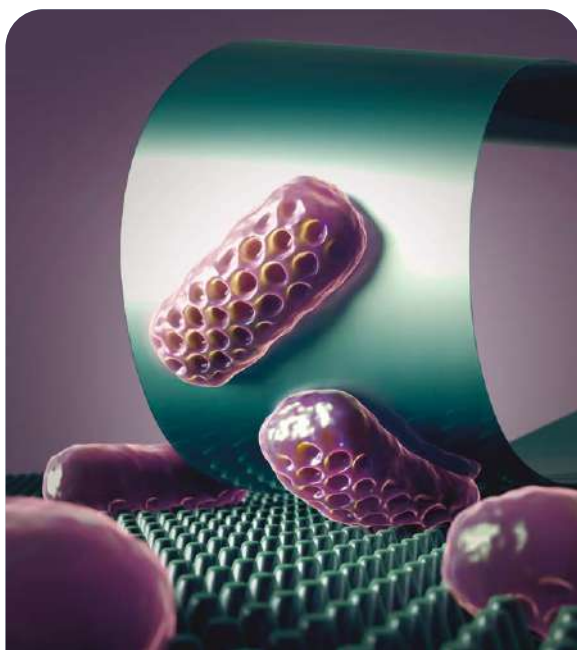


4 ESO+EMPRESA

The programme 4ESO+Empresa from Comunidad de Madrid brings closer the educational system and the professional world through supervised internships.

In the 2024 edition, IMDEA Nanociencia has hosted 8 students from the schools Fortuny, Francisco Ayala, Ramiro de Maeztu and Colegio Vallmont.

Supervisors: Valle Palomo, Ana Pizarro, Fabián Calleja, Manuela Garnica, Teresa González and Edmund Leary.



7.3. Popular articles in magazines

19/02/2024

Revista Española de Física de la RSEF, vol. 37 no. 4 sección Puntos de Interés: "La molécula C90: el nanotubo de carbono más pequeño"

Revista Española de Física de la RSEF, vol. 37 no. 4 sección Puntos de Interés: "Una única expresión analítica para explicar los moirés 1D en grafeno"

04/03/2024

Ballistic transport in long molecular wires: Porphyrin nanoribbons

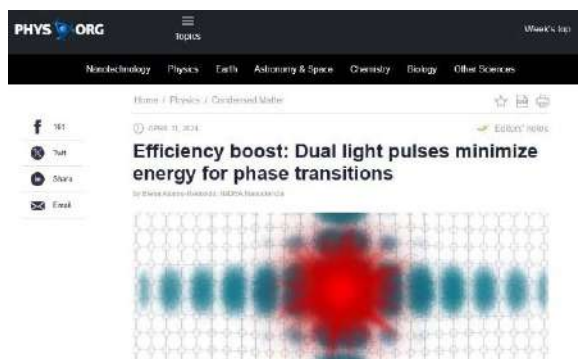


03/04/2024

Advanced microscopy technique visualizes bactericidal effect on hydrogel patches in real time



11/04/2024

Efficiency boost: dual light pulses minimize energy for phase transitions


28/05/2024

"Superfast science wins Nobel Prize"

Fernando Martín



01/07/2024

A combination of magnetic nanoparticles and chemotherapy drugs achieves greater efficacy against cancer cells


01/07/2024

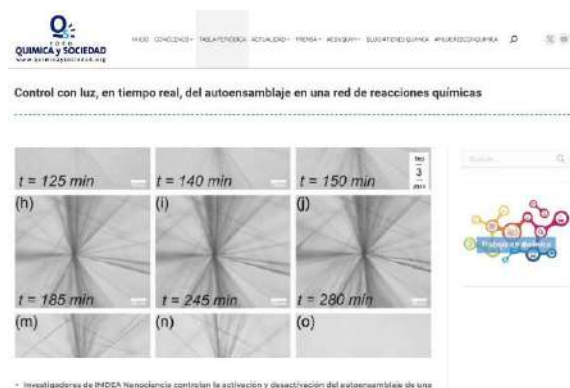
"Evolution of superconductivity in twisted graphene multilayers"
Pierre Pantaleón

22/07/2024

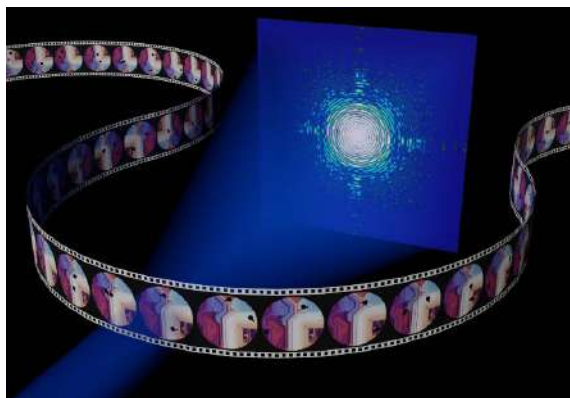
Ultra-low threshold lasing in organic polymer blend microspheres with the highest Q factor

Revista Española de Física de la RSEF, vol. 38 no. 3 sección Puntos de Interés: "Emisión láser de umbral ultra bajo en microesferas orgánicas con el factor de calidad más alto reportado hasta el momento"

02/09/2024

Real-time control over a chemical reaction network by light


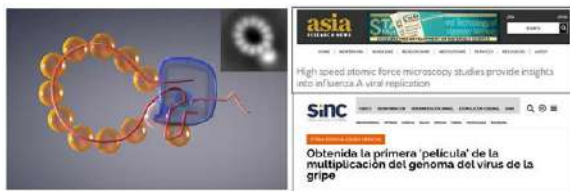
04/09/2024

New method captures the stochastic dynamics in coherent X-ray imaging at the nanoscale




11/09/2024

Researchers record the first “film” of the multiplication of the influenza A virus genome



25/09/2024

Ultra-high speed camera for molecules: attosecond spectroscopy captures the electron transfer dynamics in organic molecules
Revista Española de Física de la RSEF, sección Puntos de Interés: “Una cámara de ultra-alta velocidad para moléculas”



30/09/2024

Plastics are stronger and lighter thanks to carbon nanotubes derivatives



16/10/2024

A novel chemical reaction on a surface enables the emergence of solitons in pi-conjugated polymers



05/11/2024

Researchers analyze the picoantenna-like directional behaviour of tunnel junctions formed by surface defects at the atomic scale



07/11/2024

A new mechanism controlling resistive switching in Mott materials discovered

15/11/2024

Electron delocalization in a 2D Mott insulator



24/11/2024

El laboratorio de Álvaro Somoza en el artículo 'Las caras detrás de la investigación del cáncer en Madrid' de La Razón



10/12/2024

Resilient chiral spin textures in graphene explained



Resilient chiral spin textures in graphene explained

Posted By *Graphene Council*, Monday, December 16, 2024.



• Researchers designed a large experiment involving two synchrotrons to find evidence of the origin of strong spin-orbit coupling induced in graphene.
• The effect is greater than previously thought and its understanding paves the way to design new memory devices.

Conventional electronics are based on controlling the tiny electrical charge of electrons flowing through electronic circuits. Spintronics, on the other hand, is an emerging technology that incorporates another of the properties of electrons as a variable: spin. Spin angular momentum is a quantum-mechanical property that is already being harnessed to try to create faster and more efficient information flows. In the same way that traditional electronics uses charging to represent information as zeros and ones, the two spin states (up and down) can be used to represent the same binary data in spintronics.



7.4. Appearances in media: TV, radio, newspapers

29/02/2024

Nazario Martín y Fernando Martín en la SER RadioClubTenerife CIENCIA “Explorando la materia en la escala de las trillonésimas de segundo”

21/02/2024

Carmen García protagoniza el vídeo para el concurso ‘Pioneras en 60 segundos’ organizado por Cultura Inquieta



04/04/2024

Vídeo y entrevista para el canal “QuantumFracture” de Youtube ‘Hemos Ganado la Carrera Más Pequeña del Mundo’ (262K views)



13/07/2024

Fernando Martín, ‘La física de attosegundos’ para el programa Principio de Incertidumbre de Canal Extremadura Radio.

11/12/2024

Entrevista a Daniel Granados para el canal de Youtube ‘Chips & Tips’
- Los semiconductores: un arma de geopolítica - CITT



08/04/2024

Entrevista a Isabel Rodríguez para el artículo "Ciencia y tecnología a escala atómica y molecular" de la Revista Alfa n 57 del Consejo de Seguridad Nuclear.

explica María Ujae González, científica titular en el Instituto de Mxco y Nanotecnología (IMN-CNM, CSIC). En su laboratorio tienen equipos de litografía EBL, por haz de electrones, que sirve para "grabar" una huella de electrones sobre una superficie sensible a los electrones, y así definir aplicaciones para posteriores ataques o deposiciones de materiales y formar estructuras de tamaño nanométrico. Y también FEM, equipo de litografía por haz de iones, "donde se graban directamente motivos de tamaño micrómetro, en torno a los 7 nanómetros, sobre el material que queremos".

Los átomos también se pueden alterar con reacciones químicas, creando oxidaciones y generando poros de tamaño nanométrico que luego se rellenan con otro material; por ejemplo, aluminio. También hay técnicas para evaporar parte de los átomos y luego depositar otros sobre donde hacer con otro rollo.

En IMDEA Nanociencia, Isabel Rodríguez dirige el Grupo de Superficies Nanoestructuradas, donde trabajan en el desarrollo de materiales micro y nanoestructurados con funcionalidades nuevas o mejoradas, utilizando las tecnologías de nanofabricación. Utilizan litografía de nanolitografía (NIL) para crear nuevos dispositivos o dotar a materiales de nuevas propiedades.

También en las vacunas contra la COVID-19, "ELARN" que se utiliza para los anticuerpos se encapsula en nanopartículas de lípidos para que pueda llegar protegido a donde está la infección, penetrando en nuestro cuerpo", explica González. del IMN-CNM. La litografía de nanolitografía (NIL) para crear nuevos dispositivos o dotar a materiales de nuevas propiedades.

Isabel Rodríguez.

30/07/2024

Entrevista a Ana Pizarro para la revista Enlace del Colegio de Químicos de Madrid, n48 junio 2024

06/08/2024

"Electronic Bands Get a New Tuning Knob", article in the APS Physics Magazine featuring the publication by F. Guinea et al. Phys. Rev. Lett. 133, 066302.

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SYNOPSIS

Electronic Bands Get a New Tuning Knob

August 6, 2024 • Physics 17, 392

Researchers have used a specially crafted electric potential to manipulate the electronic band structure of graphene, laying the groundwork for on-demand electronic band design.

10/08/2024

Rodolfo Miranda es entrevistado para el reportaje 'ITALKERS TIC: Hablan los especialistas en Tecnologías de Información y Comunicación'

14/08/2024

Thomas Hermans es entrevistado para un reportaje para Telediario 21h RTVE como beneficiario del programa ATRAE.

Thomas Hermans
INVESTIGADOR PRINCIPAL DEL INSTITUTO IMDEA NANOCIENCIA
España, ¿un país para la ciencia?

08/09/2024

Entrevista a Daniel Granados para el artículo "A la búsqueda del tiempo perdido en microelectrónica" del semanal ABC Empresa

18/10/2024

Entrevista a Emilio Pérez para el artículo "Nanotubos de carbono, el segundo asalto de la revolución de las pequeñas cosas" del semanal ABC Empresa

TRASVASE: Del laboratorio al mercado

Nanotubos de carbono, el segundo asalto de la revolución de las pequeñas cosas

Las investigaciones para que este supermaterial descuberto hace ya más de tres décadas comience a impactar a fondo en la nueva economía se aceleran

ALBERTO VILA AGUIRRE

A pesar de su pequeña tamaño, los nanotubos de carbono tienen ya un impacto global. Probablemente los llamamos en el futuro, como parte imprescindible en las tarjetas del móvil, o viajeros gracias a ellos en un vehículo eléctrico. El doctor Juan José Villate, investigador principal y líder del grupo de Nanotecnología y Materiales en el Instituto IMDEA Nanociencia, explica la importancia de este material.

EN MARCHA

Industria. Materiales. Colabora con la red internacional de centros de investigación para tener y comprender Carbono Black, que permite aumentar la capacidad de producción a escala de dispositivos. La compañía italiana Villate tiene experiencia en esta tecnología para reducir emisiones de gas invernadero en un sector global en un horizonte de años, con proyectos como



Futuro, sobre el terreno. IMDEA, como en los casos de Nanociencia (a la izquierda) y Materiales (a la derecha), ocupan diversos experimentos sobre las posibilidades de aplicación de los nanotubos de carbono en muy distintos sectores.

novel, la construcción, aunque en la fabricación de cables. Por ejemplo, si se utilizan nanotubos con nanotubos en la construcción de un puente, se podría reducir su peso total, lo que no solo disminuiría el consumo de combustible, controlaría su vida útil y su mantenimiento.

