2020 has been a very difficult year. The pandemic has deeply affected our lives, the way we work, our worries and, in too many cases, directly, our health. IMDEA Nanociencia has not been an exception. We have faced a most difficult time. And, in spite of all, I can proudly state that we have been extremely successful. Thanks to the dedication, commitment and strength of our personnel, we have navigated the waves of the pandemic almost unaffected. The building has been open almost all the time. Scientific and administrative activities have continued among strict measures and a careful organization to limit risks and detect potential problems. The flexibility of the structure of the Institute has been reflected in our rapid reaction to move part of our research to address COVID19 related issues, with the development of a strong interdisciplinary effort in developing a fast, sensitive and simple test for the virus.

The summarized result of the activities of the Institute in 2020 is reflected in this booklet.

The almost 200 researchers of our Institute have published more than 230 papers in 2020, reaching a total amount of more than 2200 (with 75% of them in Q1 and 37% in D1 journals). The accumulated number of citations of the papers produced by IMDEA Nanociencia researchers has risen to more than 64000 by the end of the year. The institutional h index was 108. All of this has placed IMDEA Nanociencia among the highest-ranked organizations in Spain in the prestigious Nature Index.

It is truly remarkable that in this complicated year, new facilities have been installed and new labs are now operational: a new spin polarized ARPES system, unique in Spain, new labs for chemical synthesis, cell cultures and optical spectroscopy, a renewed liquefier plant to produce liquid Helium from the recovered gas, a new STEM microscope, a new X-ray diffractometer, and new STMs which can go down to temperatures of 800 mK with 3 Teslas applied magnetic field or perform non-contact AFM in UHV.

Preparing ourselves for a future Severo Ochoa Programme has required a reorganization of our research lines and the creation of new ones, as well as changes in the internal governance structure, which is reflected in the Executive Commission, composed of three Deputy Directors (Scientific Strategy, Dr. Julio Camarero; Outreach, Dr. Emilio Pérez and Infrastructure, Dr. Daniel Granados), the Executive Manager (Bonifacio Vega), the Vicedirector (Dr. Nazario Martín) and the Director (Dr. Rodolfo Miranda).

We have consolidated in 2020 the amazing figure of 2/3 of our budget being obtained from external, competitive sources, with only 1/3 coming directly from the administration. We have to remember that in 2009 the fraction of competitive funds that we were able to obtain was only 1/3 of the total. Even in the unusual circumstances of this year we have been able to obtain numerous projects from many different sources (private companies, European and American sources) in areas going from health or disruptive nanomaterials to ultrafast phenomena or quantum technologies. In spite of this success, there is a clear need to increase the basal financial support in order to ensure the long-term competitiveness of the Institute. The administration of the Regional Government in Madrid has shown a clear commitment in this direction.

During this year, hard and painful, I have witnessed the full commitment of everyone at the Institute, from scientists to technicians, managers or administrators and I have felt proud of all of them. It is an honor for me to be still part of this adventure.

Rodolfo Miranda
Director, IMDEA Nanociencia Institute
June 2021
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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**

- **BOARD OF TRUSTEES**
- **BOARD DELEGATE COMMISSION**
- **DIRECTOR**
  - Rodolfo Miranda
- **VICE DIRECTOR**
  - Nazario Martín
- **EXECUTIVE MANAGER**
  - Bonifacio Vega
- **SCIENTIFIC ADVISORY COMMITTEE**

**Internal Governing Structure**

- **DIRECTOR**
- **EXECUTIVE COMMITTEE**
- **RESEARCH PROGRAMMES COMMITTEE**
- **MANAGEMENT COMMITTEE**

**Executive Commission**

- **EXECUTIVE COMMISSION**
  - Rodolfo Miranda
    - DIRECTOR
  - Emilio Pérez
    - Deputy Director
    - Scientific Outreach
  - Daniel Granados
    - Deputy Director
    - Scientific Infrastructure
  - Bonifacio Vega
    - Executive Manager
  - Nazario Martín
    - Vice Director
  - Julio Camarero
    - Deputy Director
    - Scientific Strategy
4. Severo Ochoa

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

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

The focus under the Severo Ochoa programme are shown below where the research groups can make real contributions to the advancement of knowledge and technology innovation. The creation of a Translational Platform to encourage cross-programme collaboration for prototyping, proof-of-concept testing, scaling-up and implementation of technologies developed in order to bridge the gap between our labs and society.

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

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

PRESIDENT OF THE BOARD OF TRUSTEES
Prof. Ivan K. Schuller
Expert on transfer of knowledge and nanotechnology. Advisor of the State of California and the National Nanotechnology Initiative, USA

MADRID REGIONAL GOVERNMENT
Mr. Eduardo Sicilia Cavanillas
Counselor of Science, Universities and Innovation, Madrid Regional Government, Spain
Ms. Sara Gomez Martín (until June 2020)
Ms. Irene Delgado Sotillos (since June 2020)
General Director of Universities and Higher Artistic Teachings, Madrid Regional Government, Spain
Ms. Mª Luisa Castaño Marín
General Director of Research and Innovation, Madrid Regional Government, Spain

Ms. Bárbara Fernández-Reveluca Fernández-Durán
Deputy Director General for Research, Madrid Regional Government, Spain
Mr. José de la Sota Rius
Deputy Director of the Madrimasd Foundation

SPAIN NATIONAL GOVERNMENT
Prof. Cayetano López
CIMAT, Madrid, Spain

IMDEA INSTITUTES TRUSTEES
Dr. Fernando Temprano Posada
Appointed by IMDEA Software
Dr. Jerry B. Torrance
Appointed by IMDEA Materiales

SCIENTISTS
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
CIMAT, Madrid, Spain

Prof. Luis Echegoyen
University of Texas El Paso, USA

Prof. Miquel Salmerón
University of California, Berkeley, USA

INDUSTRY
Mr. Emilio Ramiro Arcas (substitute: Mrs. Silvia Cristina López Vidal)
Ramem, S.A

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. Miquel Salmerón
Department of Materials Science and Engineering, University of California, Berkeley, USA

Prof. Johannes Barth
Department of Physics, Technische Universität München, Germany

Prof. Harald Brune
Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland

Prof. Maurizio Prato
Dipartimento di Scienza Farmaceutiche. Università di Trieste, Italy

Prof. Rasmita Raval
Department of Chemistry, University of Liverpool, United Kingdom

Prof. Dr. Christoph Gerber
Department of Physics, University of Basel, Switzerland

Prof. Yvan Bruynserade
Department of Physics and Astronomy, Katholieke Universiteit Leuven, Belgium

Prof. Carlos Andrés Prieto de Castro
Spanish National Research Council (CSIC), Spain

Prof. Ignacio Lizasoain Hernández
Complutense University of Madrid, Spain

Prof. José Manuel González Sancho
Autonoma University of Madrid, Spain

Prof. Fernando Calle
Polytechnic University of Madrid, Spain

Prof. Ignacio Lizasoain Hernández
Complutense University of Madrid, Spain

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Autonoma University of Madrid, Spain

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Spanish National Research Council (CSIC), Spain

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Complutense University of Madrid, Spain

Prof. José Manuel González Sancho
Autonoma University of Madrid, Spain

Prof. Fernando Calle
Polytechnic University of Madrid, Spain
7. IMDEA Nanociencia at a Glance

Scientific Production

**Times cited**
- Total No. of publications: 2,260
- Ave citation per item: 28.37
- h index: 108

**Citations in each year**

**Publications in each year**

**Highly cited researchers**

Prof F Guinea named as one of 2020’s Highly Cited Researchers by the Web of Science Group.

This honour recognises the most influential researchers, and is demonstrated by the production of multiple highly-cited papers that rank in the top 1% by citations for field and year in Web of Science.
1. Overview

Talent

<table>
<thead>
<tr>
<th>Staff</th>
<th>Researchers</th>
<th>Nationalities</th>
<th>Average age</th>
<th>Gender balance (M/F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>213</td>
<td>196</td>
<td>18</td>
<td>34</td>
<td>57/43</td>
</tr>
</tbody>
</table>

Percentage of Funding from Core vs Competitive sources

CORE funding is from trustees, SOFT funding includes competitive projects (EU’s H2020 programme, the Spanish Ministry of Science and the Madrid Regional Government), industry contracts, and funding from private institutions (La Caixa, etc.)

Nature index

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

<table>
<thead>
<tr>
<th>INSTITUTION</th>
<th>COUNT</th>
<th>SHARE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spanish National Research Council (CSIC)</td>
<td>1207</td>
<td>209.41</td>
</tr>
<tr>
<td>Institute of Health Carlos III (ISCIII)</td>
<td>264</td>
<td>22.37</td>
</tr>
<tr>
<td>IMDEA Nanociencia</td>
<td>52</td>
<td>7.76</td>
</tr>
<tr>
<td>Spanish National Center for Cardiovascular Research (CNIC)</td>
<td>24</td>
<td>7.02</td>
</tr>
<tr>
<td>Basque Center for Macromolecular Design and Engineering</td>
<td>30</td>
<td>6.31</td>
</tr>
<tr>
<td>ALBA Synchrotron</td>
<td>45</td>
<td>5.96</td>
</tr>
<tr>
<td>Basque Research and Technology Alliance (BRTA)</td>
<td>31</td>
<td>5.18</td>
</tr>
<tr>
<td>Centre for Energy, Environment and Technology (CIEMAT)</td>
<td>86</td>
<td>4.24</td>
</tr>
<tr>
<td>National Institute for Agricultural and Food Research and Technology</td>
<td>15</td>
<td>2.48</td>
</tr>
<tr>
<td>Catalan Institute for Water Research (ICRA)</td>
<td>8</td>
<td>1.66</td>
</tr>
</tbody>
</table>
Research programmes and scientists

Nanochemistry [16]
Time Resolved Spectroscopies [28]
Atomic Scale Quantum Materials [38]
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

- **Functional Nanoscale Materials and Devices**
  Dr. Enrique Burzuri

- **Catalysis and Systems Chemistry**
  Dr. Ignacio Colomer

- **Electrochemical Biosensors**
  Prof. Encarnación Lorenzo

- **Functional Organic Materials**
  Prof. Tomás Torres

- **Covalent Organic Frameworks**
  Prof. Félix Zamora

- **Biosensors**
  Prof. José Manuel Pingarrón

- **Functional Organic Materials Hybrid Nanomaterials**
  Dr. Beatriz H. Juárez
About the programme

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

Webpage: http://www.nazariomartingroup.com

GROUP LEADER

Prof. Nazario Martín
Research Professor

PhD: Universidad Complutense de Madrid, Spain

Double Affiliation: Universidad Complutense de Madrid, Spain

ORCID:
0000-0002-5355-1477

Researcher ID:
B-4329-2008

POSTDOCS

Dr. Agustín Molina Ontoria
University of Texas at El Paso, USA

Dr. José Santos
Durham University, UK

Dr. Inés García Benito
Ecole polytechnique fédérale de Lausanne, Swiss

Dr. Javier Urieta
Universidad Complutense de Madrid, Spain

Research lines

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


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


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

PhD STUDENTS

Eider Sánchez
Jesus Galán
Luis Manuel Mateo
Chemistry of Low-Dimensional Materials


GROUP LEADER

Prof. Emilio M. Pérez
Senior Research Prof.
PhD: University of Edinburgh, UK
Previous Position: Universidad Complutense de Madrid, Spain
ORCID: 0000-0002-8739-2777
Researcher ID: B-1870-2008

POSTDOCS
Dr. Manuel Vázquez
University of Trieste, Italy
Dr. Xu Wei
The Hong Kong Polytechnic University, Hong Kong
Dr. Zhang Wanzheng
University of Erlangen-Nürnberg, German
Dr. Matthew Eaton
Northern University, Illinois, USA
Dr. Natalia Martín Sabanes
Johannes Gutenberg University, Mainz, Germany
Dr. Julia Villalva
Universidad Autónoma de Madrid, Spain

PhD STUDENTS
Sara Moreno
Alicia Naranjo
Tomás Nicolás
Ramiro Quirós
Julia Villalva

TECHNICIANS
Christine Marie Arenas
Silvia Miranda

VISITOR
Dr. Eric Anglaret
University of Montpellier, France

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

Research lines

At the Switchable NanoMaterials group (SNM) we are mainly focused on the development of metal-based coordination complexes at the macro- and nanoscopic scale for their technological application in the fields of quantum computing, spintronic and sensing devices. Besides, we are interested in developing novel dynamic molecules sticker by soft interactions capable to act as porous materials for energy storage. Our multidisciplinary approach is based on three major themes:

1. Iron-based Spin Crossover (SCO) Switchable coordination complexes (Dalton Transactions, 2020, 49, 7315; Chemistry-A European Journal, 2020, 26, 10801)
3. Non-porous architectures acting as porous compounds (ICF, 2020, 7, 3165-3175; ACIE, 2019, 58, 2310; Chemical Science, 2019, 10, 6612)

A novel extended triazole-based ligand (PM-Tria) has been synthesized and an unprecedented MOF 3D architecture has serendipitously been formed by assembling iron(II), PM-tria ligand and fluoride anions. This MOF contains a perfectly linear one-dimensional (Fe(II)-F), bridging chain that shows an antiferromagnetic behaviour. Furthermore, the structure is compared with a 14th century mosaic found in the Alhambra Palace in Granada showing a surprising symmetry resemblance See Chem. Comm., 2018, 54, 5526.
Functional Nanoscale Materials and Devices


GROUP LEADER

Dr. Enrique Burzurí
Position: Assistant Research Prof. (tenure track)
PhD: Universidad de Zaragoza
ORCID:
0000-0001-7906-7192
Researcher ID:
M-3501-2015

PhD STUDENTS
Aysegu Develioglu
Lucía Martín

Research lines

1. **2D and 1D materials:** We are interested in the fundamental properties of 2D materials and their integration into (opto) electronics and spintronics devices. We have assembled scalable nano-transistors based on franckeite heterostructures obtained by liquid-phase exfoliation. We are also involved in the controlled positioning of 1D SWNTs in complex devices. We have fabricated Physically Unclonable Functions (PUFS) and field-effect transistors with chemically modified SWNTs selectively positioned by dielectrophoresis.

2. **Magnetism of molecular materials:** We are also very interested in fundamental studies of the magnetism of molecules and other nanoscale materials (coordination polymers, 2D materials, mechanically interlocked magnetic molecules). For example, we have studied the magnetism of cylindrite van der Waals heterostructures down to the 2D limit. We have also studied the magneto-electronic response of Fe-based coordination polymers to volatile organic molecules.

3. **Molecular spin QBits:** Finally, we are exploring the incorporation of SWNT-magnetic molecule hybrids into superconducting circuits as spin QBits for quantum computation.
Catalysis and systems chemistry

Webpage: https://colomerlab.com

GROUP LEADER

Dr. Ignacio Colomer
Assistant Research Prof. (tenure track)

PhD: Universidad Complutense de Madrid, Spain
Previous Position: University of Oxford, UK

ORCID: 0000-0001-5542-7034
Researcher ID: AAB-2389-2020
Scopus: 38562666400

POSTDOCS

Dr. Laura Trulli
University of Rome “La Sapienza”

PhD STUDENTS

César Vicente

Research lines

Our group has focused on three main research lines:

1. The long-term goal of building a synthetic protocell based on chemical reactivity principles. This challenging bottom-up project intends to generate a toolbox of chemical reactions that can be used to build increasingly complex dynamic systems that operate far-from-equilibrium.

2. We are particularly interested in designing and using small lipopeptides, studying their supramolecular behaviour to understand their properties and apply them in different areas, such as catalysis, antibacterial, drug delivery or as privileged scaffolds in systems chemistry.

Electrochemical Nanobiosensors

Webpage: http://www.uam.es/gruposinv/biosens

Research lines

1. **Nanomaterials for Biosensor development**: We have developed amperometric (bio)sensors with improved performance by the inclusion of nanomaterials, such as nanodiamonds, graphene, carbon nanotubes, carbon dots and gold nanoparticles. These nanomaterials have also been chemically modified.

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

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

4. **Use of operando methods (Raman-electrochemistry, UV-V- electrochemistry)** for the mechanistic elucidation of electrochemically driven structural transformation or nanomaterial chemical modification.

GROUP LEADER

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

PhD: Universidad Autónoma de Madrid, Spain

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

**ORCID**: 0000-0001-8432-9652

**Researcher ID**: K-9825-2014
Research lines

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


2. Our group is also active in the area of photodynamic therapy (PDT), and have reviewed recently on the unique features of Pcs as advanced photosensitisers for PDT of cancer (Chem. Soc. Rev. 2020, 49, 1041). We have also successfully used Pcs in antimicrobial PDT (Eur. J. Med. Chem. 2020, 187, 111957).

3. Finally, our group is investigating the use of porphyrinoids in nanotechnological spaces. In this context, we have recently described the use of Pcs-virus nanofibers as heterogeneous catalysts for continuous-flow photooxidation processes (Adv. Mater. 2019, 31, 1902582), and the on-surface synthesis and characterization of triply-fused Por-graphene nanoribbon hybrids (Angew. Chem. Int. Ed. 2020, 59, 1334 and Angew. Chem. Int. Ed. 2021, 60, DOI: 10.1002/anie.202105350).
2. Research programmes and scientists

Covalent Organic Frameworks

Webpage: https://www.nanomater.es

GROUP LEADER

Prof. Félix Zamora
Associate Research Professor
PhD: Universidad Autónoma de Madrid, Spain
Double Affiliation: Universidad Autónoma de Madrid, Spain

ORCID:
0000-0001-7529-5120
Researcher ID:
E-6265-2014

Research lines

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

1. One-dimensional coordination polymers with electrical properties, and their potential use as "molecular wires", and the use of coordination polymers of lamellar structure to produce nanometric films and monomolecular thickness.

2. Two-dimensional materials with a rational chemical design using Covalent Organic Frameworks and Metal-Organic Frameworks: It aims to provide alternative two-dimensional materials using chemical synthesis for a rational design of structures and properties.

3. Two-dimensional materials based on inorganic crystals such as graphene, boron nitride and antimonene: Our aim is to provide novel synthetic routes for the production of suspensions and the characterization of these materials on surfaces.

