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AYUDAS RAMÓN Y CAJAL
CONVOCATORIA 2020

Turno de acceso general

Nombre: VELEZ CENTORAL, SAUL
Referencia: RYC2020-030263-I
Área Temática: **Ciencias y tecnologías de materiales**
Correo Electrónico: saul.velez@mat.ethz.ch

Título:

Magnetotransport and optical phenomena in heterostructure devices and two-dimensional materials

Resumen de la Memoria:

In May 2021, Saül Vélez will join the Condensed Matter Physics Center (IFIMAC) of the Autonoma University of Madrid as Junior Group Leader and head of the Spintronics and Nanodevices group. Since September 2017, he is holding a senior postdoctoral position at ETH Zürich. With interest in spintronics, magnetotransport, and optoelectronics phenomena, his current research focuses on exploring magnetoresistive effects and magnetic dynamic phenomena in heterostructure devices that combine magnetic oxides with materials with strong spin- orbit coupling. Among his recent achievements, Saül has demonstrated that interfacial interactions and spin currents can be used for probing and manipulating the magnetic moments of electrically insulating materials, opening a new research field with a profound fundamental and technological impact. His contributions to polaritonics and optoelectronics are also multiple.

Saül pursed his master s (2008) and PhD studies (2012) at the University of Barcelona under the supervision of Prof. Tejada, receiving in both the Extraordinary award for his outstanding results on quantum magnetism and magnetic dynamic phenomena. From April 2013 to August 2017, Saül joined the nanodevices group at CIC nanoGUNE lead by Prof. Hueso with the purpose to transition towards spintronics and nanodevices.

Saül Vélez has published 47 peer-reviewed papers, many of those in the most prestigious journals in the field: Science (3), Nature (1), Nature Nanotechnology (1), Nature Photonics (1), Nature Communications (6), or Physical Review Letters (3), taking a leading or supervision role in 20 of those. The number of citations of his publications is rapidly growing since 2014, reaching 1751 as of 19th January 2021 (~1000 in the last two years), and his h-index is 23 (WoS). He delivered 33 talks (18 invited) in international conferences and renewed research centers and is referee of several prestigious journals with 48 verified reviews (Publons). He was distinguished with the Top Peer Review Award in Physics in 2018 (Publons) and is Section Editorial Board Member of Nanomaterials. He is co-supervisor of 1 PhD student, has directly supervised 2 master thesis, 1 master project, 1 bachelor project, 2 summer internships, and 3 exchange students, and supervised the work of 3 PhD students and 2 postdocs. He is the holder of 2 projects as PI (180.000), has participated in other 8 R+D projects, and made 16 research stays of 1 week or more, including 1 stay of 3(+1) months at the New York University.
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Resumen del Currículum Vitae:

In May 2021, Saül Vélez will join the Condensed Matter Physics Center (IFIMAC) of the Autonoma University of Madrid as Junior Group Leader and head of the Spintronics and Nanodevices group. Since September 2017, he is holding a senior postdoctoral position at ETH Zürich. With interest in spintronics, magnetotransport, and optoelectronics phenomena, his current research focuses on exploring magnetoresistive effects and magnetic dynamic phenomena in heterostructure devices that combine magnetic oxides with materials with strong spin- orbit coupling. Among his recent achievements, Saül has demonstrated that interfacial interactions and spin currents can be used for probing and manipulating the magnetic moments of electrically insulating materials, opening a new research field with a profound fundamental and technological impact. His contributions to polaritonics and optoelectronics are also multiple.

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supervised the work of 3 PhD students and 2 postdocs. He is the holder of 2 projects as PI (180.000), has participated in other 8 R+D projects, and made 16 research stays of 1 week or more, including 1 stay of 3(+1) months at the New York University.

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Turno de acceso general

Nombre: GARCIA DE ARQUER, FRANCISCO PELAYO
Referencia: RYC2020-030559-I
Área Temática: **Ciencias y tecnologías de materiales**
Correo Electrónico: dearquer@gmail.com

Título:

Materials for Clean Energy and CO2 mitigation

Resumen de la Memoria:

My research has revolved around the design and implementation of nanomaterials for energy applications. During my PhD (ICFO), for energy harvesting; and in my postdoctoral work (University of Toronto) for energy storage, water splitting, and CO2 recycling using electricity.