En todo caso, la aplicación industrial aún es incierta, como ejemplo como el de la medicina, que requiere la puesta a punto de la potencia eléctrica y térmica, mayor resistencia al fuego y resistencia a la fatiga. Prescindir de la mejora de una mayor aplicación empresarial industrial en España, con muchas referencias internacionales como las multinacionales (Intel) o

22/10/2024

La Comunidad de Madrid creará una red pionera de salas limpias para la fabricación de chips



7.5. Digital communication

IMDEA Nanociencia in social media

 @imdea_nano	4.813 followers
 @imdeananociencia.bsky.social	407 followers
 @imdeananociencia @mastodon.social	98 posts
 @imdeananociencia	1.342 followers
 @imdeananociencia	1.100 followers
 @IMDEAnano	408 subscribers
 @imdeananociencia	+2.000 views
 /imdea-nanociencia	4.000 followers

Websites

IDEAL Fellowships Programme

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



TOMATTO

<https://tomatto.eu/>



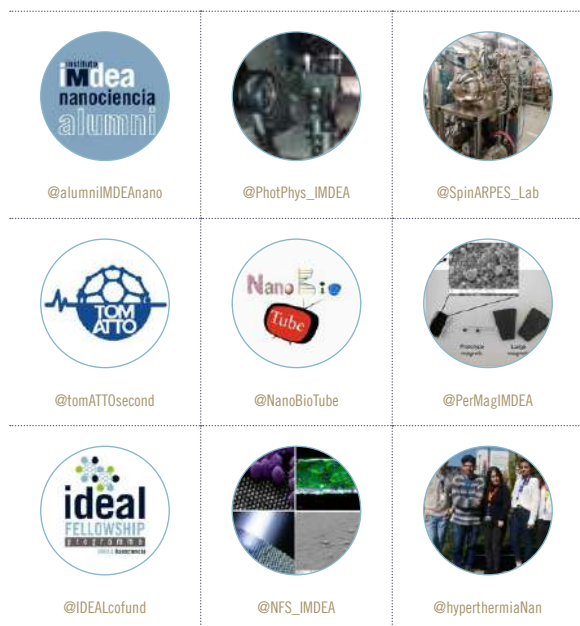
Next

<https://ca-next.eu/>





IMDEA projects and groups X accounts



Newsletter

Issues 43-53



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.



7.6. Printed media

Bookmarks

A collection of 21 different bookmarks featuring recent research works from IMDEA Nanociencia researchers.



Small is different

Roll up and leaflets for school visits



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



nano
ciencia
= to GO
listo para experimentar

nano
ciencia
entretenida

nano
ciencia
para contar

PROYECTO
**NANOCIENCIA
ABIERTA**



TALENT ATTRACTION

- Support IMDEA Nanociencia's position as an international reference centre in order to **attract international talent**.
- Development of international talent **recruitment and selection** strategies.
- **Talent retention** through training and career development plans.



RESEARCH SUPPORT

- Encourage and facilitate the participation in different **funding opportunities**.
- Support in the **preparation of competitive proposals** and cross-cutting skills.
- Maximise the capacity for **innovation and exploitation of results** in IMDEA Nanociencia's scientific programmes.



OPEN SCIENCE

- Contribute to creating **links between science and society** through excellent science communication and outreach.
- Disseminate to all sectors of society, including the elderly, combining **science and entertainment**.
- Upgrade the technological capacity of the **digital archive** and promote the use of alternative metrics.



9. High-quality research infrastructure

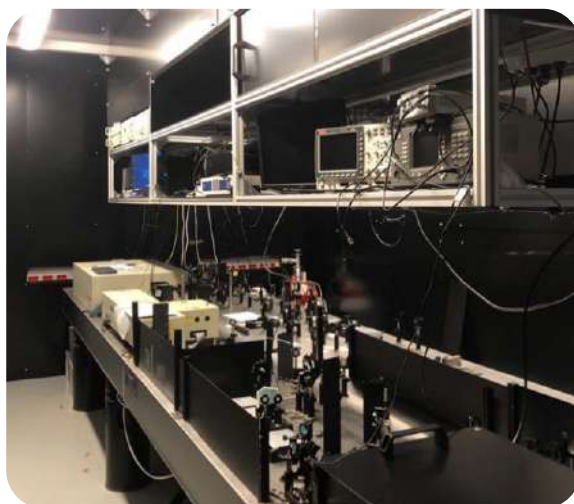
1. Existing infrastructure

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.
- Advanced Optical Characterization Lab.
- Atomic Force Microscopy Lab.



2. New singular infrastructure

Correlative Tweezers-Fluorescence Microscope

A C-Trap device (Correlative Tweezers-Fluorescence Microscope) from Lumicks® has been installed in the Molecular Motors Manipulation Lab at IMDEA Nanociencia. This system integrates high-resolution optical tweezers with an advanced microfluidics platform in a fully correlated setup, enabling real-time manipulation of individual molecules.

The optical tweezers allow for the precise handling of biomolecules with sub-nanometer resolution and can exert and measure forces with sub-picoNewton sensitivity. Meanwhile, the multi-channel laminar flow microfluidics system enables the controlled introduction of reagents into the flow cell and supports the in-situ assembly of a wide range of complex, multi-step single-molecule assays.

The C-Trap system is also being combined with tip-enhanced Raman spectroscopy (TERS), a near-field technique that merges Raman spectroscopy with scanning probe microscopy. TERS provides chemical characterization with single-molecule sensitivity and spatial resolution down to a few nanometers. Since Raman spectroscopy is sensitive to molecular species, as well as to inter- and intramolecular interactions and orientations, combining optical tweezers with TERS will allow us to investigate the physicochemical mechanisms that trigger specific shuttling events in molecular motors and other supramolecular systems.





X-RAY Microscopy

During 2024, a **Nikon Metrology XTV160 X-ray inspection and computed tomography system** was installed in the X-Ray Laboratory at IMDEA Nanociencia. This system is a key instrument for the successful execution of the WaSP project and other ongoing projects where non-destructive X-ray microscopy plays a critical role.

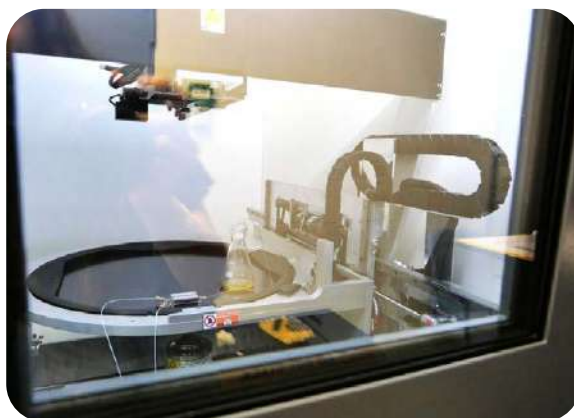
The XTV160's technology enables the acquisition of 2D images (radiography) and 3D reconstructions (Computed Tomography, micro-CT) with **spatial resolutions on the order of a few microns**. This high-resolution internal imaging capability, combined with exceptionally high contrast, is essential for analysing the complex composition of devices fabricated at the institute. These devices often include layers of materials with widely varying densities, such as glass, quartz, and heavy metals like gold, platinum, and tungsten, as well as functional nanomaterials up to 200 μm thick, all of which are opaque to optical microscopy.

At the core of the XTV160 system is its **transmission-type microfocus X-ray source**, capable of operating up to 160 kV. This acceleration voltage provides the necessary power to penetrate high-density materials, while the micron-scale focal spot size is what enables the high resolution. The source features outstanding stability, supported by an integrated solid-state power supply and a **patented filament control technology (European patent EP3948918)**. This system dynamically adjusts the tungsten filament's operating point to compensate for natural erosion, thereby maintaining a constant and stable photon flux. This not only extends the filament's life-time but is also critical for acquiring artifact-free projections during long tomography scans and for producing high-quality video-rate 2D radioscopy.

A distinctive feature, fundamental for research at IMDEA Nanociencia, is its **high-precision manipulator that tilts the source-detector assembly around the sample**, which remains stationary in its vertical orientation. This configuration is critical for the *in-operando* study of fluidic devices, as it allows for acquiring angular views for 3D reconstruction without altering gravitational-dependent phenomena such as flows, interfaces, or particle sedimentation.

Additionally, the equipment includes a **high-sensitivity, large-area Flat Panel Detector (FPD)**. This type of detector is capable of real-time imaging (up to 30 frames per second) with excellent contrast and dynamic range. The high efficiency of the detector reduces the required exposure times, enabling full tomographic scans in shorter periods (i.e., time-resolved or 4D-CT) to study dynamic processes. Furthermore, the spacious, fully shielded X-ray enclosure provides a secure and versatile internal environment for accommodating complex devices with their fluidic and electrical connections and other auxiliary elements required for *in-situ* experiments.

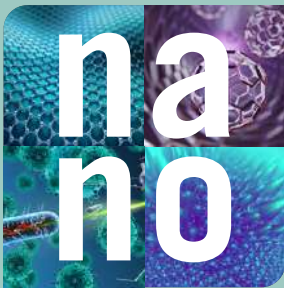
Altogether, the Nikon XTV160 system offers unique non-destructive 3D analysis capabilities and great flexibility, enabling **morphological visualization, porosity and defect analysis, and dimensional metrology** of internal components. This provides critical support for advanced research in device fabrication, nanomaterials characterization, and numerous additional scientific projects within IMDEA Nanociencia.



4

research highlights

annual
report **2024**





GLOBAL RECOGNITION

Severo Ochoa (SO) Centre of Excellence 2022-2025

In July 2021 IMDEA Nanociencia was once again awarded the Severo Ochoa (SO) Centre of Excellence accreditation by the Spanish State Agency of Research (Agencia Estatal de Investigación; AEI). The Institute will receive € 1M/year for the period 2022-2025 **to consolidate its position as a reference centre for research, both nationally and internationally**. The strategic vision of the SO programme is to continue strengthening the interdisciplinary character of the Institute, boosting the synergies of the research programmes. Additionally, we will continue the successful strategy of interaction with industry, based on a model that identifies the strategic needs of companies and selects problems that contain both enough basic science to inspire our researchers and tactical interest for the company.

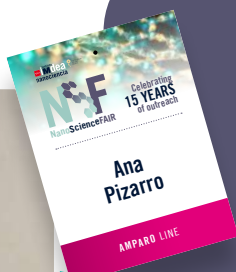
Through this we aim to tackle, using nanoscience and nanotechnology, specific societal challenges addressed by the EU in the Horizon Europe programme. We will reshape and further strengthen four well-established and successful Programmes (P1-P4), implement a new one (P5) to explore phenomena at the nanoscale in the ultrashort time regime (going down to attoseconds), and give a new emphasis to another (P6) on critical raw materials and sustainability, which is of utmost practical importance in the framework of Horizon Europe, to support the programmes we will evolve to a new Platform for Disruptive Innovation.

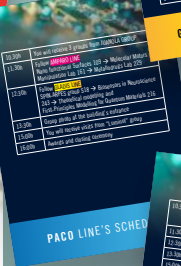
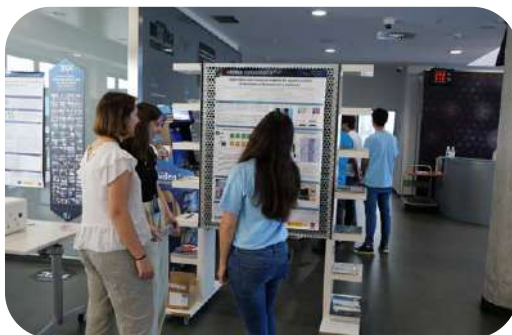
NANOSCIENCE FAIR

15 years of outreach



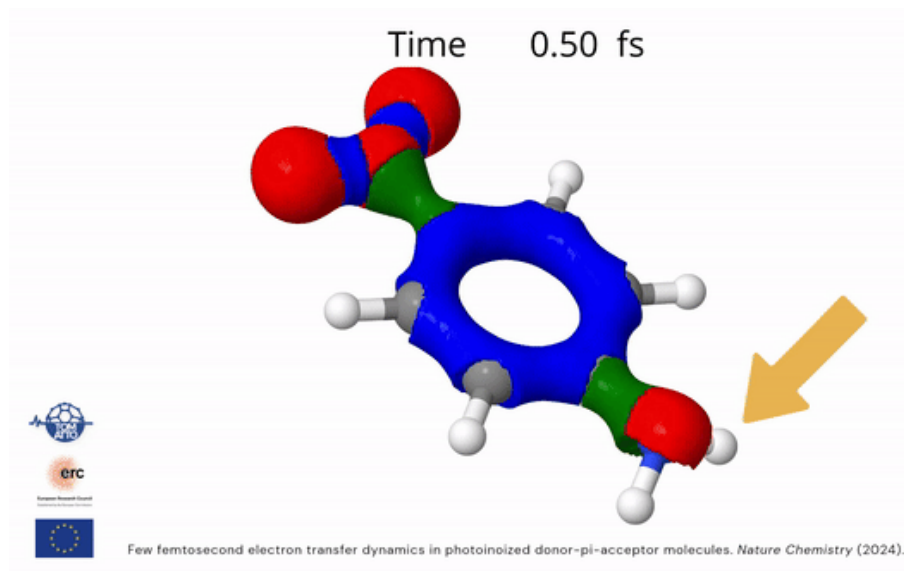
N₂F
NanoScienceFAIR







ULTRA-HIGH SPEED CAMERA FOR MOLECULES: attosecond spectroscopy captures the electron transfer dynamics in organic molecules



The TomATTO consortium, an ERC Synergy project coordinated by IMDEA Nanociencia, led by professors Fernando Martín (IMDEA Nanociencia, Universidad Autónoma de Madrid), Nazario Martín (Universidad Complutense de Madrid) and Mauro Nisoli (Istituto Politécnico de Milán), published their first collaborative work in 2024.