4. Design and synthesis of porous Materials with potential applications in water and energy based on Covalent Organic Frameworks.

Webpage: https://www.nanomater.es
Biosensors


GROUP LEADER

Prof. José Manuel Pingarrón
Associate Research Professor

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

ORCID: 0000-0003-2271-1383
Researcher ID: M-9402-2014
Scopus Author ID: 7005489861

Research lines

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

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

Functional Organic Materials Hybrid Nanomaterials

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

GROUP LEADER

Dr. Beatriz H. Juárez
Associate Researcher

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

ORCID:
0000-0003-1704-060X
Researcher ID:
G-7066-2011
L-5896-2017

PhD STUDENT

Andrés Solana

Research lines

1. The main research line includes the synthesis of colloidal nanocrystal (mainly semiconductor nanocrystals or quantum dots in 0, 1, and 2D as well as hybrid systems) with the aim to design rules for optimal nanocrystals performance. Special emphasis is given to surface chemistry studies by X-ray Photoelectron Spectroscopy and X-ray absorption Spectroscopy and characterization by advanced optical and microscopical techniques.

2. Functional materials for nanothermometry based on semiconductor nanocrystals. Among the fabricated systems for nanoscale thermal monitoring we focus on the synthesis of nanocrystals with adequate size and surface treatment for luminescence nanothermometry in the NIR range, where light attenuation in tissues is minimized and higher sensitivity can be achieved.
programme

Time Resolved Spectroscopies

Programme Manager: Prof. Johannes Gierschner

Research lines

Photophysics of Organic and Hybrid Supramolecular Nanosystems
Prof. Johannes Gierschner

Nanooptics and Nanoacoustics
Prof. Reinhold Wannemacher

Pump-probe Photoinduced Absorption Spectroscopy
Dr. Juan Cabanillas González

Nanostructured Photovoltaics
Dr. Enrique Cánovas

Time-resolved X-ray Spectroscopy in Biological and Chemical Catalysis
Dr. Dooshaye Moonshiram

Modelling Physical Properties of Nanostructures
Prof. Fernando Martín

Femtochemistry
Prof. Luis Bañares
About the programme

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


GROUP LEADER

Prof. Johannes Gierschner
Senior Research Prof.
PhD: University of Tübingen, Germany
Previous Position: Univ. Mons, Belgium

ORCID:
0000-0001-8177-7919
Researcher ID:
K-7938-2014

POSTDOCS

Dr. Kumar Behera Santosh
Indian Institute of Science Bangalore, India

VISITING RESEARCHER

Dr. Begoña Milian
Universidad de Valencia, Spain

PhD STUDENTS

Juan Carlos Roldao
Liangxuan Wang,
University of Tübingen
01/03/2020-31/08/2020

MSC

Sebastian Alonso Javier Enrique
Uppsala University
14/09/2020 - 06/11/2020
Liangxuan Wang
University of Tübingen,
01/03/2020 - 31/08/2020

POSTDOCS

Dr. Kumar Behera Santosh
Indian Institute of Science Bangalore, India

VISITING RESEARCHER

Dr. Begoña Milian
Universidad de Valencia, Spain

PhD STUDENTS

Juan Carlos Roldao
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University of Tübingen
01/03/2020-31/08/2020

MSC

Sebastian Alonso Javier Enrique
Uppsala University
14/09/2020 - 06/11/2020
Liangxuan Wang
University of Tübingen,
01/03/2020 - 31/08/2020

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 tailormade 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.
2. Research programmes and scientists

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imdea nanoscience institute

Nanooptics and Nanoacoustics

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

GROUP LEADER

Prof. Reinhold Wannemacher
Senior Research Prof.

PhD: University of Darmstadt, Germany

Previous Position: University of Leipzig, Germany

ORCID: 0000-0001-7192-3556

Researcher ID: F-7108-2011

PhD STUDENTS
Sergio Ramírez
Yansheng Liu
(co-supervised with Dr. Luo Feng)

RESEARCH ASSISTANT
Sergio Iglesias
(co-supervised with Dr. J. Cabanillas)
Jorge González
(co-supervised with Dr. J. Cabanillas)

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
Research lines

1. **Conjugated polymers for photonics**: relation between structure and light amplification properties. We study the optical gain and stimulated emission properties of conjugated polymers with femtosecond transient absorption spectroscopy. We focus on chemical structures designed to promote optical gain upon reducing inter-chain interactions. Suppression of loss mechanisms like exciton-exciton annihilation, or polaron absorption and promotion of strong host:guest interactions on polymer mixtures are crucial for outstanding light amplifying properties.

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

3. **Fluorescent chemosensors**. We investigate the use of fluorescence, amplified spontaneous emission and laser action in cavity resonators as transduction signal for sensing analytes with high sensitivity in the gas or liquid phase. For this purpose we exploit the luminescent properties of conjugated polymers, organic dyes and porous metal-organic frameworks processed in films and composites.
Nanostructured Photovoltaics

Webpage: https://ecanovas6.wixsite.com/nanopv

GROUP LEADER

Dr. Enrique Cánovas
Assistant Research Prof. (tenure track)

PhD: Universidad Politécnica de Madrid (UPM)
Previous Position: Group Leader at Max Planck for Polymer Research (MPIP).

ORCID:
0000-0003-1021-4929

PhD STUDENTS
Sergio Revuelta
Miguel Ángel Pulido

Research lines

1. Charge carrier dynamics at interfaces.


Unveiling Electronic Properties in Metal–Phthalocyanine-Based Pyrazine-Linked Conjugated Two-Dimensional Covalent Organic Frameworks.
Time-resolved X-ray Spectroscopy in Biological and Chemical Catalysis

Webpage: http://www.nanoscience.imdea.org/home-en/people/item/moonshiram

GROUP LEADER

Dr. Dooshaye Moonshiram
Assistant Research Prof. (tenure track)
PhD: Purdue University, U.S.A
Previous Position: Alexander Humboldt Fellow at Max Planck Institute for Chemical Energy Conversion, Mulheim, Germany

ORCID:
0000-0002-9075-3035
Researcher ID:
J-5138-2014

RESEARCH ASSISTANTS

Sirma Iglesias
Marina Córdoba

Research lines

1. Mapping the electronic and energetic requirements for the design of efficient and economical catalysts through synchrotron-based steady-state and time-resolved spectroscopy.

2. Developing molecular approaches to enable catalysts’ designs on electrode surfaces for realization of practical hybrid devices.

3. Investigating the time-resolved intramolecular electron transfer dynamics, kinetics, and geometric changes in homogeneous and surface-anchored modules for water oxidation, proton reduction and methane to methanol oxidation reactions.

2. Research programmes and scientists

Modelling Physical Properties of Nanostructures

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

GROUP LEADER

Prof. Fernando Martín
Associate Research Professor

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

Código Orcid: 0000-0002-7529-925X
Researcher ID: C-3972-2014

POSTDOCS
Dr. Michele Pisarra
University of Calabria, Italy
Dr. Alberto González Castrillo
Dr. Juan José Omiste
University of Toronto, Canada
Dr. Gilbert Grell
Universität Rostock, Germany
Dr. Etienne Plesiat
Universidad Autónoma de Madrid, Spain

PHD STUDENTS
Kilian Arteaga
Jorge Delgado
Francisco Fernández
Joel Gabriel Fallaque

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

GROUP LEADER

Prof. Luis Bañares
Associate Research Professor
PhD: Universidad Complutense de Madrid, Spain
Double Affiliation: Universidad Complutense de Madrid, Spain

ORCID:
0000-0002-0777-2375
Researcher ID:
B-7922-2014

POSTDOCS
Dr. Sonia Marggi
Dr. Sanat Ghosh
Dr. David Chicharro
Dr. Hugo Dacasa

PHD STUDENTS
Marta Murillo
Olivia Borrell

TECHNICIANS
Dr. Jesús González

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.

POSTDOCS
Dr. Sonia Marggi
Dr. Sanat Ghosh
Dr. David Chicharro
Dr. Hugo Dacasa

PHD STUDENTS
Marta Murillo
Olivia Borrell

TECHNICIANS
Dr. Jesús González
Ultrafast X-ray Science

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

GROUP LEADER
Prof. Wojciech Gawelda
Associate Research Professor
PhD: Ecole Polytechnique Fédérale de Lausanne, Switzerland
Double Affiliation: Distinguished “Beatriz Galindo” Professor, Department of Chemistry, Universidad Autónoma de Madrid
Previous Position: European XFEL, Schenefeld, Germany

ORCID:
0000-0001-7824-9197
Researcher ID:
B-7878-2014

POSTDOC
Dr. Andrés Burgos
Universidad Autónoma de Madrid, Spain

PhD STUDENT
Tae Kyu Choi
University of Hamburg/European XFEL, Germany

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
programme

Atomic Scale Quantum Materials

Programme Manager: Prof. Rodolfo Miranda

Research lines

- **Scanning Probe Microscopies and Surfaces**
  - Prof. Rodolfo Miranda

- **Theoretical Modelling**
  - Prof. Francisco Guinea

- **Nanoarchitectures at surfaces**
  - Dr. David Écija

- **Spin-Polarized low T STM**
  - Dr. Fabián Calleja

- **Topological surfaces states in quantum materials**
  - Dr. Manuela Garnica

- **Molecular Electronics**
  - Dr. Edmund Leary

- **Imaging of 2D Materials**
  - Prof. Amadeo L. Vázquez de Parga

- **Photonic STM**
  - Dr. Roberto Otero

- **Thermopower at the Nanoscale**
  - Prof. Nicolas Agrait

- **Theoretical Study of Molecules on Surfaces**
  - Prof. Manuel Alcamí

- **Surface Reactivity**
  - Prof. Juan M. Rojo
About the programme

The use of advanced microscopies and spectroscopies with atomic resolution is essential to characterize matter at the nanoscale. The scientists involved in this programme develop at IMDEA advanced Scanning Probe Microscopes, mostly STM, AFM and Photoelectron Microscopy to investigate problems such as the epitaxial growth of graphene, the chemical functionalization of graphene, the design of metal-intercalated graphene heterostructures, the characterization of topological insulators, the self-assembly of molecules at surfaces, the on-surface synthesis of nanomaterials from molecular precursors, the design of surface-confined metal-organic architectures, the in-situ fabrication and response of nano-catalysts, the realization of scanning tunnelling spectroscopy and inelastic scanning tunnelling spectroscopy at the level of single molecules, the investigation of tip-induced electroluminescence or the spin polarized imaging of magnetic nanostructures. Friction at the nanoscale and theoretical modelling are also involved. Activities of this programme have implications for aeronautics, electronic, magnetic, sensory, and energy applications.
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.
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.
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 CO$_2$ reduction.

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**GROUP LEADER**

**Dr. David Écija**
Senior Research Prof.

PhD: Universidad Autónoma de Madrid, Spain
Previous Position: Technical University of Munich, Germany

Researcher ID: I-2207-2012

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**RESEARCHERS**

**Dr. Koen Lauwaet**
Researcher
ICMM-CSIC, Spain

**Dr. Jose Ignacio Urgel**
Technische Universität München, Germany

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**POSTDOCS**

**Dr. Sofia de Oliveira**
Universidade Federal de Minas Gerais, Brazil

**Dr. Ana Sánchez Grande**
IMDEA Nanociencia

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**PhD STUDENTS**

Daniel Moreno
Cristina Martin
Kalyan Biswas

---

**TECHNICIAN**

Isabel Ortiz

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**VISITOR**

**Dr. Jose Maria Gallego**
ICMM-CSIC, Spain

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**Webpage:** http://ecija.hol.es

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**Nanoarchitectures at Surfaces**

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**Coordination chemistry on surfaces**

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**On-surface synthesis**

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**Chemistry at Surfaces**

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**On-surface model oxide catalysts**

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Spin-Polarized low T STM

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

GROUP LEADER

Dr. Fabián Calleja
Assistant Research Prof. (tenure track)
PhD: Universidad Autónoma de Madrid, Spain
Previous Position: Ecole Polytechnique Federale de Lausanne (EPFL), Switzerland
Researcher ID: I-7964-2012

PhD STUDENT

Cosme González
(co-supervised with Dr. 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. Extrapolation to other novel 2D materials.

We have created and characterized a superconducting (SC) nanostructure at the apex of a tungsten STM tip. The resulting SC gap width at 1 K (panel a) was reproduced in over 80 different tips (panel b), with a critical temperature around 3.5 K (panel c). Appl. Phys. Lett. 115, 073108 (2019); doi: 10.1063/1.5097694
Topological surfaces states in quantum materials

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

GROUP LEADER

Dr. Manuela Garnica
Assistant Research Prof. (tenure track)
PhD: Universidad Autónoma de Madrid, Spain
Previous Position: Technical University of Munich, Germany
ORCID: 0000-0002-7861-9490
Researcher ID: AAG-8254-2019

PhD STUDENTS

Pablo Casado
(co-supervised with Dr. Amadeo L. Vázquez de Parga)
Joan Ripoll

Research lines

Our research interests deal with 2D materials and new topological states of matter. In recent years, topological materials have attracted a wide range of attention not only for the possibility to study many aspect of fundamental physics but also because of their potential applications.

- Epitaxial growth.
- Graphene.
- Topological materials.
- Low-Temperature Scanning Tunnelling Microscopy.

“Experimental determination of surface thermal expansion and electron–phonon coupling constant of 1T-Ptx” Gloria Anemone, Manuela Garnica et al. 2D Materials 7, 025007
Molecular Electronics

GROUP LEADER

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

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

ORCID:
0000-0001-7541-5997
Researcher ID:
L-1066-2018

Research lines

1. Structure-property relationships in electron transport through single molecules.
2. Effective binding groups for the robust attachment of molecules to electrodes.
3. Aromaticity and anti-aromaticity and their effects on molecular transport.
4. Quantum Interference.

Bias-Driven Conductance Increase with Length in Porphyrin Tapes; J. Am. Chem. Soc. 2018, 140, 40, 12877–12883 (Open access article).
Imaging of 2D Materials

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

GROUP LEADER
Prof. Amadeo L. Vázquez de Parga
Associate Research Professor
PhD: Universidad Autónoma de Madrid, Spain
Double Affiliation: Universidad Autónoma de Madrid, Spain
Researcher ID: L-2418-2013

PhD STUDENTS
Pablo Casado (co-supervised with Dr. Garnica)
Cosme González (co-supervised with Dr. Calleja)
Iván Martínez

Research lines

We are exploring the properties of 2D materials by means of low temperature scanning tunnelling microscopy and spectroscopy (LT-STM/STS) in ultra-high vacuum conditions. We grow the 2D materials by means of molecular beam epitaxy (MBE), and we are focused on the following research lines:

1. **Chemistry of 2D materials.** We are exploring the chemistry of 2D materials in ultra-high vacuum conditions.

2. **Tuning the electronic structure of 2D materials.** We are interested in the influence of the substrate on the electronic properties of the 2D materials.

3. **Superconductivity.** We are interested in the superconductivity on 2D materials, the influence of the substrate, doping level and strain.

4. **Integration of 2D material in devices.** Taking advantage of the clean room facilities of the Campus of Excellence UAM-CSIC located in the building of IMDEA Nanoscience, we are exploring the integration of 2D materials on electronic devices.
Photonic STM

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

GROUP LEADER

Prof. Roberto Otero
Associate Researcher

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

ORCID:
0000-0001-6936-4003
Researcher ID:
E-4516-2011

PhD STUDENT
Óscar Jover

MSC
Alba Santos
Universidad Autonoma de Madrid, Spain
Hussein Shams
Universidad Autonoma de Madrid, Spain

VISITOR
Dr. José María Gallego
ICMM-CSIC, Spain

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.
**Thermopower at the Nanoscale**

Webpage: [http://www.nanociencia.imdea.org/home-en/people/item/nicolas-agrait-de-la-puente](http://www.nanociencia.imdea.org/home-en/people/item/nicolas-agrait-de-la-puente)

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**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), oligynes, phthalocyanines, porphyrins... (*JACS 2013*, *JACS 2014*, *JACS 2015*, *JACS 2018*).

2. Thermo power of single-molecule junctions: we explore to ability to a single molecule of different compounds to generate an electrical potential when they are under a thermal gradient (*Nano Lett. 2013*, *Nature Mater. 2016*, *Chem. Soc. Rev. 2016*).


5. Other electrode materials different from gold.

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**GROUP LEADER**

Prof. Nicolás Agraït
Associate Research Professor

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

ORCID ID:
0000-0001-8177-7919
Researcher ID:
I-2207-2012
Theoretical Study of Molecules on Surfaces

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

GROUP LEADER

Prof. Manuel Alcamí
Associate Research Professor

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

Research lines

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

His current research lines are:

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.
programme

NanoMagnetism

Programme Manager: Prof. Julio Camarero

Research lines

Advanced Magneto-Optics
Prof. Julio Camarero

Rare-Earth free Permanent Magnets
Dr. Alberto Bollero

Growth & Nanostructuring
Dr. Feng Luo

Technological and biomedical applications of magnetic nanoparticles
Dr. Francisco Terán

SpinOrbitronics
Dr. Paolo Perna

Epitaxial Growth
Dr. Miguel Ángel Niño

Magneto-photothermia
Dr. A. Espinosa

Electrodeposited nanowires
Dr. Lucas Pérez
About the programme

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

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

We aim at a better understanding of fabrication processes and physical properties of new 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


GROUP LEADER

Prof. Julio Camarero
Associate Research Professor
PhD: Universidad Autónoma de Madrid, Spain
Double Affiliation: Universidad Autónoma de Madrid, Spain
ORCID: 0000-0003-0078-7280
Researcher ID: C-4375-2014

POSTDOCS
Dr. José Luis F. Cuñado
Universidad Autónoma de Madrid, Spain
Dr. Rubén Guerrero
Institut d’Electronique Fondamentale (IEF)
Universite Paris- Sud, France
(co-supervised with Dr. P. Perna)

PhD STUDENTS
José Manuel Díez
Adrián Gudín
Beatriz Muñiz

MSC
Javier Castillo
(Co-Supervised by Dr. Ana Espinosa)
Universidad Autónoma de Madrid, Spain

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.
2. Research programmes and scientists

**Rare-Earth free Permanent Magnets**

Webpage: [http://nanociencia.imdea.org/division-permanent-magnets-applications](http://nanociencia.imdea.org/division-permanent-magnets-applications)

**GROUP LEADER**

**Prof. Alberto Bollero**
Senior Research Prof.

PhD: Technical University of Dresden

Previous Position: SPINTEC-CEA, France

**ORCID:**
0000-0002-3282-0981

**Researcher ID:**
C-3217-2017

**POSTDOCS**

Dr. Ester M. Palmero
ICMM-CSIC, Spain

Dr. Cristina Navío
Universidad Autónoma de Madrid, Spain

Dr. Javier Rial
IMDEA Nanociencia

Dr. Clémentine Bidaud
Université de Haute-Alsace, France

**PhD STUDENTS**

Melek Villanueva
Daniel Casaleiz
Carla Muñoz
Jimena Soler
Alonso José Campos

**TECHNICIANS**

Javier de Vicente
Cristina María Montero

**Research lines**

1. Fundamental and applied aspects of permanent magnets (PMs) with no or reduced content of rare-earths: MnAl-based, MnBi, L10-FeNi, ferrites, hybrid ferrite/NdFeB.