In my PhD, I worked with a class of emerging nanomaterials, colloidal quantum dots, studying the modification of their optoelectronic properties using metallic nanostructures. I found that only certain arrangements of these materials led to absorption enhancement. And an unexpected effect: that metal nanostructures could be used to tailor carrier concentration and fill electronic defects in semiconductors. At that time, the community found that electron oscillations in metals could decay into highly energetic hot electrons leading to a photocurrent. The core of my PhD focused on understanding and harnessing these phenomena, completing eight 1st author and seven additional papers at my thesis completion.

Thanks to a Connaught fellowship, I joined the Sargent group (University of Toronto) as a postdoc. There, I widened my research into new classes of materials. I also had the opportunity of delving into another exciting, yet vastly different problem: CO2 recycling and water splitting. I designed catalysts to favour these reactions using in situ spectroscopies to gain insights into associated phenomena. I pursued doping of metals to manipulate reaction intermediates; the use of semiconductors as precatalysts leading to the desired arrangement during reaction; hybrid metal-ionomer catalysts with record activity. These works have been published in Science, Nature and Nature family and led to several patent applications.

As the next step in my career, I am working to bring CO2 mitigation technologies closer to reality. A lot is unknown yet in the field of CO2 electroreduction, and many challenges remain ahead for this technology to make the needed impact on society. One of the challenges precluding further progress is the lack of understanding of what happens at the catalyst and its surroundings during CO2 transformation, when surfaces are metastable and interact with various reactants. I will use my background in materials design, spectroscopy, modeling, and electrochemistry to shed light in this direction

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Resumen del Currículum Vitae:

My career is endorsed with 105 publications and 10,009-lifetime citations, with an h-index of 40 (WoS). I have also been awarded as one of the highly cited research in 2020 (WoS). Some of my publications include:

4	Science (IF=41.845)
3	Nature (IF=42.778)
4	Nature Energy (IF=46.495)
3	Nature Nanotechnology (IF=31.538)
2	Nature Photonics (IF=31.241)
1	Nature Materials (IF=38.663)
1	Nature Electronics (IF=27.5)
1	Nature Catalysis (IF=30.471)
1	Nature Chemistry (IF=21.687)
20	Advanced Materials (IF=27.398)
3	Nature Communications (IF=12.121)
10	ACS Energy Letters (IF=19.003)
8	Nano Letters (IF=11.238)
1	Nature Reviews Materials (IF=74.699)

I summarize other milestones (which are expanded in the attached application) in chronological order.

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CONVOCATORIA 2020

Turno de acceso general

*Pre-doctoral studies:
2005-2009 - Telecommunications Engineering - Universidad de Oviedo
2008-2009 - MSc thesis - "Plasmonic Antennas and scattering nanostructures" - KU Leuven [with honors]
2009-2010 - MSc in Photonics - UPC + UB + UAB [La Caixa fellow]
2010 MSc thesis - "Plasmonically Enhanced Absorption in Colloidal Metal-Semiconductor Nanocomposites" [with honors]

*Doctoral studies: The Institute of Photonic Sciences - ICFO
2010-2015 - "Plasmonic Hot-Electron Optoelectronics" [Cum Laude] - seven 1st authored papers and seven contributed papers

*Postdoctoral work: University of Toronto - The Sargent Group
In parallel to my postdoc research activities, I had the chance to further develop my supervision and mentoring skills. The Sargent group is, with more than 80 members, one of the largest groups in materials science. As one of the three research directors in the group, I engaged in the management of different subgroups, international collaborations, and industrially sponsored research. In this role, my tasks involved the supervision of over 25 students, postdocs, research associates, and lab technicians; leading weekly meetings to review progress, discuss next steps and plan experiments; organization of monthly conferences to present our results to Prof. Sargent for his guidance; direction of manuscript preparation, and (re)submission strategies; and grant applications and reporting.