This ground-breaking study was published in *Nature Chemistry*, and unveils new insights into the ultrafast dynamics of molecular systems using attosecond extreme-ultraviolet pulses. This pioneering work offers a fresh perspective on the complex interplay between electrons and nuclei in donor-acceptor molecules, significantly advancing our understanding of chemical processes at the most fundamental level.

In Nature, photosynthesis powers plants and bacteria; within solar panels, photovoltaics transform light into electric energy. These processes are driven by electronic motion and imply charge transfer at the molecular level. The redistribution of electronic density in molecules after they absorb light is an ultrafast phenomenon of great importance involving quantum effects and molecular dynamics. The ability to measure the electron and charge transfer dynamics with extreme temporal resolution not only provides a fundamental understanding of the physical mechanisms behind these processes, but also offers unique insights into how to engineer the chemical and structural properties of the molecules.

Ultrashort ultraviolet pulses from high-order harmonic sources or free electron laser facilities stand as powerful tools for initiating and observing the response of molecules to photoionization, on timescales ranging from the femtosecond (10^{-15} seconds) down to the attosecond (10^{-18} seconds). Despite many advancements, a detailed understanding of the initial steps of electron and charge transfer after prompt photoionization is not yet available.

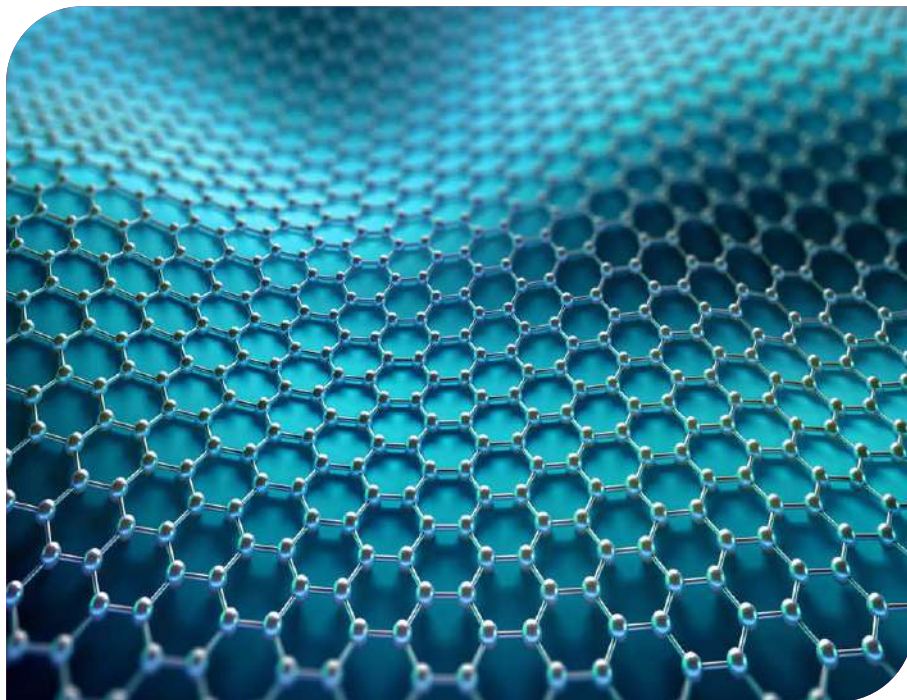
By exposing nitroaniline molecules to attosecond pulses, the team has been able to observe and analyse the earliest stages of charge transfer with unprecedented precision. This study employs a combination of cutting-edge techniques, including attosecond extreme-ultraviolet-pump/few-femtoseconds infrared-probe spectroscopy and advanced many-body quantum chemistry calculations, to capture the dynamics of these rapid processes.

Key findings from the research reveal that electron transfer from the electron donor amino group occurs within less than 10 femtoseconds, driven by a synchronized movement of nuclei and electrons. This is followed by a relaxation process that unfolds over a sub-30-femtosecond timescale. These discoveries offer valuable new insights into how electron-nuclear coupling influences electron donor-acceptor systems in response to photoionization.

This study not only sheds light on the intricacies of molecular dynamics but also sets the stage for future research in the field towards advancements in both theoretical understanding and practical applications of attosecond science.

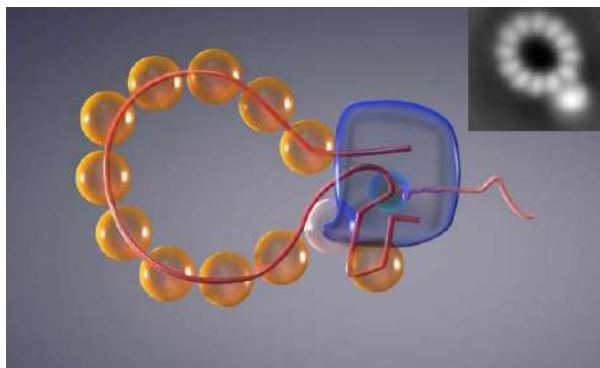
The work has been partially funded by the ERC Synergy Grant TOMATTO (951224); the COST Action ATTOCHEM (CA18222); and the accreditation Excellence Severo Ochoa awarded to IMDEA Nanociencia (CEX2020-001039-S).

Vismarra, F. *et al.* Few-femtosecond electron transfer dynamics in photoionized donor– π –acceptor molecules. *Nat. Chem.* **16**, 2017–2024 (2024). <https://doi.org/10.1038/s41557-024-01620-y>





RESEARCHERS RECORD THE FIRST “FILM” OF THE MULTIPLICATION OF THE INFLUENZA A VIRUS GENOME

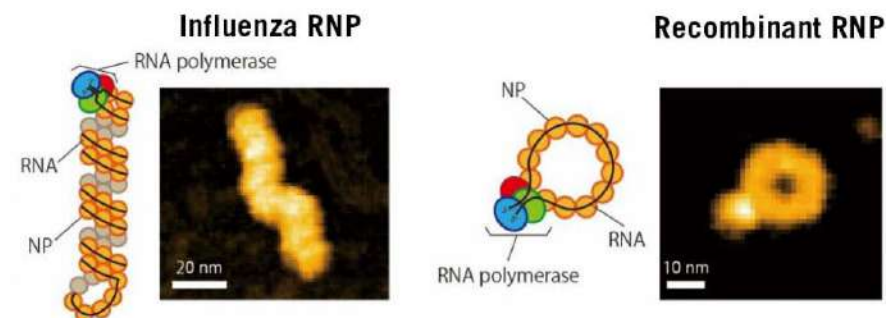


Recombinant genome of influenza A virus, during the transcription process. Credit: Patricia Bondía, Enrique Sahagún (Scixel).

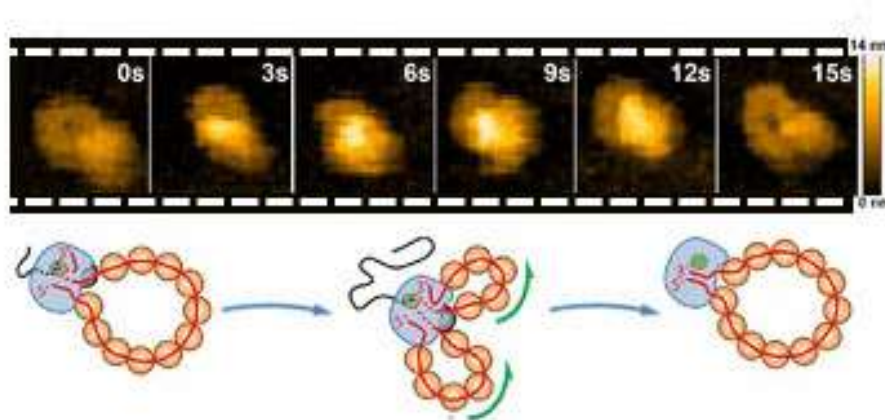
The influenza A virus is a major threat that concerns public health. Understanding how this virus replicates is crucial, especially given that its mutations can give rise to new strains capable of affecting humans. The nucleus of the virus encloses its genetic information, contained in RNA chains – ribonucleic acid – which the polymerase enzyme copies to generate new viruses. RNA strands are covered by proteins that protect RNA from being degraded inside cells. How does polymerase manage to multiply RNA efficiently if it is completely covered by proteins? And besides, how does it manage to copy RNA without decoupling it from the proteins that protect it?

During the process of RNA multiplication, the viral polymerase moves through the RNA structure, synthesizing and copying the structure. The proteins that protect the RNA of the influenza A virus genome are arranged in the form of a compact double helix, masking the position of the polymerase. Thus the polymerase in action cannot be observed and many details of the “copying” process are hidden. To date, it has not been possible to track the movement and activity of the polymerase throughout the genome of the virus.

The “Manipulation of Molecular Motors” research group at IMDEA Nano, led by Borja Ibarra, in collaboration with researchers from NanoLSI (Kanazawa University Japan) and the National Centre for Biotechnology (CNB-CSIC Madrid) have devised a strategy that is key to studying this elusive process in detail.



The researchers were able to analyze the motion of the polymerase in real-time, using high-speed atomic force microscopy. They recorded multiple “live” films of the process which, combined with electron microscopy images, helped them understand and unveil novel information about the molecular processes that govern the amplification of the viral genome. The researchers observed that the polymerase manages to access RNA without separating it from the proteins that protect it. This is essential because it preserves the structure of the genome, which in turn, allows it to multiply continuously. The polymerase is capable of producing multiple copies from the same parent RNA in several rounds, which is a key aspect for viral multiplication.



These nanoscopic “films” allowed the researchers to estimate the rate of RNA synthesis, the speed at which the viral polymerase works. The polymerase is capable of incorporating up to 35 nucleotides in one second. If we equate a nucleotide with a letter, a copyist working at this speed would be able to copy the first part of Don Quixote in just 6 hours (or the first Harry Potter book in 3 hours).

The team of researchers also discovered that nascent RNA, which can restructure and fold, influences the rate at which the polymerase works. The conformation of the nascent RNA therefore functions as a control mechanism that regulates the rate of amplification of the virus and could be a therapeutic target for the development of new antiviral strategies.

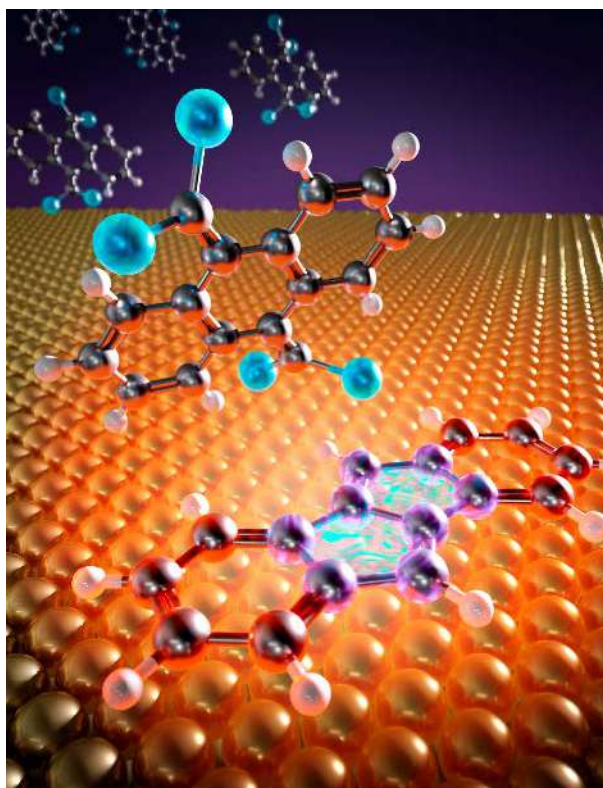
Unlike previous work that studied the isolated polymerase, this finding has been made in the natural environment of the polymerase, inside the genome and surrounded by proteins that it has to deal with and that affect the final amplification rate. The model system of this study provides direct evidence that individual viral proteins can be recycled, and confirms existing theoretical models. The work has been well received by the scientific community and offers a new approach to investigate the mechanisms of viral transcription and replication in other viruses.