   (a) Industrial collaborations: Höganäs (Sweden), IMA (Barcelona), RAMEM (Madrid)...

   (b) Projects under international Calls: H2020 FET-OPEN, M-ERA.NET.

2. Nanostructured PMs (powders and bulk).

3. Additive manufacturing of PMs.


5. Nanoparticle engineering, and electrochemical synthesis of PM nanostructures.

6. Development of micromagnets for microdevices (e.g. micro-robots in microsurgery).

7. Recycling of PMs.

Growth & Nanostructuring

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

GROUP LEADER

Prof. Feng Luo
Senior Research Prof.

PhD: Peking University, China
Previous Position: Peking University, China

Researcher ID:
E-3683-2012

PhD STUDENT
Yansheng Liu
(co-supervised with Dr. R. Wannemacher)

Research lines

1. Micro/Nano Fabrication and Ultra-Precision Manufacturing for Applications in Magnetic Hard Disk Storage, Magnetic Random Access Memory (MRAM) and Magneto-Optical Sensors.


3. Advanced Characterization Techniques Based on X-ray and Electrons.

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

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

GROUP LEADER

Dr. Francisco J. Terán
Assistant Research Prof.
(tenure track)
PhD: Université Josep Fourier - Grenoble 1, France
Previous Position: Fundación Gaiker, Spain
ORCID: 0000-0002-2466-6208
Researcher ID: F-1285-2010

PhD STUDENTS
Claudia Lozano

RESEARCH ASSISTANTS
Diego Gómez
Lydia Abellan

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 loses of magnetic nanoparticles subjected to laser irradiation.

5. The development and validation of instrumentation for advanced magnetic measurements. In the last 5 years, the Advanced Instrumentation Unit has developed high-tech instrumentation for reliable characterization of magnetic nanoparticles in colloidal dispersions or inside biological matrices.
Spinorbitronics

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

GROUP LEADER

Dr. Paolo Perna
Assistant Research Prof. (tenure track)
PhD: University of Caen Basse-Normandie, France & University of Cassino, Italy
Previous Position: CNR-SPIN, Italy
Researcher ID: C-3862-2012

POSTDOCS

Dr. Rubén Guerrero
Institut d’Electronique Fondamentale (IEF)
Universite Paris- Sud, France (co-supervised with Dr. J. Camarero)

Dr. Alberto Anandon
Universidad de Zaragoza, Spain

Dr. Iciar Arnay

PhD STUDENTS

Leticia de Melo
Pablo Olleros

TECHNICIAN

Sergio de las Heras

Research lines

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

The main research lines of the group are:

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

2. **Oxide-Spintronics**: engineering artificially the surface/interface of nanostructures based on perovskite oxides (which show a wide variety of properties as half-metallicity, dielectricity, ferroelectricity, multiferroicity), with the aim to tailor their spin-dependent transport characteristics and merge in a single device the functionalities of their individual constituents.
2. Research programmes and scientists

Epitaxial Growth


Group Leader

Dr. Miguel Ángel Niño
Assistant Research Prof.
(tenure track)

PhD: Universidad Autónoma de Madrid, Spain
Previous Position: Elettra Synchrotron Radiation Facility (Trieste), Italy
Researcher ID: M-2571-2014

PhD Student

Juan Carlos Martin

Research lines

1. Surface reactivity: We investigate the role of different surfaces in the synthesis of organic molecules in prebiotic chemistry, as well as polymerization processes on metallic and oxide surfaces (“Reactivity of a FeS Surface under Room Temperature Exposure to Nitrogen and H2S”. As well we are interested in catalytic processes, like water splitting and OER reaction at FeNi oxide surfaces.

2. Chirality: We study the interplay between the chirality and spin filtering effects of thin molecular films, with the aim to develop new magnetic materials for organic spin valves and sensors (“Enantiosensitive noning of chiral molecules on a magnetic substrate investigated by means of electron spectroscopies”).

3. Magnetism: As part of the Nanomagnetism programme we are interested in magnetic effects of metallic and organic thin films, in particular studying the influence of the magnetic anisotropy on properties of interest for device applications (“Magnetic ordering in an (Fe0.2Cr0.8)1.5[Cr(CN)6] Prussian blue analogue studied with synchrotron radiation based spectroscopies”).

4. Growth of molecular films: We study the improvement of surfaces and interfaces of thin films of organic materials for solar cell (“Combinatorial optimization of evaporated bilayer small molecule organic solar cells through orthogonal thickness gradients”).
Magnetophotothermia

GROUP LEADER

Dr. Ana Espinosa
Assistant Research Prof.
(tenure track)

PhD: Universidad Complutense de Madrid, Spain
Previous Position: Université Paris VII, France (MSCA Fellow) and ICMM-CSIC, Madrid

ORCID:
0000-0002-5626-6129

Researcher ID:
G-9162-2011

PHD STUDENT

Rosalía López

Research lines

2. Physical biotransformations of therapeutic nanoparticles.
3. Combined synergy of thermal nanotherapies and other nano-based multimodal associations.

Electrodeposited nanowires

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

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.
## Programme

**Nanomedicine**

**Programme Manager:** Prof. Rodolfo Miranda

### Research lines

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About the programme

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

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

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

Research lines

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

1. Electrical electrodes covered by vertical conducting nanowires for electrical stimulation of the neural activity.
2. Sensors of neural activity base on magnetoresistive materials. We aim to demonstrate that magnetoresistive materials can be used to sense the neural activity without the use of cryogenic liquids (as SQUIDs detectors need).

Using template-assisted electrochemical deposition, we prepare metallic electrodes covered with a network of vertical-standing nanowires of enhanced effective area and reduced impedance. We use different materials and different nanowire sizes and organizations. Together with our biologist collaborators at the CSIC (Madrid) and SISSA (Trieste), we have characterized the enhanced adhesion of neural cells to the electrode nanostructure surface as well as the ability of the electrodes to stimulate neural tissue. See: Adv. Biosys. 2020, 2000117 and Adv. Mater. Interfaces 2021, 8, 2002121.

On the other hand, the magnetoresistance (MR) effect is widely used in technologies that pervade the world, from magnetic reading heads to sensors. We develop sensing devices for the detection of neural activity based on half-metallic manganites. We work to optimize our devices to reach the subnanoTesla regime in a configuration free from magnetic shields. We have demonstrated the ability to induce a dominant switchable magnetoresistance in La0.7Sr0.3MnO3 epitaxial films at room temperature. The dominant extrinsic AMR exhibits large variation in the resistance in low field region, showing high sensitivity to applied low magnetic fields. See: Adv. Funct. Mater. 2017, 1700664.
Metallo drugs

Webpage: http://nanociencia.imdea.org/metallo-drugs-to-modulate-cancer-cell-machinery/group-home

GROUP LEADER

Dr. Ana M. Pizarro
Assistant Research Prof.

PhD: Universidad Autónoma de Madrid, Spain
Previous Position: University of Warwick, UK

ORCID:
0000-0003-3037-9835
Researcher ID:
L-8348-2014

POSTDOC

Dr. Federica Battistin
University of Trieste, Italy

PhD STUDENTS

Ana Cristina Carrasco
Sonia Infante
Arturo Villechenous
Claudia Pierina Cardozo

TECHNICIAN

Catarina Leis Malvar

Research lines

1. Exploit metal coordination and organometallic chemistry principles to design novel potent metallo drugs.

2. Development of new methods to describe the chemical interactions of our systems with the intracellular components at the nanoscale.

3. Use of recent developments in nanomedicine to load our metallo drugs to a variety of nano-systems to provide, for example, heat-mediated amplified artificial catalysis.

A new family of iridium half-sandwich drug candidates has been designed that are exceptionally potent in a number of cancer cell lines. By using 3D cryo soft X-ray and fluorescence tomographies, correlatively on the same cryopreserved cell, we have localized and quantified our new iridium anticancer agent exclusively in the cell mitochondria. See: Unambiguous Intracellular Localization and Quantification of a Potent Iridium Anticancer Compound by Correlative 3D Cryo X-Ray Imaging. 2020, Angew. Chem. Int. Ed., 59, 1270-1278.

3D section of a breast cancer cryopreserved cell showing iridium density (colour palette) inside the mitochondria (yellow mesh).
Nucleic Acids and Nanoparticles in Nanomedicine

Webpage: www.nanobioimdea.com

GROUP LEADER
Prof. Álvaro Somoza
Senior Research Prof.
PhD: Universidad Autónoma de Madrid, Spain
Previous Position: Instituto de Investigación Biomédica Barcelona (IRB Barcelona), Barcelona, Spain
Orcid 0000-0001-9873-435X
Research ID F-8781-2010

POSTDOC
Dr. Milagros Castellanos
IMDEA Nanociencia, Spain
Dr. Rocío Coloma
CNB-CSIC, Spain
Dr. Hernán Alarcón
Universidad Autónoma de Madrid, Spain
Dr. Jordi Royes
Laboratoire Pasteur, ENS Chimie y IBPC, France

PhD STUDENTS
Ana Belén Latorre
Paula Milán
Eduardo García
Ciro Rodríguez Díaz
Demian Pardo
Nuria Lafuente Gómez
Catarina Castanhéira
Rama Prajapati

Research lines
1. Nanocarriers of bioactive molecules.
2. Sensors of nucleic acids based on nanomaterials.
3. CRISPR-based gene editing systems.

Research programmes and scientists

1. Our research is mainly focused in the preparation of magnetic hybrid nanostructures that could be used for medical imaging and treatment of tumors. That includes understanding the procedures that lead to well controlled inorganic hybrids that can respond different stimuli and developing general synthetic routes for different magnetic materials. Magnetic nanoparticles are being extensively studied worldwide as contrast agents for medical imaging and as nanoheaters under alternating magnetic fields. Many intrinsic and extrinsic factors (e.g. size, crystallinity, magnetism, aggregation, colloidal stability, dispersion medium, applied field, interactions with biological media) can influence the efficiency of nanoparticles in biomedicine. Another topic of interest, also for biomedical applications, is the use of hybrid magnetic nanocomposites as antibacterial agents, given the growing concerns about bacterial resistance and the lack of alternatives to antibiotics.

2. We are also exploring the use of magnetically recoverable nano-catalysts for environmental applications. Magnetic nanostructures offer the possibility of acting as catalysts or as platforms that allow the recovery of a bound catalyst.

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

GROUP LEADER

Dr. Gorka Salas
Assistant Research Prof. (tenure track)
PhD: Universidad de Valladolid, Spain
Previous Position: CNRS, France
ORCID: 0000-0002-1196-8813
Researcher ID: F-6503-2011

PhD STUDENT
David García

RESEARCH ASSISTANT
Monica Dhanjani
Victoria López

Research lines

1. Our research is mainly focused in the preparation of magnetic hybrid nanostructures that could be used for medical imaging and treatment of tumors. That includes understanding the procedures that lead to well controlled inorganic hybrids that can respond different stimuli and developing general synthetic routes for different magnetic materials. Magnetic nanoparticles are being extensively studied worldwide as contrast agents for medical imaging and as nanoheaters under alternating magnetic fields. Many intrinsic and extrinsic factors (e.g. size, crystallinity, magnetism, aggregation, colloidal stability, dispersion medium, applied field, interactions with biological media) can influence the efficiency of nanoparticles in biomedicine. Another topic of interest, also for biomedical applications, is the use of hybrid magnetic nanocomposites as antibacterial agents, given the growing concerns about bacterial resistance and the lack of alternatives to antibiotics.

2. We are also exploring the use of magnetically recoverable nano-catalysts for environmental applications. Magnetic nanostructures offer the possibility of acting as catalysts or as platforms that allow the recovery of a bound catalyst.
Intracellular temperature measurements

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


GROUP LEADER

Dr. Sebastian A. Thompson
Assistant Research Prof. (tenure track)
PhD: City University of New York, USA
Previous Position: Marie Curie Fellow, CNC, Coimbra, Portugal

ORCID: 0000-0002-0196-1124
Scopus Author ID: 55937663100
Researcher ID: P-4606-2017
2. Research programmes and scientists

Engineering Biofunctional Nanostructures

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

GROUP LEADER

Prof. Aitziber L. Cortajarena
Associate Research Professor

PhD: Universidad del Pais Vasco, Spain
Previous Position: Yale University, USA

ORCID:
0000-0002-5331-114X
Researcher ID:
J-6202-2012

Research Assistant

Elena Sanz

Research lines

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

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

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

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

GROUP LEADER

Prof. Ángeles Villanueva
Associate Research Professor
PhD: Universidad Autónoma de Madrid, Spain
Double Affiliation: Universidad Autónoma de Madrid, Spain

Research lines

2. Biocompatibility of magnetic nanoparticles.
4. Alterations in adhesion and cytoskeletal proteins.
5. Liposomal drug delivery.
7. Signaling pathways involved in cell death.
Hyperthermia

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

GROUP LEADER

Dr. Daniel Ortega
Associate Researcher

PhD: University of Cadiz, Spain
Previous Position: University College London, United Kingdom

ORCID: 0000-0002-7441-8640
Researcher ID: D-7940-2012

PhD STUDENT

Irene Rubia

RESEARCH ASSISTANTS

Antonia Santana
Javier Ortega

Research lines

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

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

Nanobiosystems

Programme Manager: Prof. J.L. Carrascosa

Research lines

Nanobiosystems
Prof. J.L. Carrascosa

Protein Engineering
Dr. Begoña Sot

Mechanical properties of Biostructures
Dr. Johann Mertens

Advanced fluorescence nanoscopy
Dr. Cristina Flors

Molecular Motors Manipulation Lab
Dr. Borja Ibarra
About the programme

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

Webpage: http://macromolassemblies.wixsite.com/carrascosalab

GROUP LEADER

Prof. José L. Carrascosa
Associate Research Professor

PhD: Universidad Complutense de Madrid, Spain
Double Affiliation: Unidad de Nanobiotechnología. Joint Unit IMDEA Nanociencia-CNB-CSIC

Researcher ID: 35481302900

Research lines

Our group studies viral macromolecular complexes combining genetic, biochemical and structural approaches. Viruses are classical experimental systems to study basic biological principles and mechanisms. We use cryoelectron microscopy and computer three-dimensional image processing to obtain structures, at near atomic resolution, involved in bacteriophage T7 assembly and infection. With this technique, in combination with X-ray crystallography, we solved the structure of the portal protein that serves as a channel for DNA entry in the capsid in two different conformations allowing to decipher the mechanism of DNA retention during packaging. We studied also the tail machinery and other protein ejection complexes involved in different steps of the DNA delivery into the bacterial host. The study of bacteriophages has increased in the present days due to the bacterial antibiotic resistance. The understanding of the mechanism of infection of bacterial viruses could be essential to take advantage of their bacterial weapon efficacy for the implementation of new methods to fight against bacteria.
Advanced fluorescence nanoscopy

Webpage: http://imdeananotools.wix.com/flors

GROUP LEADER

Prof. Cristina Flors
Senior Research Prof.

PhD: Institut Quimic de Sarrià, Spain
Previous Position: University of Edinburgh, Edinburgh, UK

ORCID: 0000-0001-5688-9150
Researcher ID: C-2123-2017

POSTDOCS

Dr. Joaquim Torra
Institut Quimic de Sarrià, Barcelona, Spain

Dr. Felipe Viela
UC Lovain, Belgium

Dr. Patricia Bondia
IMDEA Nanociencia

PhD STUDENTS

Adrián del Valle
Ingrid Ortega

Research lines

2. Advanced correlative fluorescence and atomic force microscopy.
3. Photosensitizing fluorescent proteins for advanced microscopy.

Our laboratory works on the development of advanced fluorescence microscopy methods and their application in biology and materials science. We have built a novel correlative microscope that can perform in situ super-resolution imaging combined with atomic force microscopy (Monserrat et al, ChemPhysChem 2014), and have used it to study hybrid bionanomaterials (Bondia et al, Small 2017), the mechanisms of action of amyloid-targeting drugs (Bondia et al, J. Am. Chem. Soc. 2020) and mechanically-induced bacterial death (del Valle et al, ACS Appl. Mater. Interfaces 2020). In parallel to our super-resolution work, we are also interested in the development and characterization of fluorescent proteins as genetically-encoded photosensitizers, and their potential use in phototherapy and advanced microscopy (Ruiz-González et al, J. Am. Chem. Soc. 2013; Rodríguez-Pulido et al Chem. Commun. 2017 & ChemPhotoChem 2019)
Protein Engineering


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.