A large fraction of the research in the Sargent group is sponsored by the private sector. One of my key roles as a director of research was to interface with sponsors and researchers in the Sargent group, driving and reporting our progress towards the fulfillment of our deliverables, and working on contract renovations and IP management. Together, the research I have supervised under the guidance of Prof. Sargent totals a value of ~2M$/year.

*Relevant awards
WoS 2020 Highly cited researcher (multidisciplinar)
X-Prize finalist: member of the initial team that qualified to the final stage of the Carbon X-Prize (a 20M USD global competition seeking to scale up CO2 mitigation).
Connaught Postdoctoral Fellowship "Bioinspired ideas for sustainable energy": prestigious U of T program seeking interdisciplinary approaches to tackle global society challenges.
Materials Research Society (MRS) Fall 2014: best symposium oral presentation award (2014)
FPU Fellowship 2010-2014
Caixabank Foundation Fellowship (Masters program, 2009-2010)

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CONVOCATORIA 2020

Turno de acceso general

Nombre: CARREGAL ROMERO, SUSANA
Referencia: RYC2020-030241-I
Área Temática: **Ciencias y tecnologías de materiales**
Correo Electrónico: scarregal.ciberes@cicbiomagune.es

Título:

Nanopartículas funcionales avanzadas para aplicaciones biológicas y biomédicas

Resumen de la Memoria:

He centrado carrera científica en la aplicación de la Nanotecnología, en el contexto de la Ciencia de los Materiales, en Biología y Biomedicina. Entré en contacto con la nanotecnología y las propiedades fisicoquímicas únicas dependientes del tamaño de algunos materiales durante mi doctorado en la Universidad de Vigo, donde trabajé principalmente con nanopartículas de oro, platino e híbridas polímero/metal sensibles a la temperatura como catalizadores con propiedades superiores a sus materiales de tamaño macroscópico.

Pronto, me di cuenta de que algunas de estas propiedades fisicoquímicas dependientes del tamaño se pueden usar para aplicaciones biológicas y orienté mi carrera en esta dirección. Pude unirme al grupo Biophotonik en Marburg, dirigido por Prof. W. Parak, donde aprendí principalmente sobre experimentación con cultivos celulares y liberación remota y controlada de drogas desde nanopartículas o micropartículas. La liberación remota la llevaba a cabo con nanopartículas plasmónicas o magnéticas que fueran capaces de inducir calor localmente ante la aplicación de luz o campos magnéticos alternos respectivamente. También adquirí experiencia en la técnica de autoensamblaje para construir materiales funcionales.

Posteriormente, apliqué mi experiencia en CIC biomaGUNE en varios grupos donde pude seguir aprendiendo sobre aplicaciones in vivo de nanotecnología y técnicas de imagen molecular para su validación. Actualmente soy investigadora asociada del CIBERES en el Grupo Molecular and Functional Biomarkers liderado por el experto de imagen por resonancia magnética Prof. J. Ruíz Cabello. Mi línea de investigación es el diseño racional de nanomateriales como herramientas para entender la interacción entre nanomedicinas y biomoléculas y como agentes teranósticos. Me he enfocado en dos tipos de terapias dirigidas: 1) administración pulmonar local de nanomedicinas y 2) terapia dirigida definida por la funcionalización superficial de nanopartículas. Además de manera combinada con las anteriores, estudio la posibilidad de aplicar algunas de las nanopartículas usadas como agentes de contraste en imagen molecular para terapias catalíticas.