This work is partially funded by the Severo Ochoa Seal of Excellence awarded to IMDEA Nano (CEX2020-001039-S).

Conformational dynamics of influenza A virus ribonucleoprotein complexes during RNA synthesis. *ACS Nano*. 18, 19518 (2024). <https://doi.org/10.1021/acsnano.4c01362>



GENERATING ANTIAROMATIC MOIETIES ON SURFACES



Antiaromatic polycyclic conjugated hydrocarbons are interesting materials because their unique structural, electronic and magnetic properties with prospects in molecular optoelectronics. Antiaromaticity is a chemical property of a cyclic molecule with an electron system that has higher energy, hence the molecule is less stable due to the presence of delocalised electrons in it, as opposed to aromaticity. Unlike aromatic compounds, the synthesis of antiaromatic compounds is demanding because of their high reactivity, thus proving the synthesis of these special materials very challenging.

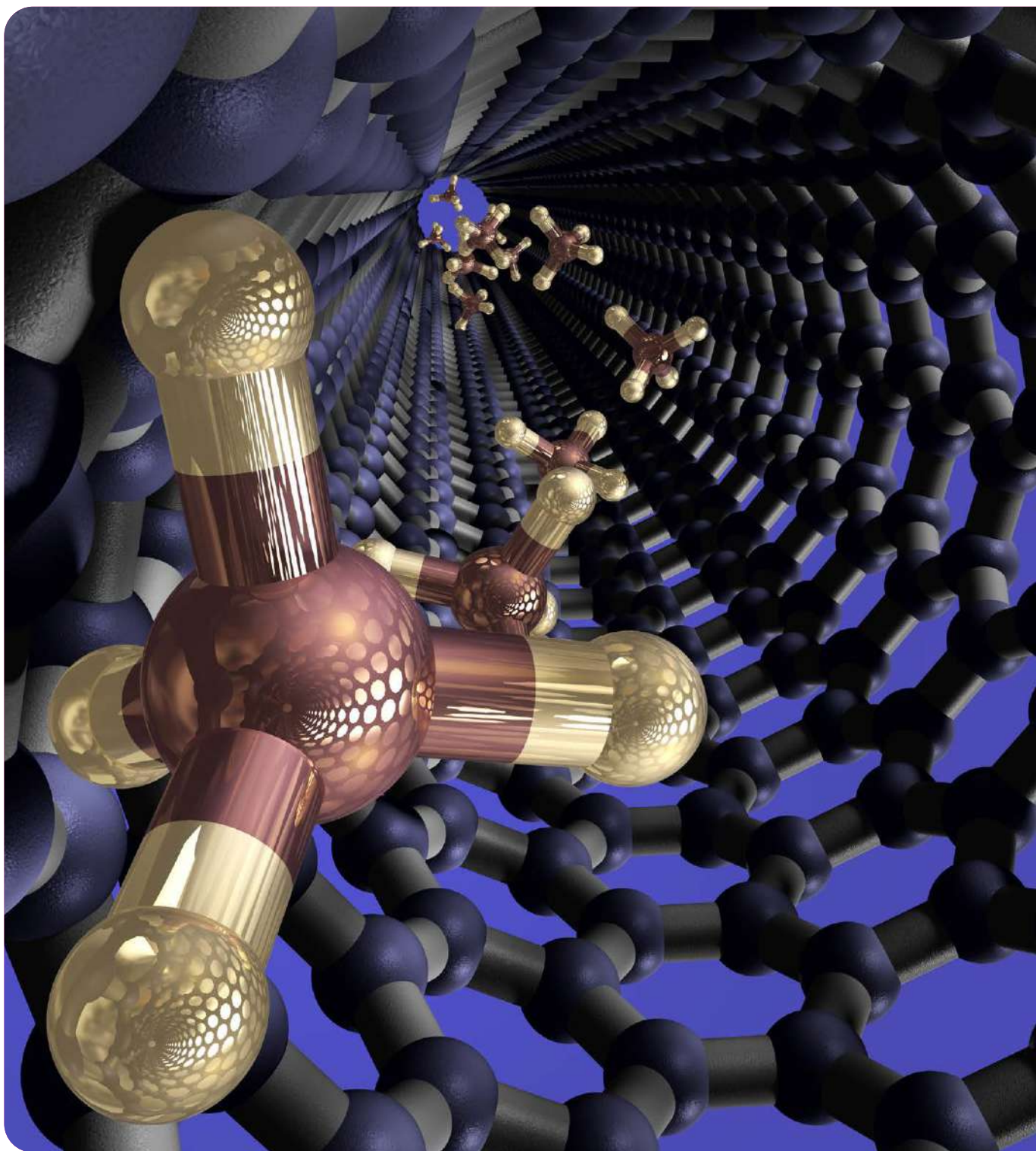
In the last decade, on-surface synthesis has emerged as a promising strategy for the development and design of new materials at the nanoscale, complementary to solution synthesis. It is based on the deposition of molecular precursors on top of a surface, and annealing to create new bonds, thus new nanomaterials. The chemical structure of the final products depends on the reaction mechanism followed by the initial molecular precursor. For instance, ring-rearrangement reactions are recently gaining increasing attention as a possible alternative toward the generation of novel nanostructures. However, controlling such reaction mechanism remains challenging due to the countless skeletal rearrangements.

In their research, researchers at Nanoarchitectonics on Surfaces group at IMDEA Nanociencia, led by David Écija in collaboration with the group of Nanocarbons and Organic Photovoltaics, led by Nazario Martín, have successfully developed a new strategy to synthesize polycyclic conjugated hydrocarbons featuring antiaromatic moieties by on-surface synthesis. They showed that the deposition of specific molecular precursors on a hot gold substrate resulted in novel intra- and inter-molecular reactions affording a skeletal ring-rearrangement. Such reaction pathways differed from the covalent polymerization of the same initial species upon deposition on top of the surface at room temperature followed by subsequent annealing. Combining different advanced microscopy techniques, researchers unveiled the chemical structures of the obtained compounds showing the formation of antiaromatic subunits within the molecular backbones.

The results, published in *Nature Synthesis*, prove that a new strategy to create these special nanomaterials is now possible. “Based on the power of organic synthetic protocols, the rational design and synthesis of suitably functionalized precursors paves the way to an unlimited new scenario” says Nazario Martín. The use of a hot metal surface during the sublimation of the molecular precursor to afford antiaromatic units represents a departure from traditional on-surface synthesis, marking a significant advancement in the field. This innovation opens up new avenues for designing molecular structures with tailored properties. “On-surface synthesis now introduces a unique paradigm to unlock new possibilities in chemistry that could impact the materials and technologies that surround us”, David Écija says. Their findings consolidate a new method for the development and design of organic materials at the nanoscale, affording the incorporation of antiaromatic subunits in their backbones. The control of ring-rearrangement reactions of carbon-based compounds on surfaces is envisaged to open new routes towards the design of low dimensional organic materials with prospects in molecular optoelectronics.

This has been partially funded by the ERC grant ELECNANO (GA number 766555), the grants QUIMTRONIC-CM, MAD2D and NANOMAGCOST from Comunidad de Madrid, and the Severo Ochoa Centre of Excellence distinction to IMDEA Nano.

Generating antiaromaticity in polycyclic conjugated hydrocarbons by thermally selective skeletal rearrangements at interfaces. *Nat. Synth* (2023). <https://doi.org/10.1038/s44160-023-00390-8>

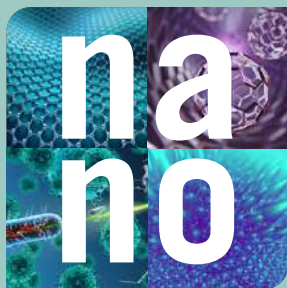


5

annexes

1. Contributions to conferences [179]

annual
report **2024**





1. Contributions to conferences

108
conferences

246
contributions:

57 invited talks

87 oral contributions

102 poster contributions

16/01/2024

Twistronics and Moiré Materials: Bridging Theory and Experiments

Trieste, Italy

Oral communications

Designing moiré patterns by strain

Pierre A. Pantaleón*, Federico Escudero, Andreas Sinner, Zhen Zhan and Francisco Guinea

Poster communications

Electronic properties of twisted TMDs using Wannier based Tight-Binding model

Guillermo Parra Martínez, Jose Angel Silva Guillén, Francisco Guinea

19/01/2024

Reunión Técnica y Foro Colaborativo TERA/CIBER/ASEBIO 'Aplicaciones de vectores no virales en terapia y edición génica: retos de la academia y la industria'

Madrid, Spain

Invited talk

Nanoterapias basadas en ácidos nucleicos para el tratamiento de la distrofia muscular de Duchenne

Álvaro Somoza

VI Simposio de la Unidad de Excelencia de Química de la Universidad de Granada

Granada, Spain

Invited talk

Laseres de attosegundos: la cámara superlenta de la Física, la Química y ... ¿la Biología?

Fernando Martín García

Síntesis enantioselectiva de nanografenos moleculares

Nazario Martín León

02/02/2024

XIX Jornada de Recerca - Societat Catalana de Física

Barcelona, Spain

Invited talk

Novel wave-mixing schemes at X-ray Free Electron Lasers

Cristian Svetina

XXIII Linz Winter Workshop 2024 'Advances in Single-Molecule Research for Biology & Nanoscience & Medicine'

Linz, Austria

Oral communications

Conformational dynamics of influenza A virus ribonucleoprotein complexes during RNA synthesis revealed by HS-AFM

Borja Ibarra*, Diego Carlero, Shingo Fukuda, Rebeca Bocanegra, Toshio Ando, Jaime Martín-Benito

11/02/2024

Biophysical Society Annual Meeting

Philadelphia, USA

Poster communications

Characterization of the real-time kinetics of the activities of the human mitochondrial DNA helicase at the single-molecule level

Ismael Plaza-G.A*, Fernando Cerrón, Rafael Fernández-Leiro, Grzegorz L. Ciesielski and Borja Ibarra*

14/02/2024

Nanomaterials Applied to Life Sciences (NALS2024)

Granada, Spain

Invited talk

Extracellular Temperature Measurements

Thompson S

Oral communications

Exploiting the potential of AC magnetometry to display thermal conformational changes of proteins

P. Palacios-Alonso, A. Venegas Gómez, J. León-Moro, E. Sanz-de Diego, S. H. Mejías, A. L. Cortajarena, R. Delgado-Buscalioni, and F. J. Terán

Poster communications

Controlled synthesis of magnetoplasmonic aggregate nanoparticles for biomedicine

Mónica Dhanjani, César del Valle, and Gorka Salas

Superparamagnetic nanoprobe for magneto-inductive sensing

Rodríguez-Ramos A, Dhanjani M, Salvador M, Peixoto V, Fraile L, Rivas M & Salas G

Synthesis of Magnetic Nanoparticles by the Recycling of Industrial Steel Waste and its application on CPWO

Cristina M. Montero, Mónica Dhanjani, Alejandro Martín, Neus Lopez-Arago, Macarena Muñoz, Zahara M. de Pedro, Jose A. Casas, Alberto Bollero, Gorka Salas

Workshop MAD-2D

Madrid, Spain

Invited talk

Bridging the Gap: Transforming Molecule-based Coordination Polymers into 2D Materials

Jose Sanchez Costa

XV Spanish-Portuguese Conference on Controlled Drug Delivery

Lisboa, Portugal

Poster communications

Albumin-Based Nanostructures as Carriers of Nucleic Acids and Drugs

Álvaro Somoza

21/02/2024

XV Conference of Young Researchers in Atomic and Molecular Physics (J2IFAM2024)

Valencia, Spain

Oral communications

Attosecond chemistry

Fernando Martín García

25/02/2024

14th Spanish-Italian Symposium on Organic Chemistry (SISOC-XIV)

Torino, Italy

Invited talk

Amazing molecular nanographenes

Nazario Martín

26/02/2024

Workshop 'Les Lundis de L'IPSIT' - Bio-inspired supramolecular materials based on polymeric or DNA origami scaffolds