GROUP LEADER

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

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

Researcher ID: H-2882-2015

PhD STUDENT
Carmen Escalona
María López Valls
2. Research programmes and scientists

Molecular Motors Nanomanipulation Lab

Webpage: www.borjaibarralab.com

GROUP LEADER

Dr. Borja Ibarra
Assistant Research Prof. (tenure track)

PhD: Universidad Autónoma Madrid
Previous Position: UC Berkeley, USA

ORCID: 0000-0001-6597-797X
Researcher ID: H-5840-2015

ASSOCIATE RESEARCHER

Dr. Francisco Javier Cao García
PhD: Universidad Complutense de Madrid
Double Affiliation: Universidad Complutense de Madrid

PhD STUDENTS

Katerina M. Lemishko
Carlos Rodríguez
Ismael Plaza

MSC

Nicolás Vivas
Universidad Autónoma de Madrid, Spain

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 temperature control systems. This exciting marriage of techniques will open up a wealth of new promising applications.
Mechanical properties of Biostructures

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

GROUP LEADER

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

PhD: University of Burgundy, France
Previous Position: Madrid Microelectronics Institute, Spain

ORCID:
0000-0002-1312-8914
Researcher ID:
I-4208-2015

Research lines

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

1. We have implemented Atomic Force Microscopy (AFM) measurements in physiological conditions to study both structural and mechanical properties of individual viral particles. We have recently showed that ribonucleoprotein complexes establish strong interactions with the inner surface of the viral shell in IBDV mature virions (Scientific Reports 2015). We are also developing new 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).
2. Research programmes and scientists
programme

Nanofabrication

Research lines

Functional Surfaces
Prof. Isabel Rodríguez

Quantum Devices and Photonics
Dr. Daniel Granados

Applied Nanoelectronics
Dr. Ramón Bernardo

Transport in 2D Systems
Prof. José Luis Vicent
2. Research programmes and scientists

imdea nanoscience institute
Functional Surfaces

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

GROUP LEADER

Prof. Isabel Rodríguez
Senior Research Prof.
PhD: National University of Singapore
Previous Position: Institute of Materials Research and Engineering (IMRE), Singapore

ORCID:
0000-0002-7178-8275
Researcher ID:
G-3178-2016

POSTDOCS

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

Dr. Jean Philippe Cacheux
Université de Toulouse, CNRS, Toulouse, France

PHD STUDENTS

María Teresa Alameda
Alejandra Jacobo
Sergio Dávila
Miguel Esteban
Alberto Martín

Research lines

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

2. Multifunctional surfaces. The programme is developing the methodology to impart onto polymer nanocomposites additional surface properties, particularly those of super-hydrophobicity and self-cleaning based on bio-inspired surface nanotexturing. The programme is also focused on up-scaling the methodology using Roll to roll nanoimprint technology.

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

GROUP LEADER

Prof. Ramón Bernardo
Assistant Research Prof. (tenure track)

PhD: Universidad Autónoma de Madrid, Spain
Previous Position: Lancaster University, UK

ORCID: 0000-0001-6881-2599
Researcher ID: N-3945-2019
Scopus Author ID: 55922273000

PhD STUDENTS
Víctor Marzoa
Cristina García

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.
Transport in 2D Systems


GROUP LEADER

Prof. José Luis Vicent
Associate Research Professor

Double Affiliation: Universidad Complutense de Madrid

ORCID:
0000-0001-9343-7671

Researcher ID:
7006735519

Dr. Mariela Menghini
Researcher
PhD: Instituto Balseiro, Universidad Nacional de Cuyo, Argentina
Previous position: Department of Physics and Astronomy, KU Leuven, Leuven, Belgium
ORCID: 0000-0002-1744-798X

ASSOCIATE RESEARCHERS

Prof. Elvira M. González
PhD: Universidad Complutense de Madrid
Double Affiliation: Universidad Complutense de Madrid
ORCID: 0000-0001-9360-3596

Dr. Alicia Gómez
PhD: Universidad Complutense de Madrid
Double Affiliation: CSIC-INTA, Torrejón de Ardoz

Dr. Álvaro Muñoz Noval
PhD: Universidad Autónoma de Madrid, Spain
Double Affiliation: Universidad Complutense de Madrid
ORCID: 0000-0003-3236-5509

PhD STUDENT

Ignacio Figueruelo

MSC

Gabriel Caballero
Universidad Complutense de Madrid

Research lines

1. Nanostructured superconductors.


3. Vortex dynamics in superconductors.

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

RMN and Mass Spec. Services  Optical Tweezers  AFM Service  Advanced Optical Microscopy Service

Dr. Zulay Pardo  PhD: Universidad Complutense de Madrid, Spain
Dr. Rebeca Bocanegra  PhD: Universidad Autónoma de Madrid, Spain
Dr. Sara de Lorenzo  PhD: Universidad de Barcelona, Spain
Dr. Patricia Pedraz  PhD: Universidad Autónoma de Madrid, Spain
Dr. Cintia Vequi-Suplicy  Universidade de Sao Paulo, Brazil

Cell Cultures  Workshop

Dr. Adriana Arnaiz  PhD: Cambridge University, UK
Dr. Vanessa Rodríguez  PhD: Universidad Autónoma de Madrid, Spain
Mr. Warren Smith  Technician
Ms. Fabiola Mogollón  Assistant

Nanofabrication Services  Cryogenics

Dr. Manuel Rodríguez  PhD: Universidad de Santiago de Compostela, Spain
Dr. María Acebrón  PhD: Universidad Autónoma de Madrid, Spain
Mr. Andrés Valera  Technician
Ivan Redondo  Technician
Management

Mr. Bonifacio Vega
General Manager

Ms. Isabel Rodríguez
Administration and Finance Manager

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

Dr. José Luis Casillas
Facilities & Infrastructure Manager

Dr. Mark William Davies
Industrial Liaison Manager

Dr. Héctor Guerrero
Strategic Industrial Partnerships

Dr. Elena Alonso
CDO. Project Manager

Mr. Ignacio Torres
Projects Manager

Ms. Mireia Gracia
Projects Manager

Ms. Patricia López
RSO Project Manager

Ms. Laura Lorente
Project Assistant

Ms. Paloma Macua
Administrative Assistant

Ms. Elena Pérez
Administrative Assistant

Ms. Juana Hemoso
Administrative Project Assistant

Ms. Margarita Gil
A3/ER System Technician

Ms. Paloma Castillo
Director’s Assistant

Mr. Gonzalo Hidalgo
Network and Systems Manager
1. Publications [87]
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4. Funding [108]
5. Training [122]
6. Internationalization [126]
7. High-quality research infrastructure [128]
8. Awards and honours [132]
9. Communication and Outreach [134]
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## Patents

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<tr>
<td>27/01/2020</td>
<td>International Conference on Molecular-Scale Charge and Thermal Transport (MSCTT), Engelberg, Switzerland</td>
<td>Electric and thermoelectric properties of conjugated oligomers at the single molecule level Edmund Leary</td>
</tr>
<tr>
<td>31/01/2020</td>
<td>NALS2020, International Conference of Nanomaterials Applied to Life Sciences, Madrid, Spain</td>
<td>Nanostructured Biomaterials as Cell Instructive &amp; Bactericidal Surfaces for Regenerative Medicine Isabel Rodriguez</td>
</tr>
<tr>
<td>23/02/2020</td>
<td>TMS 2020 Annual Meeting &amp; Exhibition San Diego, California, USA</td>
<td>Mn-based permanent magnets: from thin film micromagnets to bulk magnets obtained by hot-pressing of gas-atomized powder A. Bollero</td>
</tr>
<tr>
<td>03/05/2020</td>
<td>Virtual 13th European School on Molecular Nanoscience (ESMolNa-2020)</td>
<td>Bottom-up Synthesis of (Chiral) Nanographenes Nazario Martín</td>
</tr>
<tr>
<td>01/07/2020</td>
<td>XAS Journal Club</td>
<td>Electronic and Structure Configurations of Earth-Abundant Water Splitting Catalysts and Spin Crossover Complexes Dooshaye Moonshiram</td>
</tr>
<tr>
<td>16/07/2020</td>
<td>Nanophotonics of 2D materials. DIPC Donostia International Physics Center. Online</td>
<td>Flat bands and electronic structure in stacks of two dimensional systems* Francisco Guinea</td>
</tr>
</tbody>
</table>
31/08/2020
2020 CMD and GEFES Joint Meeting CMD2020GEFES
From rare earth-free permanent magnet filament by solution casting and extrusion to 3D-printed magnets
A. Bollero

13/09/2020
6th International Fall School on Organic Electronics (IFSOE-2020)
Dual Emission: Classes, Mechanisms and Conditions
J. Gierschner

01/11/2020
Advanced Photon Source Review Committee, Argonne National Laboratory, IL
Elucidating the Ultrafast dynamics and Structural Conformations of Earth-Abundant Solar Fuel Catalysts for Artificial Photosynthesis
Dooshaye Moonshiram

09/11/2020
International Conference on Emerging Trends in Computational and Materials Chemistry Research - ICCMCR-20
Fluorescence Quenching vs. Enhancement in Organic Materials
J. Gierschner

18/11/2020
ESpinRed
Spin-Orbit-Related Phenomena at Graphene/Ferromagnetic interface
Paolo Perna

11/12/2020
I Congreso ACEM-AEBE: Biotecnología y Nanotecnología
Nanostructured Biomaterials as Cell Instructive& Bactericidal Surfaces
Isabel Rodriguez

15/12/2020
CRC / TRR 270 HoMMage Colloquia. Technische Universität Darmstadt / Universität Duisburg-Essen
Advances in the fabrication of rare earth-free permanent magnets by thermally controlled additive manufacturing: case study of gas-atomized MnAlC alloy
E.M. Palmero

For further details see Annex page 155
4. Funding

We include all research grants that were active during the whole part of 2019 funded by the European Commission, national and regional governments and other public and private agencies.

4.1. International programmes

EUROPEAN PROJECTS

ERC GRANTS

ELECNANO

Electrically Tunable Functional Lanthanide Nanoarchitectures on Surfaces
Grant Agreement number: 766555
From 2018 to 2023
Principal Investigator: Dr. David Écija

ERC CONSOLIDATOR GRANTS

ELECNANO

ERC PROOF OF CONCEPT

PINT

Ultrastrong Composites through Polymers Interlocked with carbon NanoTubes
Grant Agreement number: 842606
From 2019 to 2020
Principal Investigator: Dr. Emilio Pérez

ERC SYNERGY GRANTS

TOMATTO

The ultimate Time scale in Organic Molecular opto-electronics, the ATTOsecond
Grant Agreement number: 951224
From 2021 to 2027
Principal Investigator: Dr. Fernando Martin, Fundación IMDEA Nanociencia (CHI)
Other Principal Investigators: Dr. Nazario Martín (Universidad Complutense de Madrid), Mauro Nisoli (Politecnico di Milano)
Additional Beneficiaries: Universidad Autónoma de Madrid
Collaborative Projects

PASSENGER

Pilot Action for Securing a Sustainable European Next Generation of Efficient RE-free magnets
Grant Agreement number: 101003914
From 2021 to 2025
Coordinated by IMDEA Nanociencia
Principal Investigators: Dr. Alberto Bollero

NOCANTHER

Nanomedicine upscaling for early clinical phases of multimodal cancer therapy
H2020-NMP-2015-two-stage
Grant Agreement number: 685795
From 2016 to 2021
Coordinated by IMDEA Nanociencia
Principal Investigators: Dr. Rodolfo Miranda and Dr. Álvaro Somoza
http://www.nocanther-project.eu/

ByAXON

Towards an active bypass for neural reconnection
H2020-FETOPEN-2016-2017
Grant Agreement number: 737116
From 2017 to 2020
Coordinated by IMDEA Nanociencia
Principal Investigators: Dr. Rodolfo Miranda and Dr. Teresa González
http://www.byaxon-project.eu/

A-LEAF

Towards An Artificial Leaf
H2020-FETPROACT-2016-2017
Grant Agreement number: 732840
From 2017 to 2020
Principal Investigators: Dr. Rodolfo Miranda and Dr. David Écija
http://www.a-leaf.eu/

EVO-NANO

Evolvable platform for programmable nanoparticle based cancer therapies
H2020-FETOPEN-2016-2017
Grant Agreement number: 800983
From 2018 to 2021
Principal Investigator: Dr. Mª Isabel Rodríguez
http://evonano.eu/

UWIPOM2

Ultra-efficient wireless powered micro-robotic joint for health applications
H2020-FETOPEN-2018-2020
Grant Agreement number: 857654
From 2019 to 2022
Principal Investigator: Dr. Alberto Bollero
Graphene-based disruptive technologies

**GRAPHENECORE 3**
Graphene Flagship Core Project 3
H2020-SGA-FET-GRAPEHENA-2019
Grant Agreement number: 881603
From 2020 to 2023
Principal Investigator: Dr. Francisco Guinea

**GRAPHENECORE 2**
Graphene Flagship Core Project 2
H2020-SGA-FET-GRAPEHENA-2017
Grant Agreement number: 785219
From 2018 to 2020
Principal Investigator: Dr. Francisco Guinea

**ISO-G-Scope**
Standardisation of structural and chemical properties of graphene
H2020-EMPIR-2019-Normative
Reference: JRP-N10 / 19NRM04
From 2020 to 2022 (36 months)
IMDEA Nanociencia is Partner in a consortium of 10 coordinated by the National Physics Laboratory / NPL (UK)
Principal Investigator: Dr. Emilio Perez

**European Cooperation in Science and Technology (COST Actions)**

**ATTOCHEM**
Attosecond Chemistry (CA18222)
From 2019 to 2023
Chair: Prof. Fernando MARTÍN
https://www.cost.eu/actions/CA18222/#tabsName:overview

**OTHER INTERNATIONAL PROGRAMMES**

**DEFROST**
Development of hybrid graphene-superconductor detectors for quantum and space applications
Funding: Office of Naval Research (United States)
From 2019 to 2021
Principal Investigator: Dr. Daniel Granados

**MiniPINS**
Miniaturized Sensor Packages and Delivery Systems for In-Situ Exploration
From 11-2019 to 04-2023 (18 months)
ESA Contract No. 4000128070/19/NL/KML
IMDEA Nanociencia is subcontractor of in a consortium of 7 coordinated by the Finnish Meteorological Institute / FMI (FI)
Principal Investigator: Dr. Héctor Guerrero
4.2. National Programmes

Plan Estatal de Investigación Científica, Técnica y de Innovación 2017-2020. Ministerio de Ciencia, Innovación y Universidades

ACCIÓN ESTRATÉGICA EN SALUD (INSTITUTO DE SALUD CARLOS III)

Convocatoria de expresiones de interés para la financiación de proyectos de investigación sobre el SARS-COV-2 y la enfermedad COVID19 con cargo al FONDO – COVID19 (Resolución COVID19, de 19 de marzo)

Desarrollo de sensores colorimétricos basados en nanopartículas de oro para la detección del SARS-COV2
Ref.: COV20/00122.
From: 2020 to 2021
Principal Investigator: Dr. Rodolfo Miranda

Transmisión de SARS-CoV2 por el aire: detección en hospitales y tecnologías innovadoras
Ref.: COV20/00144.
From 2020 to 2021
Principal Investigator: Dr. A. Alcami (CSIC)
Investigator: Dr. Alvaro Somoza

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.: SEV-2016-0686
From 2017 to 2021
Scientific Director: Dr. Francisco Guinea

IMDEA Nanociencia became an accredited Severo Ochoa Centre of Excellence by the Spanish Ministry of Economy, Industry and Competitiveness in 2017. 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.

Proyectos de I+D de generación de conocimiento

Call 2018

MICRUNC

Microscopía de super-resolución con fluoróforos no convencionales
Ref.: PGC2018-094802-B-I00
From 2019 to 2021
Principal Investigator: Dr. Cristina Flors

TOPSURF

Investigando los estados de superficie topológicos de materiales cuánticos
Ref.: PGC2018-097028-A-I00
From 2019 to 2021
Principal Investigator: Dr. Manuela Garnica
<table>
<thead>
<tr>
<th>Project</th>
<th>Description</th>
<th>Reference</th>
<th>Duration</th>
<th>Principal Investigators</th>
</tr>
</thead>
<tbody>
<tr>
<td>SpOrQuMat</td>
<td>Spin-orbit driven physics at surfaces and interfaces of quantum materials</td>
<td>PGC2018-098613-B-C21 / PGC2018-098613-B-C22</td>
<td>2019 to 2021</td>
<td>Dr. Rodolfo Miranda and Dr. Francisco Guinea</td>
</tr>
<tr>
<td>SIN_Flu</td>
<td>Caracterización de la dinámica transcripcional del virus de la gripe, influenza a, a nivel de moléculas individuales</td>
<td>PGC2018-099341-B-I00</td>
<td>2019 to 2021</td>
<td>Dr. Borja Ibarra</td>
</tr>
<tr>
<td>MECAVIRINF</td>
<td>Caracterización nano-mecánica y detección en tiempo real de la infección de células eucariotas con calicivirus</td>
<td>PGC2018-099713-B-I00</td>
<td>2019 to 2021</td>
<td>Dr. Johann Mertens</td>
</tr>
<tr>
<td>Call 2017</td>
<td>Bits de nanoestructuras magnéticas por nanolitografía de ADN para memorias magnéticas de alta densidad</td>
<td>MAT2017-89668-P</td>
<td>2018 to 2020</td>
<td>Dr. Feng Luo</td>
</tr>
<tr>
<td>OptoCT</td>
<td>Espectroscopía óptica de estado estacionario y resuelto en el tiempo de sistemas orgánicos de transferencia de carga innovadores</td>
<td>CTQ2017-87054-C2-1-P</td>
<td>2018 to 2021</td>
<td>Dr. Johannes Gierschner and Dr. Larry Luer</td>
</tr>
<tr>
<td>SwiP3H</td>
<td>Metallofamacos como conmutadores sensibles al pH para su uso en nanomedicina</td>
<td>CTQ2017-84932-P</td>
<td>2018 to 2020</td>
<td>Dr. Ana M. Pizarro</td>
</tr>
<tr>
<td>IMAN</td>
<td>Novel interfaces between molecules and nanomaterials</td>
<td>CTQ2017-86060-P</td>
<td>2018 to 2020</td>
<td>Dr. Emilio M. Pérez</td>
</tr>
<tr>
<td>Equipamiento científico</td>
<td>Sistema de fotoemisión resuelta en ángulo con polarización en espín</td>
<td>EOC2019-006304-P</td>
<td>2018 to 2020</td>
<td>Dr. Rodolfo Miranda</td>
</tr>
<tr>
<td>BPMDUHDMRM</td>
<td>Materiales orgánicos disruptivos para energía fotovoltaica</td>
<td>RED2018-102815-T</td>
<td>2020 to 2021</td>
<td>Dr. Nazario Martin</td>
</tr>
<tr>
<td>OptoCT</td>
<td>Nanotecnología en hipertermia traslacional</td>
<td>RED2018-102626-T</td>
<td>2020 to 2021</td>
<td>Dr. D. Ortega</td>
</tr>
</tbody>
</table>
### OPINA