En este contexto, estoy trabajando en la comprensión de la corona de surfactante pulmonar de nanomedicinas para mejorar las terapias actuales de la fibrosis pulmonar y otras enfermedades pulmonares (Ministerio de Ciencia e Innovación y Universidades, PID2019-106139RA-100), desarrollando calcio ultrapequeño dopado con metales. nanopartículas de carbonato para diagnóstico específico (proyecto Diamond Light Facilities, 2020) y desarrollo de nanomedicinas catalíticas basadas en nanopartículas de ferrita de manganeso ultrapequeñas como catalizador Fenton/Haber-Weiss (ChemRxiv 2020 en revisión en ACS Nano; proyecto European Synchroton Radiation Facility 2020). Puedo realizar este trabajo multidisciplinar gracias a las singulares instalaciones del CIC biomaGUNE y del ICTS ReDIB y a mi estrecha colaboración con investigadores CIBERES cuya formación es más biológica y clínica. Especialmente, mi interacción como investigadora asociada con el Prof. Jesús Ruíz Cabello, líder del Grupo Molecular and Functional Biomarkers, me permite realizar imágenes pulmonares de alta calidad con Resonancia Magnética lo cual no es trivial debido al constante movimiento respiratorio.

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Resumen del Currículum Vitae:

Soy investigadora asociada CIBERES en CIC biomaGUNE (San Sebastián) Durante mi carrera investigadora he alcanzado un amplio conocimiento sobre la Ciencia de los Materiales de nanopartículas y materiales nanoestructurados y su caracterización y manipulación. Mis principales objetivos de investigación están relacionados con la aplicación de dicha nanotecnología en biología y biomedicina. Participo activamente y lidero varios proyectos donde se utilizan nanopartículas como catalizadores, vectores para la administración de fármacos y agentes de contraste. Todas esas aplicaciones explotan propiedades fisicoquímicas específicas de nanopartículas que he aprendido a interpretar y utilizar para el desarrollo de nuevos materiales funcionales a lo largo de mi carrera.

Obtuve mi doctorado, gracias a una beca FPI, en la Universidad de Vigo en 2009 bajo la supervisión del Prof. P. Hervés Beloso y el Prof. J. Pérez Juste. Allí aprendí sobre la síntesis de nanopartículas metálicas y nanocompuestos sensibles a estímulos y los apliqué en catálisis.

Luego me concedieron una beca de la Fundación Progreso y Salud para unirme a la Philipps-Universität Marburg (Alemania) en 2010 como investigadora postdoctoral bajo la dirección del Prof. W. J. Parak. Allí participé en proyectos multidisciplinarios pero principalmente me dediqué a la administración remota y controlada de fármacos inducida por luz o campos magnéticos externos, primero en células y finalmente en un modelo animal. Allí tuve la oportunidad de liderar un subgrupo de investigadores y estudiantes dentro del grupo

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Turno de acceso general

Biophotonik, enseñar, participar en el desarrollo, elaboración y presentación de proyectos europeos (Eranet, Nanosyn project; HSFP, RGP0052 / 2012.) y alemanes (DAAD 54372132)

En 2014, me incorporé a CIC biomaGUNE para trabajar en un proyecto de transferencia de tecnología (Mineco 2013, IPs: C. Lawrie, L.Liz-Marzán) que implicaba la liberación optotérmica de un agente de contraste para producir un dispositivo de diagnóstico de cáncer. De este proyecto surgieron una empresa (INDICATE Solutions) y una patente. Luego, formé parte del laboratorio de resonancia magnética (2017-2018) donde aprendí sobre imagen por resonancia magnética y experimentación con animales gracias al Prof. P. Ramos-Cabrer. Esto me ayudó a obtener un puesto de investigadora asociada en el grupo de Biomarcadores Moleculares y Funcionales (2018) liderado por el Prof. J. Ruíz-Cabello con el apoyo de CIBERES. Allí, lidero mis propios proyectos enfocados tanto en entender la corona de surfactante pulmonar en nanomedicinas para mejorar terapias administradas via pulmonar (Ministerio de Ciencia e Innovación, PID2019-106139RA-100) como en el desarrollo de nanomedicinas catalíticas (proyecto premiado en European Synchroton Radiation Facility 2020). Además colaboro en proyectos que tienen como objetivo diagnosticar y tratar la aterosclerosis con nanomedicinas dirigidas (Fundación BBVA PR [18] _BIO_IMG_0008, La Caixa HR20-00075 e IP de un proyecto en el Sincrotón Diamond Light 2020). Pertenezco al Comité Ético de Experimentación Animal del CIC biomaGUNE, superviso a dos estudiantes de doctorado y colaboro con colegas nacionales e internacionales para ampliar la aplicación de las nanopartículas como herramientas para imitar y estudiar eventos biológicos (Nature 2020) y como agentes teranósticos. (Nanoscale 2021).