Paris, France

Invited talk

Controlling self - assembly by chemical fuels and light

Thomas Hermans

28/02/2024

5th and Final Workshop of the AttoChem COST Action

La Laguna, Spain

Invited talk

Advances and perspectives in X-ray Transient Grating Spectroscopy

Cristian Svetina

Synthetic Molecular Nanographenes

Nazario Martín

Oral communications
 Angularly resolved RABBITT: from N₂ to PAH
 V. Lorient, A. Boyer, S. Nandi, C. M. Gonzalez-Collado, E. Plésiat, A. Marciniak, C. L. Garcia, Y. Hu, S. Palakkal, M. Lara-Astiaso, A. Palacios, P. Decleva, F. Martin, F. Lépine

New directions in Attosecond Chemistry

Fernando Martín

Protein promoted chromophore excited state decay modulation

Sara H Mejias

06/03/2024

Electronic Structure, Principles and Applications Conference (ESPA)

Tarragona, Spain

Oral communications

Rational Design of Color-Pure Blue All-Organic Emitters

Johannes Gierschner

The 66th Fullerenes-Nanotubes-Graphene General Symposium

Nagoya, Japan

Oral communications

Mechanically Interlocked Derivatives of SWNTs: synthesis and potential applications

Alejandro Lopez-Moreno, Emilio M. Pérez

10/03/2024

XIX Escuela Nacional de Materiales Moleculares

Almuñécar, Spain

Invited talk

Molecular nanographenes

Nazario Martín

11/03/2024

3S24 Symposium in Surface Science

St Christof im Aldberg, Austria,

Oral communications

Probing the phase transition to a coherent 2D Kondo lattice

C.G. Ayani, M. Pisarra, I.M. Ibarburu, M. Garnica, R. Miranda, F. calleja, F. Martín, A.L. Vázquez de Parga

14/03/2024

BioNEXT: AEBIN Young Researchers Symposium

Online, Spain

Oral communications

Potent anticancer Rh(III) and Ir(III) bearing a fluorophore

A. Villechenous, V. Rodríguez-Fanjul, A. M. Pizarro

Poster communications

Rhenium tether half-sandwich complexes

A. Martin-Hoyas, A. M. Pizarro

17/03/2024

Deutsche Physikalische Gesellschaft DPG Spring Meeting of the Condensed Matter Section

Berlin, Germany

Oral communications

Selectively Addressing Plasmonic Modes and Excitonic States in a Nanocavity Hosting a Quantum Emitter

A. David Mateos, B. Miguel Varea, C. Koen Lauwaet, D. Rodolfo Miranda, E. Roberto Otero, F. Alberto Martin-Jimenez*

07/04/2024

SPIE Photonics Europe - Quantum Technologies 2024

Strasbourg, France

Oral communications
 Development of Superconducting Single-Photon Detectors based on NbTiN and Graphene
 Cristina García-Pérez, Julia García-Pérez, Fernando J Urbanos, María Acebrón, María Teresa Magaz, Alicia Gómez, Ramón Bernardo Gavito, Daniel Granados

07/04/2024

ChemOnTubes 2024

Strasbourg, France

Oral communications

Mechanochemical Synthesis of MINTs

Emilio M. Pérez

14/04/2024

6th European Workshop on Epitaxial Graphene and 2D Materials

Trieste, Italy



Oral communications

Probing the phase transition to a coherent 2D Kondo lattice

C.G. Ayani, M. Pissarra, I.M. Ibarburu, M. Garnica, R. Miranda, F. calleja, F. Martín, A.L. Vázquez de Parga

21/04/2024

International Workshop on Ultra-Fast Science (WUFS 2024)

Shanghai, China

Invited talk

Attosecond chemistry: imaging coupled electronic and nuclear motions in molecules in real time.

Fernando Martín García

05/05/2024

IEEE International Magnetics Conference INTERMAG 2024

Rio de Janeiro, Brazil

Invited talk

Giant enhancement of spin-charge conversion combining 2D and 3D materials: Fe/Gr/Pt

Alberto Anadón¹, Armando Pezo², Iciar Arnay³, Ruben Guerrero^{3,4}, Adrián Gudin³, Jaafar Ghanbaja¹, Aurelien Manchon², Sébastien Petit-Watelot¹, Paolo Perna³, Juan-Carlos Rojas-Sánchez

06/05/2024

Photo- and Electrocatalysis at the Atomic Scale PECAS-CAT&SCALE

Donostia-San Sebastian, Spain

Poster communications

2D supramolecular networks as model systems for single-atom catalysis

S. O. Parreiras*, S. K. Mathialagan, K. Lauwaet, J. I. Urgel, R. Miranda, J. M. Gallego, D. Écija

Quantum Matter International Conference

Donostia-San Sebastian, Spain

Oral communications

Unveiling the interlayer interaction in a 1H/1T TaS₂ van der Waals heterostructure

I.M. Ibarburu, C.G. Ayani, M. Bosnar, F. Calleja, A. Pinar Solé, O. Stetsovych, C. Rebanal, M. Garnica, R. Miranda, M.M. Otrokov, M. Ondracek, P. Jalinek, A. Arnau, A. L. Vázquez de Parga

06/05/2024

III Multimat

Almuñécar, Spain

Invited talk

A chemists' approach to nanomaterials science

Emilio M. Pérez

15/05/2024

Anticancer Metal Drugs: New Developments And Future Perspectives 2nd Edition

Donostia-San Sebastian, Spain

Oral communications

Tether half-sandwich complexes to modulate intracellular activity

A. M. Pizarro

19/05/2024

17th European School on Molecular Nanoscience ESMOLNA 2024

Cuenca, Spain

Oral communications

On-surface synthesis

D. Écija*

European Molecular Biology Organization (EMBO) Workshop 'Molecular biology of mitochondrial gene maintenance and expression'

Josefow, Poland

Oral communications

Single-molecule insights into human mitochondrial DNA replisome

Ismael Plaza-G.A, Fernando Cerrón, Rafael Fernández-Leiro, Grzegorz L. Ciesielski and Borja Ibarra*

20/05/2024

II Workshop Conexión Nanomedicina CSIC-IMDEA Nanociencia

Real Jardín Botánico, Madrid, Spain

Invited talk

Hybrid inorganic-inorganic magnetic nanoparticles for biomedical applications

Gorka Salas

Tools Bring Applications

Emilio M. Pérez

Oral communications

Capacidades del servicio de microscopía de fuerza atómica de IMDEA Nanociencia

P. Pedraz

Extracellular and Intracellular Temperature Measurements

Thompson S

Nanobiosystems for Health Challenges in Diagnosis and Treatment

Milagros Castellanos

Nucleic Acid Based Nanotherapies

Álvaro Somoza

Transition Metal Compounds as Tools to Interfere Intracellular Chemistry

A. M. Pizarro

V Congreso sobre Materiales Multifuncionales (MULTIMAT 2024)

Almuñécar, Spain

Oral communications

Copper compounds for luminescent and optoelectronic applications

R.Utrera-Melero

Switchable spin crossover material for passive control of temperature fluctuations in buildings

Esther Resines-Urien,¹ Miguel Ángel García García-Tuñón,² Mar García-Hernández,³ Jose Alberto Rodríguez-Velamazán,⁴ Ana Espinosa,³ and Jose Sánchez Costa¹

26/05/2024

245th Electrochemical Society Meeting

San Francisco, USA

Invited talk

Cu(II) porphyrin nanographene dyads photoexcited states dynamics.

V. Vega Mayoral

Gem-Dibromovinyls: Highly Versatile Systems for On-surface

Nazario Martín León

Synthesis of Molecular Nanographenes

Nazario Martín León

Synthesis of Novel Low-dimensional Porphyrinoid polymers on surfaces

Kalyan Biswas, Maxence Urbani, Ana Sánchez-Grande, Diego Soler, Pingo Mutombo, Koen Lauwaet, José M. Gallego, Rodolfo Miranda, David Écija, Pavel Jelínek, Tomás Torres, José I. Urgel

Oral communications

Computational Characterization of the On-Surface Synthesis of Low-Dimensional Nanostructures

A. Gallardo*, E. Pérez Elvira, K. Biswas, A. Barragán, J. Mendieta-Moreno, J. Björk, P. Jelínek, J. Urgel, D. Eciija

Generating antiaromaticity

D. Écija*

Ultrafast excited electron relaxation in triply fused Ni(II) porphyrin-nanographene conjugates for energy conversion

V. Vega Mayoral

Covalent Patterning of Graphene: From Sophistication to Simplicity

Emilio M. Pérez

27/05/2024

European Materials Research Society (E-MRS) Spring Meeting

Strasbourg, France

Invited talk

Covalent Patterning of Graphene: from sophistication to simplicity.

N. Martín Sabanés; E. M. Pérez.

Oral communications

Low-dimensional non-porous coordination polymers acting as porous as a versatile platform for reversible opto-electronic read-outs displays

Jose Sanchez Costa

School on New Computational Methods for Attosecond Molecular Processes

Zaragoza, Spain

Oral communications

Theoretical modeling of attosecond electron dynamics in molecules.

Fernando Martín García

Semana del Doctorado UAM 2024

Madrid, Spain

Oral communications

Síntesis controlada de agregados de nanopartículas con propiedades magnetoplasmónicas para biomedicina

Mónica Dhanjani, Gorka Salas

Poster communications

Designing model photosystem for tracking protein dynamics in chromophore's light harvesting properties

Gonzalo Perez

Observation of exchange bias in ultrathin La_{0.3}Sr_{0.7}MnO₃ films

Inés García-Manuz, Jose Luis F. Cuñado, Isabel Barbero, Javier Tornos, Lucas Pérez, Miguel Romero, Fernando Ajejas, Paolo Perna, Julio Camarero

The relevance of amino acid -chromophore interactions in protein conformational changes

Claudia Florez

28/05/2024

I Encuentro Presencial de la Red Española de Investigación en ELA

Madrid, Spain

Poster communications

Characterization of ALS Lymphoblasts' Extracellular vesicles: concentration, phenotyping and loading

J. A. Bueso, C. Pérez, R. Bravo, D. Otaegui, V. Palomo

28/05/2024

15th Girona Seminar

Girona, Spain

Carbon Nanotubes, 2D Materials, and Single-molecule Supramolecular Chemistry. A Multidimensional Approach to Nanochemistry

Emilio M. Pérez

01/06/2024

European Conference on Surface Synthesis ECOSS

Harrogate, United Kingdom

Oral communications

Generating antiaromaticity: thermally-selective skeletal rearrangements at interfaces

Ana Barragán*, Elena Pérez-Elvira, Qifan Chen, Diego Soler-Polo, Ana Sánchez-Grande, Diego J. Vincent, Koen Lauwaet, José Santos, Pingo Mutombo, Jesús I. Mendieta-Moreno, Bruno de la Torre, José M. Gallego, Rodolfo Miranda, Nazario Martín, Pavel Jelínek, José I. Urgel, David Écija

02/06/2024

On-Surface Synthesis International Workshop

Sant Feliu de Guixols, Spain

Oral communications

Coordinative Self-assembly of Coordinative Self-assembly of π -magnetic Porphyrins

M. Tenorio*, M. Lozano, L. erna, M. M. García, M. Urbani, K. Lauwaet, K. Biswas, D. Soler Polo, S. K. Mathialagan, S. O. Parreiras, J. M. Gallego, R. Miranda, J. I. Urgel, T. Torres, P. Jelínek, G. Bottari, D. Écija.

Designing highly delocalized solitons by harnessing the structural parity of π -conjugated polymers

K. Biswas*, J. Janeiro, A. Gallardo, M. Lozano, A. Barragán, B. Álvarez, D. Soler-Polo, O. Stetsovych, A. Pinar Solé, J. M. Gallego, D. Pérez, R. Miranda, J. I. Urgel, P. Jelínek, D. Peña and D. Écija

Generating antiaromaticity in polycyclic conjugated hydrocarbons by thermally selective skeletal rearrangements at interfaces



E. Pérez-Elvira*, A. Barragán, Q. Chen, D. Soler-Polo, A. Sánchez-Grande, D. J. Vicent, K. Lauwaet, J. Santos, P. Mutombo, J. I. Mendieta-Moreno, B. de la Torre, J. M. Gallego, R. Miranda, N. Martín, P. Jelinek, J. I. Urgel and D. Écija

03/06/2024

International Conference on Electronic Structure: Predictions and Applications (ESPA2024)

Tarragona, Spain

Oral communications

Plenary talk: New directions in theoretical attosecond chemistry.