**Optimización en los Procesos de preparación y gestión de iniciativas europeas en IMDEA Nanociencia**  
Ref.: ECT2019-000615  
From 2019-2020  
Principal Investigator: Dr. M.J. Villa (Projects, Communication and Research Support Offices)

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

#### Proyectos I+D+i «Retos Investigación»

**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-óxido metálico: estudios fundamentales y desarrollo de dipositivos de alta eficiencia para la conversión de energía solar**  
Ref.: PID2019-107808RA-I00  
From 2020 to 2023  
Principal Investigators: Dr. Enrique Canovas

### pi-CONJUNANO

**Diseño en superficies y propiedades físico-químicas de polímeros pi-conjugados**  
Ref.: PID2019-108532GB-I00  
From 2020 to 2023  
Principal Investigators: Dr. David Écija

### CATDesign

**Hacia la comprensión de requisitos electrónicos y atómicos de catalizadores económicos para la división de la molécula de agua**  
Ref.: PID2019-111086RA-I00  
From 2020 to 2023  
Principal Investigators: Dr. D Moonshiram

### AIRE

**Arquitecturas Conmutables Avanzadas para detección molecular**  
Ref.: PID2019-111479GB-I00  
From 2020 to 2023  
Principal Investigators: Dr. J. Sanchez-Costa

### Call 2018

#### SMS-QUTE

**Espintronica molecular aplicada a tecnologías cuánticas**  
Ref.: RTI2018-096075-A-C22  
From 2019 to 2022  
Principal Investigator: Dr. Enrique Burzuri
AMAPOLA

Materiales avanzados para la optimización de láseres orgánicos y aplicaciones nanotecnológicas
Ref.: RTI2018-097508-B-100
From 2019 to 2021
Principal Investigators: Dr. Juan Cabanillas and Dr. Reinhold Wannemaker

3D-MAGNETOH

Impresión 3D de imanes basados en mn para configurar un nuevo horizonte en energía y transporte
Ref.: MAT2017-89960-R
From 2018 to 2020
Principal Investigator: Dr. Alberto Boliero

FUN-SOC: FEST

Nuevas funcionalidades dirigidas por interacciones espin-orbita: texturas de espines quirales rápidas y eficientes
Ref.: RTI2018-097895-B-C42
From 2019 to 2021
Principal Investigator: Dr. Paolo Perna

NANOLICO

Nanomateriales funcionales para la verificación de predicciones in silico de nanotermometría e hipertermia magnética
Ref.: MAT2017-85617-R
From 2018 to 2020
Principal Investigator: Dr. Francisco J. Terán

INTRA_TEMP

Interpretación de la temperatura intracelular para el diagnóstico y tratamiento del cáncer
Ref.: RTI2018-101050-J-100
From 2019 to 2021
Principal Investigator: Dr. Sebasitán Thompson Parga

DETECTA

Desarrollo de detectores para futuras misiones espaciales en el mm/sub-mm y fir basados en materiales superconductores o de baja dimensionalidad
Ref.: ESP2017-86582-C4-3-R
From 2018 to 2019
Principal Investigator: Dr. Daniel Granados Ruiz

TOPTWEEZ

Medida de temperatura en medios fisiológicos mediante pinzas ópticas
Ref.: RTI2018-101939-B-100
From 2019 to 2021
Principal Investigator: Dr. Gorka Salas

BiSURE

Superficies nanoestructuradas biofuncionales como nueva generación de implantes en medicina regenerativa
Ref.: DPI2017-90058-R
From 2018 to 2020
Principal Investigators: Dr. M. Isabel Rodríguez Fernández and Dr. Teresa González

Call 2017

NanoSmart

Nanoestructuras inteligentes contra el melanoma de úvea y el cáncer de páncreas
Ref.: SAF2017-87305-R
From 2018 to 2020
Principal Investigators: Dr. Álvaro Somoza and Dr. Begoña Sot
Programación Conjunta Internacional

**COSMAG**

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

Funding: M-ERANET 2019
From 2020 to 2023
Principal Investigator: D. Alberto Bollero
Coordinated by IMDEA Nanociencia

**SOgraphMEM**

*Spin Orbit functionalized GRAPHene for resistive-magnetic MEMories*

Funding: FLAG ERA 3
From 2020 to 2022
Principal Investigator: Dr. Paolo Perna
Coordinated by IMDEA Nanociencia

**BIOMAG**

*Advanced magnetic nanoparticles for detection and quantification of biomarkers in biological fluids*

Funding: M-ERANET 2018
From 2019 to 2022
Principal Investigator: Dr. Francisco J. Terán
Coordinated by IMDEA Nanociencia

**AMYLIGHT**

*Desarrollo de estrategias fototerapéuticas para la amiloidosis mediante visión nanoscopica del daño fotoinducido al material amiloide*

Funding: Japan-Spain 2018
From 2019 to 2021
Principal Investigator: Dr. Cristina Flors

Acciones de Dinamización “Europa Investigación”

**2DTONIC**

*Materiales topológicos 2d para valleytronic*

Ayudas del ERC “Starting Grants” (StG)
Ref.: EIN2020-112223
From 2020 to 2022
Principal Investigator: Dr. Manuela Garnica

**METALpHACT**

*Metalfarmacos para modular el flujo de protones en las células cancerosas*

Ayudas del ERC “Consolidator Grants” (CoG)
Ref.: EIN2020-112423
From 2020 to 2022
Principal Investigator: Dr. Ana Pizarro

**Intra_Temp**

*Temperatura intracelular para el diagnóstico y tratamiento del cáncer*

Ayudas del ERC “Consolidator Grants” (CoG)
Ref.: EIN2020-112419
From 2020 to 2022
Principal Investigator: Dr. Sebastian Thompson

**Designing rational schemes for solar fuel and methane oxidizing catalysts**

Ayudas del ERC “Starting Grants” (StG)
Ref.: EIN2019-103399
From 2019 to 2020
Principal Investigator: Dr. Dooshaye Moonshiram
Preparación de la propuesta: ANACONDA
Acciones en Tecnologías Futuras y Emergentes (FET)
Ref.: EIN2019-103305
From 2019 to 2020
Principal Investigator: Dr. Isabel Rodríguez Fernández

Nanociencia aplicada al desarrollo de imanes permanentes libres de tierras raras mediante tecnologías sostenible
Ayudas del ERC “Advanced Grants” (AdG)
Ref.: EIN2019-103506
From 2019 to 2020
Principal Investigator: Dr. Alberto Bollero

Convocatoria de Ayudas para el Fomento de la Cultura Científica

Other projects

AECC Semilla

Ideas Semilla 2019
Principal Investigator: Dr. Ana Espinosa de los Monteros

Nanoseek

Fonduo SUPERA COVID-19
2020-2021
Principal Investigator: Dr. Rodolfo Miranda (UAM)
(col. IMDEA Nanociencia and Hospital Ramón y Cajal)

4.3. Regional programmes

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

SINERGIAS 2018

FULMATEN

Fotónica ultrarrápida para el diseño de nuevos materiales y la captura eficiente de energía
Coordinator: IMDEA Nanociencia
From 2019 to 2021
Principal Investigator: Dr. Fernando Martin
<table>
<thead>
<tr>
<th>Project</th>
<th>Description</th>
<th>Coordinator</th>
<th>From</th>
<th>Principal Investigators</th>
</tr>
</thead>
<tbody>
<tr>
<td>QUIMTRONIC</td>
<td>Química disruptiva en la nanoescala por electrónica y flexibles</td>
<td>Universidad Complutense de Madrid</td>
<td>2019-2021</td>
<td>Dr. David Écija and Dr. Nazario Martín</td>
</tr>
<tr>
<td>CONVOCATORIA TECNOLOGÍAS 2018</td>
<td>NMAT2D</td>
<td>IMDEA Nanociencia</td>
<td>2019-2022</td>
<td>Dr. Francisco Guinea</td>
</tr>
<tr>
<td>TEC2SPACE</td>
<td>Desarrollo y explotación de nuevas tecnologías para instrumentación espacial en la Comunidad de Madrid</td>
<td>Centro de Astrobiología (CAB)</td>
<td>2019-2022</td>
<td>Dr. Daniel Granados</td>
</tr>
<tr>
<td>MADRID-PV2</td>
<td>Materiales, dispositivos y tecnologías para el desarrollo de la industria fotovoltaica</td>
<td>Instituto Energía Solar</td>
<td>2019-2022</td>
<td>Dr. Isabel Rodríguez</td>
</tr>
<tr>
<td>FotoArt</td>
<td>Nueva generación de materiales multifuncionales para fotosíntesis artificial</td>
<td>IMDEA Energía</td>
<td>2019-2022</td>
<td>Dr. Emilio M. Pérez and Dr. Miguel A. Niño</td>
</tr>
<tr>
<td>CONVOCATORIA BIOMEDICINA 2017</td>
<td>RENIM-CM</td>
<td>Fundación para la Investigación Biomédica Hospital Gregorio Marañón</td>
<td>2018-2021</td>
<td>Dr. Cristina Flors</td>
</tr>
</tbody>
</table>
4.4. Industrial projects

The Strategic Industrial Partnership Office (SIPO) is led by H. Guerrero since 2019. The office 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 (69 companies accumulated in 2019-20) 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.

Company: Höganäs (Sweden)

ECNanoManga
Up-scaled production of a new generation of Exchange/Coupled Nanocrystalline Mn-based RE-free PMs.
From 2018 to 2021
Principal Investigator: Dr. Alberto Bollero

Company: Nanocore Aps (Denmark)

TSUNAMI
From 2010-2023
Principal Investigator: Dr. Emilio M. Pérez

Partnerships Readiness Level (PRL)
proprietary to IMDEA Nano

Industrial Opportunities (09/2019)

<table>
<thead>
<tr>
<th>A1</th>
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<th>C3</th>
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<td>13</td>
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</tr>
</tbody>
</table>

Nanotechnology Roadmapping

- Problem definition
- Strategic importance
- Business timeframe
- Capability
- Financial investment
- Feasibility
- Relevance
- Maturity
- Time
- Potential impact
- Industrial scalability
- Resources needed
- Development timeframe
- Technology readiness
4.5. Fellowships

4.5.1. International

**MARIE SKŁODOWSKA-CURIE ACTIONS (MSCA) | H2020**

**OssCaNa**

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

H2020-MSCA-IF-2019 MSCA-IF-EF-ST  
Grant Agreement number: 886314  
Duration: 2021-2023  
Fellow: Dr. Jose Ignacio Urgel

**4f-Mag**

*On-surface design of lanthanide coordinated networks featuring single atom magnetism*

H2020-MSCA-IF-2019 MSCA-IF-EF-ST  
Grant Agreement number: 894924  
Duration: 2021-2022  
Fellow: Dr. Sofia de Oliveira Parreiras

**TweeTERS**

*Coupling of Optical tweezers with Tip-enhanced Raman Spectroscopy for single-molecule investigation of supramolecular systems*

H2020-MSCA-IF-2019 MSCA-IF-EF-ST  
Grant Agreement number: 892667  
Duration: 2020-2022  
Fellow: Dr. Natalia Martin

**2DSPIN**

*2D magnetic materials for molecular SPINtronics*

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 2015 Dr. Jose Sánchez Costa

- **Ayudas para la contratación de doctores «Juan de la Cierva»**
  - Call 2018 Dr. Jose Ignacio Urgel (Incorporación)
  - Call 2017 Dr. Lucia Piñeiro (Formación)

- **Ayudas para la contratación de personal técnico de apoyo a la I+D+i**
  - Call 2019 Sergio de las Heras
  - Call 2018 Patricia Pedraz, Cinúa de Vequi
  - Call 2017 Silvia Miranda
  - Call 2016 Isabel Ortiz

- **Contratos predoctorales para la formación de doctores (FPI Programme)**
  - Call 2019 Claudia, Cardozo, Alberto Martin Asencio, Saúl Garcia-Orrit, Ana Martinez, Ismael Plaza
  - Call 2018 Alicia Naranjo, Ana Arché, Jesús Galán, Alejandro Jimeno, Joel Gabriel Fallaque, Ingrid Ortega
  - Call 2017 Paula Milian, Daniel Moreno, Tomás Nicolas
  - Call 2016 Patricia Bondia
4.5.3. Regional (Comunidad de Madrid)

**PROGRAMA DE ATRACCIÓN DE TALENTO INVESTIGADOR**

**Ayudas para la contratación de doctores con experiencia (Modalidad 1)**
- Call 2019 Dr. Edmund Leary
- Call 2018 Dr. Ana Espinosa
- Call 2017 Dr. Enrique Cánovas, Dr. Enrique Burzuri

**Ayudas para la contratación de jóvenes doctores (Modalidad 2)**
- Call 2019 Dr. Ramón Bernardo, Dr. Jose Ignacio Urgel, Dr. Víctor Vega
- Call 2018 Dr. Yago Ferreirós, Dr. Alberto González
- Call 2017 Dr. Manuela Garnica, Dr. Christin David

**Ayudas para la Contratación de Doctorados Industriales**
- Call 2017 Synthelia Organics S.L. (IND2017/ IND-7809). D Demian Pardo

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**Programa Operativo de Empleo Juvenil y la Iniciativa de Empleo Juvenil (YEI). Contratación de Investigadores predoctorales y postdoctorales**

Total 28:
- 2017 (16 Predocs); 2018 (8 Predocs & 1 PostDoc); 2019 (3 Predocs & 1 PostDoc)

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

Total 14:
- 2017 (3 Ayu. & 2 Tec.); 2018 (3 Ayud.); 2019 (4 Ayu. & 2 Tec.)

---

**4.5.4. Others Programmes**

**Becas postdoctorales en Centros de Investigación y Universidades Españolas (Junior Leader)**
- Call 2019 Dr. Ignacio Colomer
- Call 2018 Dr. Manuela Garnica

**Programa de Becas de Doctorado InPhINIT**
- Call 2020 Alonso Jose Campos
- Call 2018 Raman Prajapati

**Ayudas Predoctorales en Oncología (APRO)**
- Call 2019 Dr. Catarina Coutinho
5. Training

1. Seminars

14/01/2020
IMDEA Nanociencia
Multifunctional approaches based on thermal nanotherapies: heat generation, therapeutic efficiency and limitations
Dr. Ana Espinosa

Carbon and DNA nanostructures: from controlled assembly to functional devices
Prof. Matiye Palma
Queen Mary University of London, UK
3rd Feb

Nanoparticles: from safe-by-design to toxic-by-design
Dr. Stefan Sassen
KU Leuven, Gent, Belgium
28th Jan

Science at Alba: 18th Feb
2. Conferences and Courses

32 courses and conferences
16 international institutions
20 of them online

3. Training programmes

As part of the Severo Ochoa programme a series of new training programmes have been launched over the past year.

IMDEA Nano Postdoctoral Programme in Nanoscience — a 2 year training plan developed to provide technical excellence in the multidisciplinary fields on offer at IMDEA Nanociencia.

IMDEA Nano Doctoral Programme in Nanomedicine — a 3 year programmes that allows our doctoral students in nanomedicine to gain a cutting-edge education in the developing area of nanomedicine.

IMDEA Nano Bachelor and Graduate Education in Nanotechnology — the aim of this particular programme is to engage undergraduate students from local Universities at an early stage and encourage them to gain experience in the IMDEA Nanociencia laboratories.

Transferable Skills Courses — the aim of this programme is to provide transversal training support in both research derived needs and non-scientific skills, these courses are open to all IMDEA Nanociencia staff.