Fernando Martín García

05/06/2024

EMBL Symposium 'Microtubules: from atoms to complex systems'

Heidelberg, Germany

Poster communications

Fluorescent probes for visualizing microtubules and their function

R. Paris, D. Lucena, M. A. Oliva, F. Diaz, V. Palomo

European South Atlantic Biophysics Congress ESAB 2024

Donostia-San Sebastian, Spain

Oral communications

Characterization of the real-time kinetics of the activities of the human mitochondrial DNA helicase at the single-molecule level

Ismael Plaza-G.A*, Fernando Cerrón, Rafael Fernández-Leiro, Grzegorz L. Ciesielski and Borja Ibarra*

Designing model photosystem for tracking protein dynamics in chromophore's light harvesting properties

Gonzalo Perez

The relevance of amino acid -chromophore interactions in protein conformational changes

Claudia Florez

Poster communications

Conformational dynamics of influenza A virus ribonucleoprotein complexes during RNA synthesis revealed by HS-AFM

Borja Ibarra*, Diego Carlero, Shingo Fukuda, Rebecca Bocanegra, Toshio Ando, Jaime Martin-Benito

Temperature effects on the real-time kinetics of the human mitochondrial DNA polymerase

Lyra Zumeta, FJ Cao, G. Ciesielski

Uncovering the Mechanical Properties and Folding of Single-Stranded RNA using Optical Tweezers: A Study on Influenza A Viral ssRNA Genomes.

Bocanegra, R*; Rodríguez, C; Viader-Godoy, X; Mañosas, M; Ritort, F; Ibarra, B.

06/06/2024

Workshop in Biogenic Material Science

Straubing, Germany

Invited talk

Protein promoted chromophore excited state decay modulation

Sara H Mejias

10/06/2024

19th annual event of European Technology Platform on Nanomedicine (ETPN 2024)

Milan, Italy

Poster communications

Design and Characterization of Brain Penetrating Nanoparticles to Target the Circadian Clock in Alzheimer's Disease

Marion Le Meur, Paolo Blasi, Valle Palomo

11/06/2024

Workshop 'European Workshop on Innovative and Advanced Epitaxy'

Vilnius, Lithuania

Poster communications

Growth and Characterization of Monolayer NbTe2 on Epitaxial Graphene

Archit Dhingra, Beatriz Muñoz Cano, Fabian Calleja, A. L. Vázquez de Parga, Miguel Angel Valbuena, Manuela Garnica

12/06/2024

POLYMAT Spotlight - International Workshop on Macromolecular Materials

Donostia-San Sebastian, Spain

Invited talk

Nanoscience around the mechanical bond

Emilio M. Pérez

Oral communications

Designing optical air quality sensors based on lanthanide luminescent metal-organic frameworks

Jose Sanchez Costa

13/06/2024

Systems Chemistry Discussion Series

Online, France

Invited talk

Supramolecular oscillations

Thomas Hermans

16/06/2024

Coherence 2024 International Conference

Helsingborg, Sweden

Poster communications

Coherent Imaging of Incoherent Dynamics

Arnab Sarkar and Allan Johnson

Corbella Summer School

Online, Italy

Invited talk

Introduction to Supramolecular Systems Chemistry

Thomas Hermans

European Society for Photobiology School

Bricen, Italy

Poster communications

Designing model photosystem for tracking protein dynamics in chromophore's light harvesting properties

Claudia Florez

The relevance of amino acid -chromophore interactions in protein conformational changes

Gonzalo Perez

XI International Symposium on Ultrafast Dynamics & Ultrafast Bandgap Photonics
Heraklion, Greece

Invited talk

Decoupled few-femtosecond electronic and structural transitions in VO₂: A bad metal, a semi-metal, and structural revivals

Allan Johnson

17/06/2024

14th International Conference on the Scientific and Clinical Applications of Magnetic Carriers

Barcelona, Spain

Oral communications

Multicore magnetic nanoparticles for magnetic hyperthermia and combination therapy against cancer

David García-Soriano, Paula Milán-Rois, Nuria Lafuente-Gómez, Ciro Rodríguez-Díaz, Cristina Navío, Álvaro Somoza, and Gorka Salas

Novel and quick magnetic methodology for in situ monitoring redox reactions in the liquid phase: revisiting the properties of Fe-Cr spinels
I. Mikelez-Alonso, J. Sanchez-Martínez, C. Martínez-Boubeta, I. Sanz-Muñoz, A.L. Cortajarena and F.J. Terán

Poster communications

Novel magnetic transduction methodology for DNA detection in liquids

S. Ozel-Okcu, M. J. Valle-Pastor, P. Palacios-Alonso, I. Mikelez-Alonso, R. Bocanegra, A. L. Cortajarena, R. Delgado-Buscalioni, and F. J. Terán

17th European Vacuum Conference (EVC-17) 37th European Conference on Surface Science (ECOSS-17)

Harrogate, United Kingdom

Invited talk

Light-matter interactions at atomic scales

A. David Mateos, B. Miguel Varea, C. Koen Lauwaet, D. Rodolfo Miranda, E. Roberto Otero, F. Alberto Martín-Jiménez*

3rd Annual Nanoseries Conference

Lisboa, Portugal

Invited talk

Improving sensing methodology for drug selection in neurodegenerative diseases

Valle Palomo

9th European Nanomanipulation Workshop

Madrid, Spain

Poster communications

Tip-induced molecular surgery on coordinating open shell porphyrins

L.erna*, M.Tenorio, M. Martíne, . Urbani, M. Lozano, J. Gallardo, A. Barragá, D. Soler-Polo, S. K. Mathialaga, S. O. Parreiras, J. M. Gallego, R. Miranda, P. Jelinek, G. Bottari, D. Écija, T.Torres, and J. I. Urgel

Science at FELs

Paris, France

Invited talk

Advances of X-ray Transient Grating at European X-FEL

Cristian Svetina

23/06/2024

13th International Conference on Porphyrins and Phthalocyanines (ICPP-13)

Niagara Falls, USA

Oral communications

Engineering open-shell porphyrin nanoarchitectures on surfaces

D. Écija*

24/06/2024

21st IUPAB & 62nd BSI Joint Congress

Kyoto, Japan

Poster communications

Single-molecule manipulation of genome integrity guardians.

Ortiz-Rodríguez, M.; Galletto, R.; Ibarra, B

III International Conference on Novel 2D Materials Explored Via Scanning Probe Microscopy & Spectroscopy (2DSPM2024)

Donostia-San Sebastian, Spain

Invited talk

Evolution of Superconductivity in Twisted Graphene Multilayers

Min Long, Alejandro Jimeno-Pozo, Héctor Sainz-Cruz, Pierre A. Pantaleón*, and Francisco Guinea

Poster communications

Unveiling the interlayer interaction in a 1H/1T TaS₂ van der Waals heterostructure

C. Rebanal, C.G. Ayani, M. Bosnar, F. Calleja, A. Pinar Solé, O. Stetsovych, I.M. Ibarburu, M. Garnica, R. Miranda, M. M. Otrokov, M. Ondrá ek, P. Jelínek, A. Arnau, A.L. Vázquez de Parga

25/06/2024

14th Graphene Conference Series 2024

Madrid, Spain

Oral communications

Engineering a Spin-Orbit Bandgap in Graphene-Tellurium Heterostructures

B. Muñoz Cano, D. Pacilè, F. Calleja, M. G. Cuixart, M. Pissarra, A. Sindona, F. Martín, E. Salagre, P. Segovia, E. G. Michel, A. L. Vázquez de Parga, R. Miranda, J. Camarero, M. A. Valbuena, M. Garnica

27/06/2024

II Simposio de Química Física y Transferencia de Conocimiento UAM

Madrid, Spain

Oral communications

Air quality optical sensor based on a 2D lanthanide MOF composite

Jorge Sangrador Pérez, Jose Sánchez Costa, Juan Cabanillas González

Poster communications

Biphasic Electron Transfer in C343 sensitized mesoporous SnO₂ revealed by a combination of FLUPS and TRTS

Miguel Ángel Pulido-Lendínez, Marco Ballabio, Andrés Burgos-Caminal, María E. Corrales, Sergio Revuelta, Saul García-Orrit, Víctor Vega-Mayoral, Juan Cabanillas-González, Luis Bañares, Wojciech Gawelda, and Enrique Cánovas



It is possible to tune chromophore properties by changing its physicochemical environment using protein-based bioengineered photosystems
Angelo Alonzo Beratto, Asier García, Teresa Gonzalez

30/06/2024

International Conference on Magnetism (ICM 2024)

Bologna, Italy

Oral communications

Atomic resolution in-situ insights into heating and electric effects in Bi-doped Cu nanowires for spintronics

Alejandra Guedeja-Marron, Matilde Saura-Muñoz, Ines García-Manuz, Henrik L. Andersen, Lunjie J. Zeng, Alok Ranjan, Ignacio Figueruelo-Campanero, Mariela Menghini, Eva Olsson, Paolo Perna, Lucas Perez, Maria Varela

Ersted-field-driven domain wall motion in cylindrical nanowires with azimuthal domains
Lucía Gómez Cruz, Laura Álvaro Gómez, Claudia Fernández González, Christophe Thirion, Eva Pereiro, Olivier Fruchart, Aurélien Masseboeuf, Lucas Pérez

Singularities and topological analysis of micromagnetic processes in magnetic nanowires
Laura Alvaro-Gomez, Jerome Hurst, Shriraj Hegde, Jean-Christophe Toussaint, Christophe Thirion, Lucas Perez, Aurelien Masseboeuf, Olivier Fruchart, Daria Gusakova

Tailoring the magnetic properties of Cobalt atoms by metal-organic coordination
S. O. Parreiras*

Various timescales of spin-textures dynamics in cylindrical nanowires

Laura Álvaro Gómez, Aurélien Masseboeuf, Sandra Ruiz Gómez, Claudia Fernández González, Nicolas Mille, Markus Weigand, Sebastian Wintz, Lucia Aballe, Rachid Belkhou, Christophe Thirion, Daria Gusakova, Lucas Pérez, Olivier Fruchart

Poster communications

Designing organolanthanide sandwich complexes by on-surface synthesis

S. K. Mathialagan, * S. O. Parreiras, M. Tenorio, L. erna, D. Moreno, B. Muñoz-Cano, K. Lauwaet, C. Navío, M. Valvidares, M. A. Valbuena, J. I. Urgel, P. Gargiani, R. Miranda, J. Camarero, J. I. Martínez, J. M. Gallego, and D. Écija

Interfaces with Graphene: an amazing playground for SpinOrbitronics

A. Gudin, B. Muñoz, J. Sanchez-Barriga, I. Arnanay, A. Anadon, M. Jugovac, M. Valvidares, G. Bihlmayer, P. Ollerros-Rodríguez, F. Ajejas, A. Guedeja-Marron, M. Varela, Juan-Carlos Rojas-Sánchez, M.-A. Valbuena, P. Perna

Isotropic spin and inverse spin Hall effect in epitaxial (111)-oriented Pt/Co systems

A. Gudin, * A. Anadón, I. Arnanay, R. Guerrero, S. Petit-Watlot, J. Camarero, J.C. Rojas-Sánchez, P. Perna

Modulation of the DMI in Co based metallic trilayers using light and heavy elements

F. Ajejas, S. Mallick, Y. Sassi, W. Legrand, S. Collin, A. Vecchiola, K. Bouzehouane, A. Thiaville, S. Pizzini, N. Reyren, V. Cros, A. Fert

Observation of exchange bias in ultrathin La_{0.3}Sr_{0.7}MnO₃ films

Inés García Manuz, Jose Luis Fernández Cuñado, Isabel Barbero, Javier Tornos, Lucas Pérez, Miguel Romera, Fernando Ajejas, Paolo Perna, Julio Camarero

01/07/2024

7th Course “Challenges and Prospects of Nanomedicine for Brain Targeting” of the International School of Nanomedicine

Erice, Italy

Oral communications

Nanoparticles to Target the Circadian Clock in Alzheimer's Disease: Optimization of Brain Penetration.