For further details see Annex page 160
4. PhD thesis

31/01/2020
Mariano Vera

Novel Functionalization Methods of 1D and 2D Materials and Their Applications
Supervisor: Emilio Pérez
Universidad Autónoma de Madrid

14/02/2020
Miguel Ángel Revuelta Maza

Synthesis, Aggregation and Photophysical Studies of A2B2 Phthalocyanines: Novel Archetypes for Anticancer and Antimicrobial Photodynamic Therapy
Supervisor(s): Tomás Torres and Gema de la Torre Ponce
Universidad Autónoma de Madrid

21/02/2020
Alfonso Pérez Sanchez

Síntesis y Propiedades de sistemas multivalentes basados en nanoformas de carbono
Supervisor(s): Nazario Martín
Universidad Complutense de Madrid

12/03/2020
Yansheng Liu

The applications of CVD grown graphene in surface-enhanced Raman scattering and Förster resonance energy transfer
Supervisor(s): Feng Luo and Reinhold Wannemacher

18/05/2020
Yansheng Liu

The applications of CVD grown graphene in surface-enhanced Raman scattering and Förster resonance energy transfer
Supervisor: Feng Luo
Universidad Autónoma de Madrid

02/06/2020
Peng Han

Charge carrier dynamics in hybrid semiconductors
Supervisor(s): Enrique Cánovas y Mischa Bonn
Universidad Complutense de Madrid

17/07/2020
Julia Villalva

Chemistry of nanomaterials inside out; mechanically interlocked, endohedral and covalent derivatives of SWNTs and 2D materials
Supervisor: Emilio Pérez
Universidad Autónoma de Madrid

18/09/2020
Adrián del Valle

Simultaneous Fluorescence and Atomic Force Microscopy to study mechanically-induced bacterial death in real time
Supervisor: Cristina Flors
Universidad Autónoma de Madrid

22/09/2020
Estefanía Fernández

Novel switchable hybrid materials for applications as sensors at the molecular level
Supervisor: José Sánchez Costa
Universidad Complutense de Madrid
24/09/2020
Sofía Mena
Molecular Machines and Materials based on Mechanically Interlocked Carbon Nanotubes
Supervisor: Emilio Pérez
Universidad Autónoma de Madrid

25/09/2020
Kateryna Lemishko
Mechano-chemistry and dynamics of biological and synthetic systems
Supervisor: Borja Ibarra
Universidad Autónoma de Madrid

21/10/2020
Ana Sánchez Grande
Design and characterization of functional nanomaterials on surfaces
Supervisor: David Écija
Universidad Autónoma de Madrid

05/11/2020
Chen Sun
Optical and morphology properties of supramolecularly controlled conjugated polymers
Supervisor(s): Juan Cabanillas

06/11/2020
Ana Carrasco
Tethered Iridium(III) Cyclopentadienyl Half-Sandwich Complexes for Biological Applications
Supervisor: Ana Pizarro
Universidad Autónoma de Madrid

16/11/2020
Ahmad Sousaraei
Photophysical Properties of Luminescent Metal-Organic Frameworks for Gas Sensing
Supervisor(s): Juan Cabanillas

27/11/2020
Javier Urieta Mora
Design and synthesis of organic p-type semiconductors: Toward efficient Perovskite Solar Cells
Supervisor(s): Nazario Martín
Universidad Complutense de Madrid

16/11/2020
Veronica Almeida Marrero
Synthesis, Supramolecular Organization and Biological Properties of Phthalocyanine-Sialic Acid Biohybrid Photosensitizers
Supervisor(s): Tomás Torres and Andres de la Escosura Navazo
Universidad Autónoma de Madrid

05/12/2020
Veronica Almeida Marrero
Synthesis, Supramolecular Organization and Biological Properties of Phthalocyanine-Sialic Acid Biohybrid Photosensitizers
Supervisor(s): Tomás Torres and Andres de la Escosura Navazo
Universidad Autónoma de Madrid
6. Internationalization

1. Scientific Conference (co)-organized

Organized by:

NALS 2020
2nd International Conference on Nanomaterials Applied to Life Sciences
29th-31st January 2020

16th dec 2020
10th early stage researchers workshop in nanoscience
2. Collaborations with top Research Institutions

To increase our external collaborations (both national and international) we have supported our researchers at all levels to carry out placements in research institutes and industry. >90 mobility months have been accumulated (incoming/outgoing) -funded by the SO, ERASMUS, EMBO etc. Some notable collaborations that have started this year are highlighted below:

- **Collaboration between D Granados and R J Young** (Programme 5)

- **Equipment Development Agreement between F J Terán and T Pellegrino** (Programme 3)

- **Group of E Canovas** has become an official Max Planck Partner Group, work will focus on a subclass of graphen-like 2D metal organic frameworks (Programme 1)

- **D Granados DEFROST Project** (Programmes 1, 4, 5)

- **Strategic Alliance** (Programmes 1, 4, 5)

3. Other collaborations

**CENTRO ESPAÑOL DE METROLOGÍA (CEM)** – A framework agreement was signed with IMDEA (issued in the BOE 30 March 2020). This agreement is focus in the areas of R&D, measurement methods and metrological traceability, education and outreach in Metrology. Thanks to this approach to CEM, IMDEA Nanociencia is participating in projects and proposals of EURAMET (the European Association of National Metrology Institutes) and its initiative EMPIR (European Metrology Programme for Innovation and Research) an initiative co-funded by the Horizon 2020 and the EMPIR participating states. EMPIR coordinates research projects to address grand challenges, while supporting and developing the SI system of measurement units.

**NATO**

Dr. Héctor Guerrero was selected in June 2020 by Secretary General of the North Atlantic Treaty Organization (NATO) as one of the twelve members of the high level Advisory Group on Emerging and Disruptive Technologies. His nomination was proposed by Spanish Ministry of Defence. The principal role of the Advisory Group will be to provide insights, advice and help challenge NATO approach on Emerging and Disruptive Technologies.
7. High-quality research infrastructure

1. Center for nanofabrication

The Centre for Nanofabrication is a joint proposal between the IMDEA Nanociencia and Campus of Excellence UAM+CSIC to create a facility of excellence for the fabrication of nanostructures and devices based on a wide range of nanosciences. The manufacturing of such nanostructures and devices is crucial for fundamental research, but also for the development of prospective nanotechnologies with commercial applications. The Centre for Nanofabrication is hosted in a latest generation clean room, with more than 200m² of clean room surface and more than 500m² in total, including the technical gray area. The clean room is divided in two main areas. The smaller section is approximately 60m² and has a certified air quality of ISO-5 (Class-100). This section is devoted to lithography processes. It is equipped with electron beam Lithography (e-Beam), Focused Ion Beam Lithography (FIB), Gas Assisted Ion/Electron beam lithography (Multi-GIS), Mask-less Optical lithography and Nano-Imprint Lithography. This section is also equipped with a small wet chemistry room for all the processes related to nano and micro lithography. The largest section of the clean room is about 140m² and has a certified air quality of ISO-6 (Class-1000). This part is dedicated to sample and device processing. It is equipped with several thin film evaporators (Thermal, eBeam), an unique Atomic Layer Deposition (ALD), inductively Coupled Plasma Reactive Ion etching (ICP-RIE) for deep cryo etching, Reactive Ion Etching for Metals and Insulators (RIE), Rapid thermal Processor (RTP), Profilometer.
(Dektak), Plasma Cleaner, Ozone Cleaner, Optical Microscopy, Wire Bonder, Diamond Scriber, Probe Satiation and Parameter analyzer. This section is also equipped with an encapsulation room and a large wet chemistry room.

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

2. New infrastructure

New infrastructure and equipment are been geared in the direction of accomplishing world leading research and discoveries in Nanoscience and Nanotechnology, creating and reinforcing the different research programmes by implementing unique facilities and making them available to the scientific community.

One of the priorities of the infrastructure development was to ensure equipment and laboratory space was available to develop our new Research programme in Quantum Devices (P5). This is highlighted by the following scientific infrastructures:

- A new spin-ARPES (spin & Angle Resolved Photoemission Spectroscopy) system, unique in Spain, has been installed in December 2020. It will permit the characterisation of the electronic structure of spin polarised bands in surfaces and interfaces.

- New UHV e-beam evaporator installed in the centre of nanofabrication as part of our framework collaboration with UAM. Partially funded by a National Infrastructure Grant.

- The new closed-circuit helium cryostat with ultra-low vibrations for optoelectronic characterisation (AttoDry800) is operative since March 2020.

- We have also continued to reinforce the other research programmes including the following cross-disciplinary laboratories: a unique non-contact AFM/STM laboratory in UHV (installed in 2019) is fully operative at cryogenic temperatures since June 2020 as part of Dr. Ecija’s ERC Project (P2) (CoG -ELECNANO).
• Cell Culture and Microbiology Unit expansion to now host two laboratories working under BioSafety Level 2 is operative since beginning 2020. Enabling in-house projects and encouraging transversal transfer of knowledge between programmes (P2, P3, P6) potentiating external collaborations.

• Laboratory for PhotoHyperthermia AECC seed funding is assisting in the set-up of this unique facility (P3, P4 A. Espinosa).

3. RedLab – Network of laboratories of the Regional Government of Madrid

278
Laboratory of Surfaces
Contact: F. Calleja

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Laboratory of Advanced Optical Characterization
Contact: J. Cabanillas

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Laboratory of Femtosecond Spectroscopy
Contact: L. Lüer

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Laboratory of Nanomagnetism
Contact: P. Perna

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Laboratory of Atomic Force Microscopy
Contact: C. Flors

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Laboratory of Cell Cultures
Contact: A. Pizarro

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Laboratory of Nanofabrication
Contact: D. Granados
8. Awards and honours

Premio Nacional de Investigación 2020
Nazario Martín

Premios de Investigación de la Comunidad de Madrid “Miguel Catalán” 2019
José Luis López Carrascosa

Embajador del Madrid Convention Bureau 2020
Rodolfo Miranda
Prof. Tomás Torres
03/02/2020
Fellow de Chemistry Europe, 2019
Chemistry Europe/Wiley
01/07/2020
Premio Lourenço-Madinaveitia, Portugal, 2020
Sociedade Portuguesa de Química

Dr. Borja Ibarra
Investigador de NanoLSI
Instituto de Ciencias de la Vida Nano de la Universidad de Kanazawa
Prof. Honorífico
Universidad Complutense de Madrid

Prof. Fernando Martín
01/09/2020
Doctor Honoris Causa
Stockholm University, Sweden

Best Twitter Poster,
10th Early Stage Researchers Workshop in Nanoscience
Ahmad Sousarei
16/12/2020

Best Poster
8th Multifrequency AFM Conference
Adrián del Valle
30/10/2020

Best Oral Communication Award
at the CEMAG Young Symposium Meeting
Elena Sanz de Diego
19/11/2020

Best Poster Presentation Award
at the CEMAG Young Symposium Meeting
Carla Muñoz
19/11/2020

Best Poster
JEMS 2020
Adrián Gudín
07/12/2020
9. Communication and Outreach

Nanociencia para todos

Nanociencia para Todos is the outreach programme of IMDEA Nanociencia. 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.

Virtual Lab tours

Part of Nanociencia para todos, allows continuity with our visits and keeps Institute commitment to “open-doors”.

IMDEA Nanociencia on Instagram!

Easier access for students to videos/virtual tours.
Virtual exhibition of journal covers #IMDEANanoPics
Nanociencia to-go

This programme is aimed at educational centres for the older generations. It consists in live or online tours with “take-away” experiments—supported by videos (science at home). 22 students of the Universidad de Mayores Rey Juan Carlos (URJC) participated in an organized tour at IMDEA Nanociencia on February 26th. On November 23th an online tour took place.
XX edición de la Semana de la Ciencia y la Innovación de Madrid

November 10th
“Acércate a la Nanociencia: lo pequeño es diferente”
70 Students from IES Emilio Castelar (Carabanchel and Colegio San Gabriel (Madrid)) assisted to the on-line lecture by Dr. E. Pérez.

Noche Europea de los Investigadores de Madrid en IMDEA Nanociencia

Investigadores de los 7 institutos IMDEA hablarán de grandes investigadoras que han sido o podrían ser protagonistas en la gran pantalla.

Investigadoras invitadas:
Abraham Estève (Agua)
Ana Barreiro de Mena (Alimentación)
Marta Linares (Energía)
Mónica Echeverry y Eugenia Nieto (Materiales)
Marta Martín y Sofia Oliveira (Innovación)
Arturo Azcorra (Networks)
Elena Gutierrez y Olivia Sebastián (Software)

Con la colaboración especial de:
Manuel Corre (Software)

¡Pudrás preguntar a los investigadores a través de los perfiles de los Institutos IMDEA en YouTube, Twitter y Facebook!
Día internacional de la mujer y la niña en la ciencia

Programa

10:00 - 10:30 Bienvenida en el salón de actos - Ana Pizarro, 30 minutos.

10:30 - 11:00 Kohoot Mujeres que hacen historia en el salón de actos - Álvaro Somoza, 30 minutos

11:00 - 12:00 Visita a los laboratorios - Sala Hínarejos, Adriana Arévalo, S21, Zulay Parodi; B35, Cristina Navia; 109, Isabel Rodríguez; 157, Begona Sot; B11, Cristina Picos; 121 Emilia Pérez; S03, Manuela Garine; 137/151, Álvaro Somoza; B49, Mariela Menghini

Students (4º ESO) from IES La Senda (Getafe) and Colegio Mater Salvatoris (Madrid) participated.

For further details see Annex page 162
Open Science commitment - all IMDEA publications and data will be freely available at the Institutional repository. This aligns the Institute with the Open Access policies of Horizon Europe and the Spanish and Regional Government funding agency requirements.
1. Competitive Projects Office (CPO) [140]
2. Research Support Office (RSO) [144]
3. Gender Equality Plan 2020 [146]
About

SO Programme
Strengthening Research Support

As well as support for our Research Programmes, an important part of the Severo Ochoa project was to reinforce and strengthen the support provided for our researchers. The strengthening of the Competitive Projects Office—provides help in identifying and submission of proposals to important international funding sources (EU, and others). The Dissemination and Communication Office has been formalised, allowing the expansion of our communication networks to aid the dissemination of the scientific results from the Institute. The opening of the Research Support Office allows us to centralise support for staff and students and has the short-term goal of achieving the Human Resource Research of Excellence Award. Finally, the creation of the Strategic International Partnerships Office provides our researchers with unique support in creating collaborative links to both Industry and World-renowned research institutes.
Competitive Projects Office (CPO)

CPO works to promote the participation of the researchers in funding programmes to develop ambitious, innovative and high-quality research.

FOCUS 1: VISIBILITY

- Monthly Internal Newsletter
- Factsheets & Tools
- Training (Skills development support programme)
- Research Projects Office Web page
FOCUS 2: TALENT ATTRACTION

The CPO engages in talent attraction campaigns to recruit outstanding researchers:

- CPO-led initiatives (CO-FUND, ITN, large consortium)
- Open-Training
- Expressions of interest ERC

FOCUS 3: ASSISTANCE

- Active Funding identification
- Proposal Revision Service
- Support service to find partners
- Projects Report Service
- Innovation-based proposal (FET-PROACTIVE, FET Launchpad, EIT KICs)

NanoECoG
Nanotechnology for Electroencephalography
H2020-FETOPEN-2018-2020 CSA-LSP
Submitted: Proposal number 101034993

Nanostripe
Adaptive nanostripes for upgrading current technologies
H2020-FETOPEN-2018-2020 CSA-LSP
Submitted: Proposal number 101034978

FOCUS 4: SUSTAINABILITY

Europa Redes y Gestores - Europa Centros Tecnológicos

OPINA

Optimización en los Procesos de preparación y gestión de iniciativas europeas en IMDEA Nanociencia
Ref.: ECT2019-000615
From 2019-2020
Principal Investigator: Dr. M.J. Villa (Projects, Communication and Research Support Offices)

IM-PULSA

Plan estratégico para el impulso de la participación de IMDEA Nanociencia en Horizonte Europa (IM-PULSA)
Ref.: ECT2020-000746
From: 2021-2022
Principal Investigator: Dr. M.J. Villa (Projects, Communication and Research Support Offices)
Research Support Office (RSO)

RSO, launched in 2019, centralizes and enhances human resources services to support research staff and their career development.

**Initial Phase: 1st Year**
Start of procedure: June 15th 2020

**FOCUS 1**
Initial Phase of the HRS4R procedure to obtain the HR Excellence in Research award.

**Actions:**
- HRS4R procedure started on June 15th
- Supervisor Committee established
- Communication Plan created

**FOCUS 2**
Support talent attraction through personal assistance with emphasis on international staff.

**Actions:**
- Personal assistance for researchers
- Creation of specific informative content for different profiles

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FOCUS 3

Development of the IMDEA Nano Welcome Pack to boost HR internal communication

**Actions:**
- Development of the Welcome Pack and the Employee Handbook

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FOCUS 4

Researchers Career Development support.

**Actions:**
- Training courses on Career & Professional Development
- Development of Personal Career and Development Plan, Appraisal & Self Assessment tool
Gender Equality Plan 2020

Women in Nanoscience session in NALS 2020

Outreach activities on the Int. Day of Women & Girls in Science

Incorporating gender training in our programmes

Collection of resources on gender in R+D for researchers

Incorporation of gender analysis in competitive project proposals

Selection of indicators for monitoring implementation of the Gender/Equality? Plan

Work-life balance policies included in the Welcome Pack

RSO staff being trained in gender
1. Detection of SARS-CoV-2 [149]
2. NoCanther [150]
3. Applications of nanotechnology for metrology [152]
1. Detection of SARS-CoV-2

Fighting against COVID-19

The COVID-19 pandemic triggered a strong reaction in the scientific community. This led to the urgent development of vaccines, pharmaceuticals and equipment to protect against infection, relieve symptoms or cure the disease. In parallel, the development of technologies to counter the spread of disease and save lives, such as diagnostic, analytics and information tools. Testing was demonstrated as crucial for detecting and minimising the spread of the virus, as well as for monitoring the condition of patients. The IMDEA Nanociencia contribution to this unexpected global fight was in the field of developing detectors, in particular, gold nanoparticle-based sensors for the detection of SARS-CoV-2.

Vision

The diagnostic system proposed at IMDEA Nanociencia was aimed at merging the two main approaches for detecting the SARS-CoV-2: the RT-qPCR (quantitative Reverse Transcription PCR) and the antigen tests. The PCR tests are focused on a precise and specific detection of the viral RNA after enzymatic amplification, but require expensive equipment, specialized personnel and hours to get the results. On the contrary, in a few minutes the antigen test detect the virus by targeting the proteins on the virus’s surface by using lateral flow assays. The IMDEA Nanociencia detector merges both systems to obtain precision, as the PCR, with the ease of use and low-cost like the antigen test.

Implementation

IMDEA Nanociencia opted for a quick adaptation of its current bio-sensing technology - based on gold nanoparticles (AuNPs) covered with functionalized oligonucleotides - to detect the viral RNA of SARS-CoV-2. This approach required the modification of AuNPs with DNA sequences complementary to the sequence of the viral RNA. The interaction between these nucleic acids induces the aggregation of AuNPs, which can be detected by the naked eye, which simplifies its use and readout. The system can be adapted to detect different genes of the virus, including those with single point mutations. In parallel, to increase the sensor’s sensitivity, amplification systems were implemented to allow the detection of viral RNA obtained from infected cells or patients. Also, readout systems using lateral flow assays and optoelectronic emitters and detectors were developed. Additionally, IMDEA Nanociencia collaborates in a project of the Centro de Biología Molecular Severo Ochoa (CBMSO / CSIC) to detect the virus in the air in the areas of particular prevalence, such as Madrid hospitals.

Funding and partnership

The research effort was supported thanks to several projects financed by ad hoc funds deployed during the initial months of the pandemic. The Instituto de Salud Carlos III (ISCIII) launched the FONDO – COVID19, and Banco de Santander with CRUE Universidades Española (Conferencia de Rectores de las Universidades españolas) and CSIC (Consejo Superior de Investigaciones Científicas) had the initiative of the Fondo Supera Covid-19. IMDEA Nanociencia was involved in three projects, two of the ISCIII grants:
Transmisión de SARS-CoV2 por el aire: detección en hospitales y tecnologías innovadoras, coordinated by CBMSO / CSIC and with the participation of the University Hospitals (La Paz, Puerta de Hierro and Severo Ochoa), the Centro Nacional de Microbiología (ISCIII) and the Instituto de Salud Global de Barcelona, as collaborating entities.

Desarrollo de sensores colorimétricos basados en nanopartículas de oro para la detección del SARS-CoV2 — Coordinated by IMDEA Nanociencia with Instituto Ramón y Cajal de Investigación Sanitaria (YRYCIS) and Synthelia Organics S.L. as collaborating entities.

and a third one of Santander-CRUE-CSIC:

Nanotech-based PCR-free SARS-CoV-2 quantitative detection kit (NANOSEEK) — Coordinated by UAM (Universidad Autónoma de Madrid) and with the participation of the Hospital Universitario Ramón y Cajal

Several partnerships grew in the framework of these projects thanks to the participation of Hospitals and companies. The interdisciplinary of the R&D teams is a constant in the projects, a demonstration of the determination of the science community in supporting any solution from its expertise to mitigate the pandemic. At the time of the edition of this annual report the research continues, but the huge advance achieved by IMDEA Nanociencia in these detection techniques has changed forever our ability to deal with the future bio-threats that will come with emerging viruses.

2. NoCanTher
A long-haul multidisciplinary project reaches a clinical study

Background

Nanomedicine has emerged as a potential therapy for pancreatic cancer, a disease with a 5-year survival rate as low as 5%. Novel approaches are therefore required to increase the efficacy of chemotherapy. The NoCanTher project was launched in 2016 to test the use of magnetic nanoparticles in treating locally advanced pancreatic cancer, and is coordinated by the Institute. The project builds on the work from the Multifun project (2011-2015, PI: Prof Rodolfo Miranda), scientifically coordinated by IMDEA Nanociencia, which led the early development of the nanoparticles used as the basis of the NoCanTher project.
Milestone Clinical Study

The NoCanTher project has entered its final phase with the start of a clinical study aimed at patients with unresectable, locally advanced pancreatic cancer that has not metastasized, for whom the only therapeutic alternative is palliative chemotherapy.

This important milestone marks the culmination of over ten years’ of scientific work. The study will be led from Spain and carried out at two sites Hospital Universitario de Fuenlabrada (Madrid) and -Vall d’Hebron Institute of Oncology (Barcelona). This novel approach will now be tested in patients with locally advanced pancreatic cancer.

Magnetic nanoparticles are implanted in the tumor, followed by the application of an alternating magnetic field to enhance the therapeutic effect of the standard of care.

Multidisciplinary Groups

The IMDEA team headed by Rodolfo Miranda and Álvaro Somoza, have implemented the experience of the preparation and scale-up of magnetic nanoparticles and importantly, the characterization of this type of nanomaterials. Important contributions from Fran Teran, Gorka Salas, Daniel Ortega supported by Ana Pizarro and the team at the cell-culture unit have brought together chemists, physicists and biologists together to achieve this unique success.

Consortium:

Under the coordination of IMDEA Nanociencia, eleven national and international research centres are members of the NoCanTher – Nanomedicine upscaling for early clinical phases of multimodal cancer therapy – Consortium: BioKerality Research Institute (Miñano, Spain), ImmuPharma (London, England), Chemicell (Berlin, Germany), University Hospital (Jena, Germany), Resonant Circuits (London, England), Vall d’Hebron Research Institute (VHIR) (Vall d’Hebron Barcelona Hospital Campus, Barcelona, Spain), Trinity College (Dublin, Ireland), Université Paris Diderot (Paris, France),
Vall d’Hebron Institute of Oncology (VHIO) (Vall d’Hebron Hospital Campus, Barcelona, Spain), Hospital Universitario de Fuenlabrada (Madrid, Spain).

This project receives funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 685795.

For more information about the project, please visit: www.nocanther-project.eu.

3. Applications of nanotechnology for metrology

Metrology

metrology is a science in continuous evolution, trying to improve the realization of fundamental magnitudes through precision measurements of various fundamental constants. An example of this is the realization of resistance through the quantum Hall effect. The revision of the SI in 2019 represents an historic change of paradigm for metrology, defining all the SI units in terms of fundamental constants of nature. The development of new experiments and devices is a challenge in metrology and a clear opportunity for nanotechnology.

Vision

Nanotechnology is an enabler for metrology, with potential to make materials and devices to correlate physical observables to the fixed defining constants, paving the way for the realization of self-calibrating systems. The final goal is to achieve systems that can independently refer to the fundamental constants of nature with zero-chain traceability. In order to have a safe convergence with the metrology field, IMDEA Nanociencia signed in March 2020 an institutional agreement with the CEM (Centro Español de Metrología) and began to participate in the European Metrology Programme for Innovation and Research (EMPIR), co-funded by European Union’s Horizon 2020 research and innovation programme and the EMPIR participating member states. Thanks to this framework, we can participate in addressing some of the metrology challenges proposed by the European Association of National Metrology Institutes (EURAMET). IMDEA Nanociencia and CEM have a common interest in working together towards a Spanish quantum resistance standard based on Graphene.
Funding and partnership

iMDEA Nanociencia’s heritage in the full value chain of 2D materials (graphene, MoS2…), combined with the know-how in superconductivity and its unique capabilities in micro/nano-manufacturing, made the Institute an excellent participant to apply in EMPIR consortiums. The relations with main European Metrology National Centres and industrial actors in Metrology were established and several projects were financed in the 2019/20 calls:

1. **ISO-G-Scope** - Standardisation of structural and chemical properties of graphene;
2. **MEMQuD** - Memristive devices as Quantum Standard for Nanometrology;
3. **COMET** - Two dimensional lattices of covalent- and metal-organic frameworks for the Quantum Hall resistance standard.

![Value chain of 2D Materials (Graphene, MoS2 ...)](image)

The first measurement of Quantum Hall effect in graphene, performed at IMDEA
annexes

1. National and International Congresses  [155]
2. Conferences and Courses   [160]
3. Outreach activities    [162]
1. National and international congresses: invited lectures and regular contributions

33 events
24 online

161 contributions

15 invited lectures
and 116 regular contributions,
56 oral and 60 as posters

15/01/2020
13th National Organic Chemistry Meeting (13ENQO), Universidade de Aveiro, Aveiro

Subphthalocyanines: Singular aromatic non-planar molecules
Oral contribution
T. Torres

29/01/2020
NALS2020, International Conference of Nanomaterials Applied to Life Sciences, Madrid

Oral contributions

Biocompatibility studies of novel nanostructures electrodes for neural repair in spinal cord injury
Ana Domínguez, Ankor González-Mayorga, Beatriz L. Rodilla, Ana Arché, Lucas Pérez, María Concepción Serrano, Teresa González, Elisa López, and María Concepción Serrano

Nanotechnology-based neural interfaces

Targeting the plasma membrane as a secondary target in photodynamic therpay for cancer cells
Sebastian Thompson

Tumour Vessel-on-a-chip for Nanomedicine Development
Sergio Dávila, Jean Cacheux Isabel Rodríguez

Role of the number of recognition ligands per particle on the sensitivity of a novel magnetic detection method of biomarkers

Poster contributions

Hybrid systems for metal-based bio-orthogonal catalysis on carbon nanotubes
Federica Battistini, Ana M. Pizarro

Iridium(III) Anticancer Complexes for the Functionalization of Soft Materials
Ana C. Carrasco, Adriana Arnaiz, Ivonne González-Gamboa, Carmen Yuste-Calvo, Flora Sánchez, Fernando Ponz and Ana M. Pizarro

Magnetic detection of neural activity in spinal cord slices

Mechanobiological Control of Human Neural Stem Cells
Miguel Esteban-Lucía, Judith Estengre Pérez, Silvia García-López, Jaime J Hernández, María P Pereira, Alberto Martínez-Serrano, Isabel Rodríguez

Nanostructured electrodes for electrophysiological measurements
Ana Arché-Núñez, Beatriz L. Rodilla, Julio Camarero, Rodolfo Miranda, Lucas Pérez, María Concepción Serrano and M. Teresa González

Nanostructured electrodes for neural stimulation

Osmium(II) half-sandwich compounds with carboxylate groups for nanoparticle functionalization
Sonia Infante-Tadeo, Abraha Habtemariam, and Ana M. Pizarro

Rhodium and iridium half-sandwich complexes that report on activity status inside cells
Arturo Villegas-Rojo, Ana C. Carrasco, Adrián Luguera and Ana M. Pizarro

Synthetic micro-nano environments for controlling infection and cell implantation in prosthetics

Ultra-low magnetic field sensing using AMR magnetometers based
I. Martínez, A. Vera, R. Guerrero, L. Enger, L. Perez, J. Camarero, L. Mechin, R. Miranda, M. T. González

Quantification of heat dose released by iron oxide nanoparticles inside breast cancer cells under near infrared irradiation
Claudia Lozano Pedraza, Ana Espinosa, Francisco Sanz-Rodriguez and Francisco J. Teran
Benefits of the Encapsulation of Ag2S-based and Iron Oxide Nanocrystals into Phospholipidic Micelles in their Magnetic Properties

Janus gold-iron oxide nanohybrids for magnetically-guided photothermal therapy

Synthesis of iron oxide hybrid nanoparticles for magnetic hyperthermia applications over different tumour cell lines
David García-Soriano, Paula Milán-Rois, Nuria Lafuente-Gómez, Cristina Navío, Álvaro Somoza, Gorka Salas

30/01/2020
1st meeting of the European XFEL Spanish user community, Hamburg, Germany
Attosecond molecular dynamics with XFELs, a theoretical perspective
Oral contribution
F. Martín

02/02/2020
Single Molecule Biophysics, Les Houches, France
Five minutes in the life of a molecular shuttle
Oral contribution
B. Ibarra

23/02/2020
TMS 2020 Annual Meeting & Exhibition, San Diego
Development of tuned composites based on metallic particles for advanced 3D-printing by Fused Deposition Modeling
Oral contributions
E.M. Palmero, D. Casaleiz, J. de Vicente, J. Hernández-Vicen, S. López-Vidal, E. Ramiro, and A. Bollero

Understanding the role of particle size in the development of flexible permanent magnet-polymer filaments
E.M. Palmero, D. Casaleiz, J. Rial, J. de Vicente, and A. Bollero

25/02/2020
Innovaciones en las tecnologías cuánticas (InnoUAM Cuántica), Madrid, Spain
Lo que la Química Computacional espera de las tecnologías cuánticas
Oral contribution
F. Martín

01/03/2020
MAGNETOFON COST Meeting. Online
Ultrafast Light-Induced Nucleation of Skyrmion Lattices
Oral contribution
Pablo Olleros-Rodríguez, Mara Strungaru, Sergiu Ruta, Paul Gavriloaea, Roy Chantrell, Paolo Perna and Oksana Chubykalo-Fesenko

02/03/2020
JCI - V Reunión de Jóvenes Investigadores en Coloides e Interfases. Online
Cation incorporation and leaching in MnFe3-xO4 nanoparticles and its influence on properties for biomedical applications
Oral contribution
David García-Soriano, Rebeca Amaro, Nuria Lafuente-Gómez, Paula Milán-Rois, Álvaro Somoza, Cristina Navío, Fernando Herranz, Lucia Gutiérrez, Gorka Salas

03/03/2020
#RSCPoster Online Poster Session RSC
Tomás Nicolás
https://twitter.com/tnicolasgarcia/status/1234842687179776000

07/03/2020
Atsuhiro Osuka on the occasion of his 65th birthday and formal retirement, Kyoto University, Kyoto.

Phthalo- and Subphthalocyanines: Supramolecular Chemistry and Molecular Photovoltaics
Oral contribution
T. Torres

01/04/2020
Molecular-based coordination polymer as reversible and precise acetonitrile electro-optical readout
Oral contribution
J. S. Costa

04-05/04/2020
Hackathonvirtual Madrid #VenceAlVirus
Sistema de diagnóstico de la enfermedad CoVid-19
Oral communication
H. Guerrero

03/05/2020
ESMolNa2020 13th European School on Molecular Nanoscience. Online
Hybrid Superconducting Nanowires Single-Photon Detectors
Oral contribution
Cristina García-Pérez

04/05/2020
EGU General Assembly 2020
MiniPINS - Miniature in situ sensor packages for Mars and Moon
Oral contribution
H. Guerrero

30/05/2020
65th Crystal Engineering and Emerging Materials Workshop of Ontario and Quebec, Canada. Online
Reversible Protonation of Porphyrinic MOF as the Working Principle for Colorimetric Sensor Tags for Biogenic Amines
Oral contribution
Ahmad Sousarei*, Juan Cabanillas-Gonzalez
Virtual Scanning Probe Microscopy Workshop. Online
Transition from Yu-Shiba-Rusinov states to Kondo screening of a charged TCNQ molecule on a Nd STM tip
Poster contribution
C.G. Ayani, F. Calleja, P. Casado, M. Garnica, A.L. Vázquez de Parga and R. Miranda

Unveiling the radiative local density of optical states of a plasmonic nanocavity by STM

1H and 1T’ MoTe2 islands on Graphene/Ir (111): Growth, Topography and Electronic Structure
Poster contribution
P. Casado Aguilar, A. L. Vázquez de Parga, R. Miranda, M. Garnica

FENS 2020 Virtual Forum of Neuroscience. Online
Mechanobiological Control of Human Neural Stem Cells
Poster contribution
Miguel Esteban-Lucía, Judith Estengre Pérez, Silvia García-López, Jaime J Hernández, Marta P Pereira, Alberto Martínez-Serrano, Isabel Rodríguez

Polymeric Composite Nanopillars to Interface Neurons and Synaptic Network Formation
Poster contribution
Ivo Calaresu, Jaime Hernandez, Isabel Rodriguez, M. Teresa González, Denis Scaini and Laura Ballerini

The 2020 Around-the-Clock Around-the-Globe Magnetics Conference. Online
3D magnetometry using XMCD-PEEM microscopy
Oral contribution
S. Ruiz-Gómez, L. Pérez, J. de la Figuera, A. Quesada, M. Foerster, L. Aballe

2020 CMD and GEFES Joint Meeting CMD2020GEFES. Online
Oral contributions
Ferrocene — Graphene Molecular Junctions for Light Photodetection
Trasobares, Jorge ;C. de Lory, Marina ;Martín, Juan Carlos ;Gómez, Alicia ;Niño, Miguel Ángel ;Miranda, Rodolfo ;Granados, Daniel

One single step from ε-phase gas-atomized to L10-phase MnAlC bulk magnet by hot-pressing
C. Muñoz-Rodríguez, E.M. Palmero, J. Rial, L. Feng, T. Mix, T.G. Woodcock, and A. Bollero

Spin-Orbit Torque from the Introduction of Cu Interlayers in Pt/Cu/Co/Pt Nanolayered Structures for Spintronic Devices

Ultrafast Light-Induced Nucleation of Skyrmion Lattices
Pablo Olleros-Rodriguez, Mara Strungaru, Sergiu Ruta, Paul Gavriloea, Roy Chantrell, Paolo Perna and Oksana Chubykalo-Fesenko

Hybrid Superconducting Nanowires Single-Photon Detectors
Cristina García-Pérez, Víctor Marzoa, Marina C. De Ory, María Acebrón, María Teresa Magaz, Fernando J Urbanos, Alicia Gómez, Ramón Bernardo-Gavito, Daniel Granados

Unveiling the radiative local density of optical states of a plasmonic nanocavity by STM
Roberto Otero, Alberto Martín-Jiménez, Antonio I. Fernández-Domínguez, Koen Lauwaet, Daniel Granados, Rodolfo Miranda, and Francisco J. García-Vidal.

Pi-conjugated polymers and topology
D. Ecija

Optical characterization of few-layer MoS2 mechanical resonators

Correlation between microstructure and magnetic properties of core/shell nanoparticles: (Co-, Ni-) ferrite/(CoFe, NiFe)
D. Casaleiz, M. Villanueva, E.M. Palmero, Y. Luengo, J. Camarero, A. Espinosa, G. Salas, and A. Bollero

Spin-state dependent electrical conductivity in single-wall carbon nanotubes encapsulating spin crossover molecules.
Aysegul Develioglu, Julia Villalva, Arturo Gamonal, Eduardo Rial, José Sánchez Costa, Emilio M. Pérez, Enrique Burzuri.

European School of Magnetism (ESM). Online
Magnetic configuration of permalloy cylindrical nanowires with chemical barriers
Poster contribution
Laura Alvaro Gomez

SBAN2020 3rd Spanish Conference on Biomedical Applications of Nanomaterials. Online
Magnetic detection of neural activity in spinal cord slices
A. Vera, I. Martinez, R. Guerrero, I. Calaresu, J.
Camarero, L. Ballerini, R. Miranda, M. T. González, L. Pérez

Planar and sharp nanotechnology-based electrodes for neural electric measurements

The influence of cation incorporation and leaching in the properties of Mn-doped nanoparticles for biomedical applications.

Topographical bioengineering for mesenchymal stem cell-control and bactericidal properties study

Opto-magnetic nanostructures for application in nanothermometry and hyperthermia: interactions in the biological environment

Doxorubicin-loaded iron oxide nanoparticles for multimodal hyperthermia-based anticancer treatments

Structure and magnetic properties of multi-core iron oxide nanoparticles obtained by polyol process

07/09/2020
AEBIN Photochemistry School. Online
Activatable fluorescent probes based on rhodium(III) and iridium(III) half sandwich
Poster contribution
Arturo Villechenous Rojo, Ana M. Pizarro.

09/09/2020
1st Annual meeting of the European COST Action on Attosecond Chemistry (AttoChem). Online
Imaging electron molecular dynamics: towards attochemistry
Oral contribution
F. Martin.

19/09/2020
ImagineNano2020. Online
Nano-scale temperature measurements using anisotropy-based nanothermometers for cancer theranostics
Oral contribution
Sebastian Thompson.