Marion Le Meur, Paolo Blasi, Valle Palomo

I Workshop On Memristors

Barcelona, Spain

Poster communications

Electro-optical characterization of three-terminal field-effect transistor based on mechanically exfoliated MoS₂

Gabriel Caballero, Ramón Bernardo Gavito, Fernando Jiménez Urbanos, Mariela Menghini, Ignacio Figueruelo, Daniel Granados

International Conference on Ion Beam Modification of Materials 2024 (IBMM 2024)

London, United Kingdom

Oral communications

Diamond-defect engineering of NV- Centres using ion beam irradiation

Nuria Gordillo, A. Andriño-Gómez, J.L. Toural, J.L. Pau, A. Redondo-Cubero, G. Tabares, G. García, J. García-Pérez, R. Bernardo-Gavito, D. Granados, MA. Ramos

08/07/2024

24th IEEE International Conference on Nanotechnology (IEEE-NANO 2024)

Gijón, Spain

Oral communications

One-step and wash-free magnetic method for direct SARS-CoV-2 virus detection in patient samples

C. Martinez-Boubeta, T. Asimakidou, K. Kailitaidou, G. Vourlias, L. Balcells Argemí, F. J. Teran, and K. Simeonidis

Controlled Release Society Annual Meeting 2024

Bologna, Italy

Poster communications

Albumin-Based Nanostructures as Carriers of Nucleic Acids and Drugs

Álvaro Somoza

Wavemix-NEXT COST Annual Meeting

Madrid, Spain

Invited talk

Ultrafast and Nonlinear Coherent X-ray Imaging In the Condensed Phase

Allan Johnson

Oral communications

Supramolecular assemblies for the determination of protein structure in dynamic native environment

Angelo Alonzo Beratto

14/07/2024

29th International Union of Pure and Applied Chemistry Symposium on Photochemistry (PHOTOIUPAC 2024)

Valencia, Spain

Oral communications

Constructing Color-Pure Blue All-Organic Luminescent Phosphors on Physical Grounds

Johannes Gierschner

Exchangeable fluorophores enable long-term STED super-resolution imaging of amyloids

J. Torra, C. Flors*

Protein promoted chromophore excited state decay modulation

Sara H Mejias

*Poster communications*Biphasic Electron Transfer in C343 sensitized mesoporous SnO₂ revealed by a combination of FLUPS and TRTS

Miguel Ángel Pulido-Lendínez, Marco Ballabio, Andrés Burgos-Caminal, María E. Corrales, Sergio Revuelta, Saul Garcia-Orrit, Víctor Vega-Mayoral, Juan Cabanillas-González, Luis Bañares, Wojciech Gawelda, and Enrique Cánovas

15/07/2024

9th European Conference on Molecular Magnetism

Krakow, Spain

Oral communications

The Awakening of On-Surface Synthesis

D. Écija*

Quantum Designer Physics (QDP2024)

Donostia-San Sebastian, Spain

Invited talk

Evolution of Superconductivity in Twisted Graphene Multilayers

Min Long, Alejandro Jimeno-Pozo, Héctor Sainz-Cruz, Pierre A. Pantaleón*, and Francisco Guinea

XXXIX Reunión Bial de la Real Sociedad Española de Física

Donostia-San Sebastian, Spain

Invited talk

Few-femtosecond coupled charge and lattice dynamics in an ultrafast phase transition

Allan Johnson

Oral communications

Ballistic electron transport through porphyrin nanoribbons

Edmund Leary

TaTe₂: A vast landscape of structural and electronic properties

Jose Angel Silva Guillén, Enric Canadell

Poster communications

Designing moiré patterns by strain

Pierre A. Pantaleón*, Federico Escudero, Andreas Sinner, Zhen Zhan and Francisco Guinea

Electronic properties of twisted TMDs using Wannier based Tight-Binding model

Guillermo Parra Martínez, Jose Angel Silva Guillén, Francisco Guinea

Study of the exfoliation of two-dimensional Cu-doped TiSe₂

Gonzalo Molina, Alvaro Rosa, Manuel Otero, Gustavo Morales

23/07/2024

13th International Conference on Porphyrins and Phthalocyanines (ICPP-13)

Niagara Falls, USA

Invited talk

Exploring the chemical space of tetracyano-substituted porphyrinoids: Synthesis, photophysical properties, racemization features, and chemical transformation

G. Bottari

28/07/2024

Alzheimer's Association International Conference (AAIC 2024)

Online, USA

Poster communications

Improving the Clinical Translation of Circadian Clock Dysfunction Treatments in Alzheimer's Disease with Nanoformulations

Marion Le Meur, Paolo Blasi, Valle Palomo

International Conference of Raman Spectroscopy (XXVIII ICORS)

Roma, Italy

Invited talk

Coupling optical tweezers with tip-enhanced Raman spectroscopy for the investigation of individual supramolecular systems

N. Martín Sabanés; G. Tobajas-Curiel; R. Bocanegra; B. Ibarra, E. M. Pérez

01/08/2024

Universidad Internacional Menéndez Pelayo Summer Course on 'Extracellular vesicles in neuroscience'

Santander, Spain

Invited talk

Characterization of EVs in aging and neurodegenerative diseases

Valle Palomo

25/08/2024

17th European Biological Inorganic Chemistry Conference (EuroBIC-17)

Münster, Germany

Oral communications

Potent anticancer Rh(III) tether complexes

A. M. Pizarro

Poster communications

Novel families of highly cytotoxic ruthenium- and osmium-arene tethered complexes

C. Cardozo, A. M. Pizarro

26/08/2024

XXVIII Congresso Nazionale della Società Chimica Italiana

Milan, Italy

Poster communications

Design and Synthesis of Benzothiazole-based Proteolysis Targeting Chimeras for Targeted Degradation of Casein kinase 1 (CK1) Implicated in Circadian Clock Dysregulation of Alzheimer's disease (AD)

E. Radošević, a E. Uliassi, a K. Musilek, b, I. Castellino, b V. Palomo, c M.L. Bolognesia



01/09/2024

General Conference of the Condensed Matter Division of the European Physical Society (CMD31)

Braga, Portugal

Invited talk

Designing moiré patterns by strain

Pierre A. Pantaleón*, Federico Escudero, Andreas Sinner, Zhen Zhan and Francisco Guinea

Oral communications

Apparent color and Raman vibrational modes of the

Ignacio Figueruelo-Campanero, Adolfo del Campo, Simon Mellaerts, Gladys Nieva, Elvira M González, Jean-Pierre Locquet, Aida Serrano and Mariela Menghini

Poster communications

On-surface Synthesis of π -Magnetic Au-Coordinated Porphyrins

L. erna*, M.Tenorio, M. Lozano, M. M. García, M. Urbani, K. Lauwaet, K. Biswas, D. Soler Polo, S. K. Mathialagan, S. O. Parreiras, J. M. Gallego, R. Miranda, J. I. Urgel, T. Torres, P. Jelínek, G. Bottari, D. Écija.

XXVIII EFMC International Symposium on Medicinal Chemistry

Roma, Italy

Poster communications

Benzothiazole-based Proteolysis Targeting Chimeras for Targeted Degradation of Casein Kinase 1 in Alzheimer's Disease Circadian Clock Dysfunction: Influence of Geometry on Physicochemical Properties

Radošević, a E. Uliassi, a K. Musilek, b, I. Castellino, b V. Palomo, c M.L. Bolognesia

Multifunctionalized Nanodrug Delivery Systems to Target Circadian Clock in Alzheimer's Disease.

Marion Le Meur, Paolo Blasi, Valle Palomo

02/09/2024

Extreme Light Infrastructure Summer School (ELISS 2024)

Szeged, Hungary

Oral communications

Attochemistry: chemistry at the attosecond time scale

Fernando Martín García

XI AUSE Conference and VI ALBA Users

Meeting

Oviedo, Spain

Oral communications

Engineering of organolanthanide sandwich complexes by on-surface synthesis

S. O. Parreiras*, S. Mathialagan, M. Tenorio, L. erna, D. Moreno, B. Muñoz-Cano, C. Navío, M. Valvidares, M. Valbuena, J. Urgel, P. Gargiani, R. Miranda, J. Camarero, J. Martínez, J. Gallego, D. Écija

Experimental observation of a magnetically induced warping transition in a topological insulator mediated by rare-earth surface dopants using angle-resolved photoemission spectroscopy.

B. Muñoz Cano, M. A. Valbuena

Poster communications

Effects on the topological surface state induced by Er surface doping in the prototypical topological insulator Bi₂Te₃ studied by photoemission spectroscopy.

B. Muñoz Cano, M. A. Valbuena

03/09/2024

46º Congreso de la Sociedad Española de Bioquímica y Biología Molecular (SEBBM)

A Coruña, Spain

Poster communications

Nanoparticle-mediated delivery optimization of CRISPR/Cas RNP for gene therapy

Diego Castaño Esteban, María López Valls, Carmen Escalona Noguero, Nuria Lafuente Gómez, Álvaro Somoza, Gorka Salas, Begoña Sot

07/09/2024

1st Sino-German Workshop on Nanospectroscopy and Nanofabrication

Hangzhou, China

Invited talk

Computationally Modelling of Fluorescence & Raman Response from Single Organic Dyes in Complex Nano-Environments

Johannes Gierschner

08/09/2024

18th Conference on Methods and Applications in Fluorescence

Valencia, Spain

Oral communications

Exchangeable fluorophores enable long-term STED super-resolution imaging of amyloids

J. Torra, C. Flors*

Poster communications

Exploring the usefulness of a fluorescent membrane tension probe in bacteria

M. C. González-García,* J. Requejo-Isidro, M. Pazos, C. Flors

Multichromophoric fluorescent glycofullerenes

A. Hrehoret*, B. Illescas, C. Flors, N. Martin

12/09/2024

4th NanoBioCargo Symposium

Madrid, Spain

Oral communications

Biosensors for pharmacological evaluation in neurodegenerative diseases

Paula Fernández-Gómez, Carlota Tosat-Bitrián, Ángeles Martín Requero, Valle Palomo.

16/09/2024

European Materials Research Society Fall Meeting (EMRS)

Warsaw, Poland

Oral communications

Room-Temperature Laser Induced Water Release in a Spin-Crossover Metal-Organic Framework: a Structure-Properties Investigation

Sara Gullace, Jose Sanchez Costa

Multiscale Phenomena in Condensed Matter (MULTIS2024)

Krakow, Poland

Invited talk

X-rays Transient Gratings at the European X-ray Free Electron Laser

Cristian Svetina

17/09/2024

4th International Conference on Interface Properties in Organic and Hybrid Electronics (IPOE-2024)

Barcelona, Spain

Oral communications

Deciphering Directionality and Dimensionality of Intra- and Intermolecular Charge Transfer Interactions at the Organic-Organic Interface,

Johannes Gierschner

18/09/2024

Engineered Living Materials Conference

Saarbrücken, Germany

Oral communications

Advanced fluorescence microscopy to understand the interactions between bacteria and materials

M. C. González-García, F. Viela, I. V. Ortega, C. Flors*

19/09/2024

16th International Conference on Frontiers of Design and Manufacturing (ICFDM2024)

Xiamen, China

Invited talk

IMDEA Nanociencia: An instrument to generate scientific knowledge and innovation

Emilio M. Pérez

19/09/2024

7th Spanish Conference on Biomedical Applications of Nanomaterials (SBAN 2024)

Madrid, Spain

Poster communications

Development of magnetoplasmonic nanoparticles with potential utility in biomedicine

Lucía Pardinas, Gorka Salas

Development of new biodetection methodologies based on spectroscopy for the detection of HPV+ OPC in liquid biopsies

Julietta Baciredo, Ramón Bernardo-Gavito y Milagros Castellanos

Effect of morphology and size of magnetic nanoparticles on cell viability

Mónica Dhanjani, Gorka Salas

Enhancing magnetoinductive sensing in lateral flow immunoassays with superparamagnetic nanoflowers

Rodríguez-Ramos A, Salvador M, Peixoto V, Fraile L, Rivas M & Salas G

Immunoregulatory microRNA-based Nanosystems in the systemic activation of effector T-cell immune responses

Guillermo González-Salvo, Lola Fernández-Messina and Milagros Castellanos Molina

22/09/2024

10th International Fall School on Organic Electronics (IFSOE-2024)

Online, Rusia

Invited talk

Color-Pure All-Organic Emitter Design on Physical Grounds

Johannes Gierschner

23/09/2024

Light Matter Interaction at Nanoscale Workshop

Madrid, Spain

Oral communications

Light-induced generation of one-dimensional Stone-Wales-based polymers on surfaces

E. Pérez-Elvira*, A. Barragán, A. Gallardo, S. Canola, J. Ma, K. Lauwaet, J. M. Gallego, X. Feng, D. Écija and J. I. Urgel

24/09/2024

Early Career Researchers in Metal-Organic Frameworks and Related Materials Meeting (Young MOF)

Cambridge, United Kingdom

Poster communications

Ultrasound-induced Nanostructuring of a 3D Spin Crossover MOF

Ana Martínez-Martínez, Esther Resines-Urien, Lucía Martín, Sara Gullace, Javier Collado, Enrique Burzurí, César Santiago, Carolina Sañudo, José Sánchez Costaa

01/10/2024

Sino-Spanish Symposium on Advanced Materials for Nanotechnology and Optoelectronics

Madrid, Spain

Invited talk

Molecular Nanographenes: The Search for Chiral Defects

Nazario Martín León

03/10/2024

Workshop of the Spanish Network on Spintronics (SpinRED 2024)

Madrid, Spain

Invited talk

Electronic Origin of Spin-Orbit Coupling and Dzyaloshinskii-Moriya Interaction in Graphene/Ferromagnet/Heavy Metal Heterostructures

M. A. Valbuena

Oral communications

Electrical control of exchange-bias in HMI/AFM insulator/FM systems

Fernando Ajejas^{1,*}, Felipe Torres^{1, 2}, Ali C. Basaran¹, Pavel Salev¹ and Ivan K. Schuller¹