24/09/2020
2020 Shijiazhuang International Biotechnology and Pharmaceutical R&D Cloud Summit, Shijiazhuang, China. Online
Phthalocyanines based photosensitizers for Photodynamic Therapy of cancer and atherosclerosis
Oral contribution
T. Torres.

24/09/2020-09/10/2020
14th Europlanet Science Congress 2020
MiniPINS - Miniature in situ sensor packages for Mars and Moon
Oral contribution
H. Guerrero.

13/10/2020
Faraday Discussion: Cooperative phenomena in framework materials. Online
A switchable iron-based coordination polymer toward reversible acetonitrile electro-optical readout
Poster contribution
E. Resines-Urien, J. S. Costa.

28/10/2020
International Conference on LEEM-PEEM 2020. Online
Domain Wall dynamics in permalloy nanowires with ferromagnetic chemical barriers
Poster contribution
S. Ruiz-Gómez, C. Fernández-González, Michael Foerster, Lúcia Aballe, Juan de la Figuera, Adrián Quesada and Lucas Pérez.

30/10/2020
8th Multifrequency AFM conference. Online
Bacterial cell wall mechanical damage studied by simultaneous nanoindentation and fluorescence microscopy
Poster contribution
Adrián Del Valle, Joaquim Torra, Patricia Bon-día, Caterina M. Tone, Virginia Vadillo and Cristina Flors.

02/11/2020
MMM2020 Annual Conference on Magnetism and Magnetic Materials. Online
Ultrafast Light-Induced Nucleation of Skyrmion Lattices
Oral contribution
Pablo Olleros-Rodríguez, Mara Strungaru, Sergiu Ruta, Paul Gavrileoa, Roy Chantrell, Paolo Perna and Oksana Chubykalo-Fesenko.

18/11/2020
4th Young Researchers in Magnetism. Online
Influence of the spatial distribution of Iron Oxide Nanocrystals into Phospholipidic Capsules on their Magnetic Losses
Oral contributions

Exploiting Nanomagnetism for Bio-markers Detection in Biological Fluids
Development of novel MnAlC-based permanent magnet composite materials by solution casting to obtain flexible filaments for 3D printing
D. Casaleiz, E.M. Palmero, J. de Vicente, and A. Bollero

Non-Equilibrium heating path for the light-induced nucleation of skyrmion lattices
Pablo Olleros-Rodríguez, Mara Strungaru, Sergiu Ruta, Paul Gavriloaea, Roy Chantrell, Paolo Perna and Oksana Chubykalo-Fesenko

Rare earth-free MnAlC permanent magnets produced by hot pressing from ε-phase gas-atomized and milled powder
C. Muñoz-Rodríguez, E.M. Palmero, J. Rial, L. Feng, T. Mix, T.G. Woodcock, and A. Bollero

Scale-up of nanowires synthesis for the application in composite bonded magnets

Poster contributions
Magnetic detection of neural activity in spinal cord slices

Spin Orbit driven effects and Thermal Activation of Ferromagnet Intercalated Graphene-Heavy Metal Interfaces

01/12/2020
JEMS2020 The Joint European Magnetic Symposia. Online

Oral contributions
Effect of the deposition temperature on the performance of AMR sensors based on La2/3Sr1/3MnO3 thin films

Non-Equilibrium heating path for the light-induced nucleation of skyrmion lattices
Pablo Olleros-Rodríguez, Mara Strungaru, Sergiu Ruta, Paul Gavriloaea, Roy Chantrell, Paolo Perna and Oksana Chubykalo-Fesenko

Towards an active bypass for neural reconnection
I. Martínez, A. Vera, R. Guerrero, I. Calaresu, L. Perez, J. Camarero, L. Ballerini, R. Miranda, M. T. González

Ultra-low magnetic field AMR magnetometers study based on LSMO for biomedical applications

Poster contributions
Collective magnetic behaviour of metallic nanowire arrays
Claudia Fernandez-Gonzalez, Sandra Ruiz-Gomez, Adrián Gudín, José Manuel Diez, Julio Camarero and Lucas Perez

Spin Orbit driven effects and Thermal Activation of Ferromagnet Intercalated Graphene-Heavy Metal Interfaces

11/12/2020
10th Early Stage Researchers Workshop in Nanoscience. Online

Oral contributions
2H- and 1T’- MoTe2 islands on Graphene/Ir(111): Growth, Topography and Electronic Structure
P. Casado Aguilar, A. L. Vázquez de Parga, R. Miranda, M. Garnica

3D-printing of MnAlC magnets: Influence of the particle size on the synthesis of MnAlC/polymer composites and magnetic flexible filaments for 3D-printing
D. Casaleiz, E.M. Palmero, J. de Vicente, and A. Bollero

Covalent post-synthetic modification of switchable iron-based coordination polymers by volatile organic compounds: A versatile strategy for selective sensor development
E. Resines-Urrien, J. S. Costa
Poster contributions

*Activation of the Ir–N(pyridine) Bond in Half-Sandwich Tethered Iridium(III) Complexes*
Ana C. Carrasco, Vanessa Rodríguez-Fanjul, and Ana M. Pizarro

*Enhanced Differentiation of Neural Stem Cells on Nanopillar-patterned Substrates*
Miguel Esteban-Lucía, Judith Estengre Pérez, Silvia García-López, Jaime J Hernández, Marta P Pereira, Alberto Martínez-Serrano, Isabel Rodríguez

*Fluorescent tethered rhodium(III) and iridium(III) half-sandwich complexes*
Arturo Villegas Rojo, Ana M. Pizarro

*Hybrid systems for metal-based bio-orthogonal catalysis on carbon nanotubes*
Federica Battistin, Ana M. Pizarro

*Liquid phase exfoliation of cylindrite: a natural van der Waals superlattice with intrinsic magnetic interactions*
Lucía Martín, Yue Niu, Julia Villalva, Riccardo Frisenda, Mar García-Hernández, Emilio M. Pérez, Andrés Castellanos-Gomez and Enrique Burzuri

*Luminescent metal-organic frameworks embedded in a polymer matrix for chemical sensing*
Ahmad Sousarei*, Juan Cabanillas-Gonzalez

*Magnetic detection of neural activity in spinal cord slices*

*Osmium(II) half-sandwich tethered complexes: activation, reactivity and catalytic behaviour*
Sonia Infante-Tadeo, Abraha Habtemariam, Adriana Arnáiz, Diane L. Barber and Ana M. Pizarro

*Planar and sharp nanotechnology-based electrodes for electrophysiological neural activity study*

*Ruthenium- and osmium-arene tethered complexes for selective activation in cancer cells*
Claudia Cardozo Yusti, Ana M. Pizarro

*Spin Orbit driven effects and Thermal Activation of Ferromagnet Intercalated Graphene-Heavy Metal Interfaces*

*Spin state dependent electrical conductivity in single-wall carbon nanotubes encapsulating spin crossover molecules*
Aysegül Develioglu, Julia Villalva, Arturo Gamoñal, Eduardo Rial, José Sánchez Costa, Emilio M. Pérez, Enrique Burzuri

*On-surface synthesis of doubly-linked one-dimensional pentacene ladder polymer*
Kalyan Biswas, José I. Urgel, Ana Sánchez-Grande, Shayan Edalatmanesh, José Santos, Borja Cirera, Pingo Mutombo, Koen Lauwaet, Rodolfo Miranda, Pavel Jelinek, Nazario Martin, David Eciá

**2. Conferences and Courses**

**01/01/2020**

*Institute for Pure & Applied Mathematics, UCLA, Los Angeles*

*Theory and computation for 2D models.*

Francisco Guinea (Invited)

**14/01/2020**

*Coimbra Institute for Clinical and Biomedical Research, Universidade de Coimbra, Portugal*

*Phthalocyanines for Photodynamic Therapy*

T. Torres (Invited)

**28/01/2020**

*Swiss Federal Laboratories for Materials Science and Technology (EMPA), Engelberg*

*Electric and thermoelectric properties of conjugated oligomers at the single molecule level*

Edmund Leary (Invited)
19/02/2020
Centro Nacional de Biotecnología, Madrid
Hybrid AFM and Fluorescence Nanoscopy to image amyloids: from materials to biomedicine
Cristina Flors (Invited)

28/02/2020
Colorado School of Mines, Golden CO, USA
Protected cat states in a driven superfluid boson gas
Fernando Sols

01/03/2020
Université de Bordeaux, France
Probing the interaction between magnetic nanoparticles and biological entities by AC magnetometry
Francisco J. Teran

05/03/2020
NARA Institute of Science and Technology (NAIST) Ikonoma, Japan
Subphthalocyanines: Singular aromatic non-planar molecules. Synthesis, supramolecular organization
T. Torres

02/03/2020
Universidad de Oviedo
Biomedical applications of magnetic nanomaterials School
Francisco J. Teran
Probing the interaction between magnetic nanoparticles and biological entities by AC magnetometry

06/03/2020
Instituto de Cerámica de Galicia, Santiago de Compostela
Probing the interaction between magnetic nanoparticles and biological entities by AC magnetometry
Francisco J. Teran

27/04/2020
Katholieke Universiteit Leuven (KU Leuven). Online
What we do in the sunshine: contributions from IMDEA Nano to the chemistry of 2D materials
Emilio M. Pérez

20/05/2020
Geneva Bussiness School
How to run a successful team in today’s fast-paced work environment - LEADERSHIP and Space Exploration
H. Guerrero

24/06/2020
Instituto de Ciencia de Materiales de Aragón (ICMA). Online
Chateando con la ciencia ahora on-line: El tsunami de la Nanotecnología
Rodolfo Miranda (Invited)

01/07/2020
Instituto de Ciencias Fotónicas ICFO. Online
Emergent phenomena in Moiré materials
Francisco Guinea (Invited)

02/07/2020
Institut des Sciences Chimiques de Rennes (ISCR). Online
What we do in the sunshine: tales of the chemistry of low-dimensional materials
Emilio M. Pérez (Invited)

01/09/2020
Department of Physics, University of Minnesota. Online
Francisco Guinea (Invited)

16/09/2020
Seminaros de Investigación “Alberto Tejedor” del Instituto de Investigación Sanitaria Instituto de Investigación Sanitaria Gregorio Marañón, Madrid. Online
ByAxon: el camino hacia un bypass activo para reconexiones neuronales
Lucas Pérez (Invited)

27/04/2020
Chemistry Europe Fellows Day, Real Sociedad Española de Química. Madrid. Online
Subphthalocyanines: Singular aromatic non-planar molecules
T. Torres

30/09/2020 & 2-3/10/2020
Universidad Carlos III de Madrid
Taxonomies for space systems engineering
H. Guerrero

07/10/2020
PhDay Físicas 2020. Online
Arturo Vera, Lucas Pérez
https://fisicas.ucm.es/phday-fisicas-2020

11/10/2020
SNU Online Seminar Series on Photochemistry and Photophysics, Department of Materials Science and Engineering, Seoul National University, South Korea Online
Photophysics of Innovative Organic Charge-Transfer Systems
Johannes Gierschner (Invited)

21/10/2020
Institute of Polymer Optoelectronic Materials and Devices, School of Materials Science and Engineering, South China University of Technology
Luminescence Enhancement and Quenching in Organic Solids
Johannes Gierschner (Invited)

24/10/2020
Institute of Polymer Optoelectronic Materials and Devices, School of Materials Science and Engineering, South China University of Technology. Online
Photophysics of Supramolecular Polymers for Artificial Light-Harvesting
Johannes Gierschner (Invited)
3. Outreach activities

14/01/2020
Rueda de prensa del Consejo de Gobierno - 14 de enero de 2020 en IMDEA Nanociencia Ignacio Aguado, Vicepresidente de la Comunidad de Madrid
https://twitter.com/ComunidadMadrid/status/12170517602205696
Comunidad de Madrid
https://www.comunidad.madrid/noticias/2020/01/14/impulsamos-institutos-madrilenos-estudios-avanzados

27/01/2020
Madrid al frente de la investigación para la recuperación de funciones ante lesiones medulares
BYAXON project
Madrid lidera la investigación de un bypass para lesiones medulares
BYAXON project
Visita del Vicepresidente Ignacio Aguado y Consejero de Ciencia Eduardo Sicilia a IMDEA Nanociencia
https://twitter.com/ignacioaguado/status/1221860217509511173
03/03/2020
Blog post - Cover of Nanoscale Horizons
https://scixel.es/red-light
17/04/2020
Eduardo Sicilia sobre test de COVID-19 en El Barometro de Inter Radio
https://twitter.com/edsicilia/status/1251158242677256195?s=20
20/04/2020
Aparición en Buenos Dias Madrid de Telemadrid
Alvaro Somoza
Entrevista en Inter Almeria TV
Rodolfo Miranda
https://twitter.com/interalmeriatv/status/1252213364320866304? século=20
Test rápido para el coronavirus que se desarrolla en el madrileños IMDEA “la clave está en un líquido con nanopartículas de oro”
Alvaro Somoza
https://twitter.com/telemadrid/status/1252136580397051905?s=20

21/04/2020
Desarrollan un sensor con nanopartículas de oro para detectar la COVID-19
Alvaro Somoza
https://twitter.com/informativost5/status/1252293704196542464?s=20

01/05/2020
#IMDEAnanoPics campaign - marcapáginas
On Twitter, Facebook and Instagram #IMDEA-nanoPics

01/06/2020
Contribution to a book: “Ciencia y Cosmos del siglo XXI”
Francisco Guinea
https://drive.google.com/file/d/1pry1EG02YDWS5nDDqti2gAPs5mEYMH/view?usp=sharing

18/06/2020
Front cover of Nature Nanotechnology June 2020 Issue
ELECNANO project
David Ecija
https://www.nature.com/nnano/volumes/15/issues/6

25/06/2020
Campaña #InvestigarEsAvanzar Comic sobre la publicación científica en Small, co-financiada por la AECC
AECC project
Ana Espinosa
https://twitter.com/aecc_es/status/1276068011405914112?s=20

27/08/2020
Podcast Coffee Break SyR 282: Agujeros negros en el Sistema Solar, nanoelectrodos, hierro-60 y supernovas, y mucho más
BYAXON project
https://francis.naukas.com/2020/08/28/podcast-cb-syr-282-vari-asc这只 noticias/?fbclid=IwAR1KU7JdukXGRbfjWWhmFK70a0dG1LmPOK6UbCk2ww8qSLGymDph0Ko4

07/09/2020
A LEAF - On the road to solar fuels
ALEAF project
https://www.youtube.com/watch?v=Pr8Hu321z-A

22/09/2020
Future Tech Week #EICFTW
BYAXON project
https://twitter.com/search?q=from%3Abyaxon_project%20eicftw

23/09/2020
Programa “Aqui hay trabajo” de La2 de RTVE
AECC project
Ana Espinosa

27/11/2020
NOCHE EUROPA INVESTIGADORES - Grandes científicas en la gran pantalla
Featured by MSCA fellows at IMDEA Nanociencia

02/12/2020
NOCHE EUROPA INVESTIGADORES - Grandes científicas en la gran pantalla
https://www.youtube.com/watch?v=-heZ8qKcQLc&feature=youtu.be

Exhibitions

23/04/2020
XI Feria Madrid Es Ciencia 2020. Online
V. Marzoa, C. García-Pérez, R. Bernardo-Gavito, D. Granados
https://www.madrimasd.org/feriamadridesciencia

02/11/2020
Semana de la Ciencia y la Innovación 2020. Online
Virtual exhibition on social media #IMDEANA-nopics
Virtual lab tour

05/11/2020
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Madrid lidera la investigación de un bypass para lesiones medulares

Madrid lidera la investigación de un bypass para lesiones medulares - visita del Vicepresidente de la Comunidad de Madrid Ignacio Aguado
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02/02/2020
Rodolfo Miranda: “Tener un lugar en el que investigar es un sueño”

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Cs impulsará las medidas necesarias para convertir a Madrid en un “referente en el acceso de las mujeres y las niñas a la ciencia”

20/02/2020
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Max Planck Partner Group at IMDEA Nanociencia

IMDEA Nanociencia desarrolla un innovador test diagnóstico del Coronavirus

Covid-19: Prevención, antibióticos y nanotecnología, entre los nuevos ensayos financiados por el ISCIII

El Instituto de Salud Carlos III financia seis nuevos ensayos sobre el Covid-19

El ISCIII financia seis nuevos ensayos para mejorar la prevención, diagnóstico y tratamiento del COVID-19

IMDEA Nanoscience develops an innovative diagnostic test for Coronavirus to be financed by the Carlos III Health Institute (ISCIII)

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Aguado se reune con investigadores madrileños que estudian nuevos tests mas rápidos y certeros

Desarrollan una prueba rápida y precisa para identificar casos de infección del coronavirus

Madrid desarrolla un test para diagnosticar coronavirus de forma “más rápida, sencilla y certera”

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Social media

TWITTER
La cuenta oficial de IMDEA Nanociencia es la principal red social para la difusión de la ciencia. En 2020 tuvo hasta 2500 seguidores, y un total de 530k impresiones.
https://twitter.com/IMDEA_Nano

FACEBOOK
La página de IMDEA Nanociencia en Facebook mantiene a sus seguidores actualizados con las últimas noticias de nuestro instituto. En 2020 tuvimos hasta 700 seguidores.
https://www.facebook.com/IMDEAnanociencia/

YOUTUBE
IMDEA Nanociencia explica proyectos, líneas de investigación y publicaciones en breves vídeos. Los YouTubers de nuestro instituto se destacan en nuestras listas de reproducción.
https://www.youtube.com/channel/UCyL-J_nvT6Um1-xvRPPg3oA

LINKED-IN
Encuentra ofertas de trabajo, mantente en contacto con los compañeros de trabajo. En el último año, la cuenta ha aumentado considerablemente sus seguidores hasta 1500.
https://www.linkedin.com/company/imdea-nanociencia/

INSTAGRAM
En el año 2020 IMDEA Nanociencia estrena cuenta de Instagram para conectar con el público más joven. En la actualidad, la cuenta tiene 600 seguidores.
https://www.instagram.com/IMDEAnanociencia/