04/10/2024

III Simposio de Jóvenes Investigadores (Real Academia Nacional de Medicina)

Madrid, Spain

Poster communications

Estudio de vesículas extracelulares en modelos derivados de pacientes de Esclerosis Lateral Amiotrófica

J. A. Bueso, C. Pérez, R. Bravo, D. Otaegui, V. Palomo



Evaluación del transporte intracelular con sondas fluorescentes en modelos de enfermedades neurodegenerativas

R. París, P. Fernandez, C. Pérez, C. Tosat, F. Díaz V. Palomo

14/10/2024

19th Edition of Graphene Week

Prague, Czech Republic

Oral communications

Engineering a Spin-Orbit Bandgap in Graphene-Tellurium Heterostructures

B. Muñoz Cano, D. Pacilè, F. Calleja, M. G. Cuixart, M. Pissarra, A. Sindona, F. Martín, E. Salagre, P. Segovia, E. G. Michel, A. L. Vázquez de Parga, R. Miranda, J. Camarero, M. A. Valbuena, M. Garnica

16/10/2024

XI Mediterranean Organic Chemistry Meeting (REQOMED)

Elche, Spain

Invited talk

Molecular Nanographenes: The Search for Enantioselectivity

Nazario Martín León

17/10/2024

II Workshop on Advanced Quantum Phenomena in 2D Carbon Based Materials

Alicante, Spain

Invited talk

Ballistic Conductance through Porphyrin Nanoribbons

Edmund Leary

Oral communications

The Awakening of On-Surface Synthesis

D. Écija*

18/10/2024

XIII Meeting on Nucleic Acids and Nucleosides

Madrid, Spain

Oral communications

Regulating Long Non-Coding RNAs for Pancreatic Cancer Treatment

Irene Pardo

19/10/2024

VI Simposio de la Unidad de Excelencia de Química de la Universidad de Granada

Granada, Spain

Invited talk

Síntesis enantioselectiva de nanografenos moleculares

Nazario Martín

22/10/2024

31st Annual Congress of the European Society of Gene and Cell Therapy (ESGCT)

Roma, Italy

Poster communications

CRISPR RNPs delivery by iron oxide magnetic nanoparticles

Carmen Escalona Noguero, Nuria Lafuente Gómez, Álvaro Somoza, Gorka Salas, Begoña Sot

23/10/2024

9th European Graphene Forum

Barcelona, Spain

Invited talk

Chemistry of 2D Materials for Patterning and Building Heterostructures

Emilio M. Pérez

23/10/2024

7º Simposio Internacional del Grupo Español de Innovación e Investigación en Vesículas Extracelulares (GEIVEX)

Palma de Mallorca, Spain

Poster communications

Comparative study of extracellular vesicles and neuronal

C. Pérez de la Lastra, L. P. Fernández, S. Cruz-Gil, M. García Beccaria, A. de Gorostegui, R. Ramos Ruiz., C. Fernández-Díaz, V. Palomo

Melanoma-derived extracellular vesicles promote t cell exhaustion that can be reverted using immunoregulatory micrornas

Guillermo González-Salso, Milagros Castellanos Molina and Lola Fernández-Messina

31/10/2024

Institut de Química Teòrica i Computacional Meeting (IQTC)

Barcelona, Spain

Invited talk

Charge Transfer State Engineering for Tailor-Made Luminescent Organic Materials

Johannes Gierschner

06/11/2024

Ultrafast Science and Technology Spain (USTS 2024)

Sitges, Spain

Invited talk

Transient Grating spectroscopy: from optical to X-rays

Cristian Svetina

Oral communications

Few-femtosecond electronic and structural transitions in VO₂

Allan Johnson

High carrier mobility in triphenylenehexathiol based metal-organic frameworks measured with time-resolved terahertz spectroscopy

Marco Ballabio*, Alejandro Núñez López, Eugenio Coronado and Enrique Cánovas

Poster communications

Biphasic Electron Transfer in C343 sensitized mesoporous SnO₂ revealed by a combination of FLUPS and TRTS

Miguel Ángel Pulido-Lendínez, Marco Ballabio, Andrés Burgos-Caminal, María E. Corrales, Sergio Revuelta, Saul García-Orrit, Víctor Vega-Mayoral, Juan Cabanillas-González, Luis Bañares, Wojciech Gawelda, and Enrique Cánovas

Collapse of the Drude Model in Silicon at Low Temperatures

C. Rocha, S. Revuelta, V. Balos, E. Cánovas*

Depth Profiling at Interfaces by combining Phase-Sensitive Sum and Difference Frequency Generation Spectroscopies

Vasileios Balos; Tobias Garling; Alvaro Diaz Duque; Ben John; Alexander Fellows; Martin Wolf; and Martin Thämer

Exploring many-body phenomena: biexciton generation and Auger recombination in Ag₂S nanocrystals

V. Vega Mayoral

12/11/2024

3rd Conference on Advanced Materials in Spain (AMATS 2024)

Valladolid, Spain

Oral communications

On-surface synthesis

D. Écija*

Mechanically Interlocked SWNTs For Superior Composites

Emilio M. Pérez

Poster communications

Multivalent Fluorescent Glycofullerenes

A. Hrehoret*, B. Illescas, C. Flors, N. Martin

19/11/2024

Reunión del Grupo de Química Biológica de la Real Sociedad Española de Química

Sevilla, Spain

Oral communications

Nanoterapias basadas en ácidos nucleicos para el tratamiento de la distrofia muscular de Duchenne

Álvaro Somoza

21/11/2024

1st International Conference on Materials and Thermophysical Properties (ICMTP-2024)

Online, India

Invited talk

Tailor-Made Luminescent Conjugated Organic Materials Through a Holistic Approach

Johannes Gierschner

27/11/2024

8th Scientific Meeting of PhD Students (JPhD2024)

Campus UAB, Barcelona

Invited talk

Metal-insulator transitions and applications in neuromorphic computing

Mariela Menghini

04/12/2024

New Trends in Linear and Non-linear spectroscopic Chirality Studies (NETLINCS)

Trieste, Italy

Invited talk

NEXT COST Action for the development and application of nonlinear wave-mixing methods in the extreme ultraviolet to hard X-rays

Cristian Svetina

11/12/2024

16th Berlin Electron Storage Ring Society for Synchrotron Radiation at Helmholtz Zentrum Berlin (BESSY@HZB) Users Meeting

Berlin, Germany

Invited talk

Rashba-like Spin Textures in Graphene Promoted by Ferromagnet-Mediated Electronic Hybridization with a Heavy Metal.

M. A. Valbuena

17/12/2024

14th Early Stage Researchers Workshop in Nanoscience

IMDEA Nanociencia, Madrid, Spain

Oral communications

Cavity optomechanics in MoS₂ micro-drum resonators

Julia García Pérez, Ramón Bernardo Gavito, Daniel Granados

Exploring bacterial-surface interactions with a fluorescent membrane tension probe

M. C. Gonzalez-Garcia*, D. Ballesteros, M. Pazos, J. Requejo-Isidro and C. Flors

Implementation of spin-orbit torque biasing into manganite-based AMR sensors

R. Solís^{1,2}, A. Guío¹, I. García-Manuz^{1,3}, A. Gu-dín^{1,3}, V. Pierron², H. Mathadi³, P. Pradeep³, S. Velez³, M. Belmeguenai⁴, P. Olleros¹, F. Aje-jas¹, J. Camarero^{1,3}, L. Méchin², S. Flament², and P. Perna¹

Multifunctionalized Gold Nanoparticles for Bio-medical Applications

Mario Martinez

Room-Temperature Laser Induced Water Release in a Spin-Crossover Metal-Organic Framework: a Structure-Properties Investigation

Sara Gullace,¹ Jose Sanchez Costa²

Poster communications

Application of magnetic nanoparticles obtained by recycling of industrial steel residues in CWPO

Cristina M. Montero, Mónica Dhanjani, Alejandro Martín, Neus Lopez-Arago, Macarena Munoz, Zahara M. de Pedro, Jose A. Casas, Alberto Bollero, Gorka Salas

“Benzothiazole-based Proteolysis Targeting Chimeras of Casein kinase 1 (CK1) for targeting Circadian Clock Dysfunction in Alzheimer’s disease (AD)”

E. Radošević, a I. Castellino, b K. Musilek, b, V. Palomo, c M.L. Bolognesia

Biphasic Electron Transfer in C343 sensitized mesoporous SnO₂ revealed by a combination of FLUPS and TRTS

Miguel Ángel Pulido-Lendínez, Marco Ballabio, Andrés Burgos-Caminal, María E. Corrales, Sergio Revuelta, Saul Garcia-Orrit, Víctor Vega-Mayoral, Juan Cabanillas-González, Luis Ba-ñares, Wojciech Gawelda, and Enrique Cánovas

Can we tune artificial photosystems to perform photocatalysis?

Asier García

Collapse of the Drude Model in Silicon at Low Temperatures

C. Rocha, S. Revuelta, V. Balos, E. Cánovas*

Concomitant Thermochromic and Phase-Change Effect in a Switchable Spin Crossover



Material for Efficient Passive Control of Day and Night Temperature Fluctuations

Esther Resines-Urien,^a Miguel Ángel García García-Tuñón,^b Mar García-Hernández,^c Jose Alberto Rodríguez-Velamazán,^d Ana Espinosa,^{*a} and Jose Sánchez Costa^{*a}

Designing model photosystem for tracking protein dynamics in chromophore's light harvesting properties

Gonzalo Pérez

"Designing organolanthanide sandwich complexes by on-surface synthesis"

S. K. Mathialagan,^{*} S. O. Parreiras, M. Tenorio, L. erna, D. Moreno, B. Muñoz-Cano, K. Lauwaet, C. Navío, M. Valvidares, M. A. Valbuena, J. I. Urgel, P. Gargiani, R. Miranda, J. Camarero, J. I. Martínez, J. M. Gallego, and D. Écija

"Development of a FRET-based sensor to monitor the activity of BACE1 in

live cells"

J. A. Bueso, C. Tosat, M. H. Stewart, K. Susumu, I. L. Medintz, S. A. Díaz, V. Palomo

Development of tungsten carbide nanowire superconducting detectors by pulsed focused ion beam induced deposition (PFIBID)

Cristina García-Pérez, Fernando J Urbanos, Manuel Rodríguez Osorio, Gabriel Caballero, Alicia Gómez, Ramón Bernardo Gavito, Daniel Granados

Effect of morphology and size of magnetic nanoparticles on cell viability

Mónica Dhanjani, Gorka Salas

Efficient CO₂ optical sensor based on europium 3D MOF/PDMS composite

Jorge Sangrador Pérez, Jose Sánchez Costa, Juan Cabanillas González

Electrical characterization of a large-area single-layer Cu₃BHT 2D conjugated coordination polymer

Sandra Martínez Estévez

Empowering the immune system by targeted nanoparticle-based precision delivery of immunoregulatory microRNAs to lymphocytes

Guillermo González-Salzo, Lola Fernández-Messina and Milagros Castellanos Molina

Exploring New Frontiers in Intracellular Chemistry with Half-Sandwich Organometallic Complexes: A Synthetic Overview on Cobalt(III) Derivatives

A. Annunziata, A. M. Pizarro

Harnessing energy and electron transfer processes in engineered bio-hybrids for enantioselective photocatalysis

Atikur Rahman

Multiple Post synthetic modification over 3D MOF europium metal center

Estefanía Fernández-Bartolomé,¹ Jorge Sangrador-Pérez,² Javier Urieta,¹ Rubén Turo Cortés,² E. Carolina Sañudo,^{3,4} Nazario Martín,^{1,2*} and José Sánchez Costa^{2*}

"Nonlinear coherent diffractive XUV/X-ray imaging in quantum materials"

Arnab Sarkar and Allan Johnson

Nucleic acid functionalization on gold nanoparticle in a flow reactor

Demian Pardo Filippidis

On-surface Synthesis of π -Magnetic Au-Coordinated Porphyrins

L. erna^{*}, M. Tenorio, M. Lozano, M. M. García, M. Urbani, K. Lauwaet, K. Biswas, D. Soler Polo, S. K. Mathialagan, S. O. Parreiras, J. M. Gallego, R. Miranda, J. I. Urgel, T. Torres, P. Jelínek, G. Bottari, D. Écija.

Optimization of Oligonucleotide Encapsulation into BSA Nanoparticles

Guillermo G. López

Phonon dispersion in twisted h-BN

Gonzalo N. Molina, Emmanuela Cappelluti, Habib Rostami, Francisco Guinea, Jose Angel Silva Guillén

Rational design of fluorescent glycofullerenes for single-particle tracking

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