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Turno de acceso general

Nombre: ESPINOSA DE LOS MONTEROS ROYO, ANA
Referencia: RYC2020-029282-I
Área Temática: **Ciencias y tecnologías de materiales**
Correo Electrónico: ana.espinosa@imdea.org

Título:

Multimodal nanoparticle-based strategies for biomedical applications

Resumen de la Memoria:

My experience in Materials Science has acquired over the years a multidisciplinary character, ranging from material Physics to biomedical applications, turning my profile to the biomedical field.
My first research activity is mostly characterized by an inorganic physics background, which has allowed me to have a deep knowledge of low dimensional systems and nanostructures. First, during my Ph. D in Physics (UAM, Spain, 2010), focused on the study and fabrication of heterostructures and thin films based on semiconductor oxides (FP-Unidades Asociadas PhD grant). During this period, I participated in 5 national projects, performed a short stay (EPM-Canada) and published 14 papers. Thereafter, during my first postdoctoral stage at the Magnetism and Magnetotransport Laboratory (CSIC, Spain 2010-2013) leading the research line based on magnetic nanoparticles for biomedical and technological applications. I published 14 papers dealing with advanced structural and characterization of nanosystems, performed experiments in synchrotron facilities and participated in 3 national and international projects. I established fruitful collaborations with national and international research groups.
During my second postdoctoral period in the Laboratoire de Matière et Systèmes Complexes (MSC, Paris, France, 2013-2017), I could acquire knowledge concerning biomedical applications of nanomagnetism performing in vitro and in vivo hyperthermia methods, by starting a research activity based on thermal magnetic nanotherapies in the frame of a FP7 European Project. From 2014, following a Marie Curie IntraEuropean fellowship (196 k), my research project was devoted to unravel the physical mechanisms on magneto-plasmonic particles, introducing the plasmonic-based hyperthermia as a new technique in the host group, exploring its feasibility with high rate of success. During this period I published 16 papers, I was responsible of the project of pre-clinical studies and participated in 3 international projects.
Thanks to my initial training as a Physicist and my immersion in "nano-biomedical" research, in 2017 I joined the Materials for Health group (ICMM-CSIC, Spain, 2017) for 6 months to study different synthesis protocols of nanostructures for magnetic nanotherapies and their intracellular degradation in tissues. During this short period, I published 3 papers and performed X-ray-based experiments in large facilities.
In 2018, I moved to IMDEA Nanoscience (Spain, 2018) within the Severo Ochoa programme to coordinate an interdisciplinary research project based on multifunctional nanothermal structures between different groups of Nanomedicine, opening a new line of research based on photo-activated therapies. Since 2019, I am the principal investigator of two projects (Atracción de Talento-2018 Mod. 1 (305 k) and AECC Ideas Semilla 2019 (Asociación Española contra el Cáncer (19.6 k)), based on multifunctional magneto-photothermal agents for cancer treatment to study their sinergy with chemo- and radiotherapy effects in tumours cells (in vitro and in vivo). During this time, I have opened different research lines with my own lab, established new national and international collaborations, supervised students (1 Master and 2 Degree projects, 1 PhD in progress)), performed experiments in Large Facilities (as main proposer) and published papers in high impact journals.

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Resumen del Currículum Vitae:

Graduated in Physics, I obtained her PhD in Materials Physics in 2010 at the Universidad Autónoma de Madrid (Spain) receiving the Cum Laude qualification (FP-Unidades Asociadas grant from MINECO). The research was devoted to the study and fabrication of heterostructures and thin films based on wide band gap oxides for applications in Information Technologies.
After his PhD, I worked as a postdoctoral fellow at the Magnetism and Magnetotransport Laboratory (ICMM-CSIC, Spain) leading the magnetic nanoparticle research focused on the study of structural and magnetic properties of different nanosystems such as iron oxide nanoparticles for biomedical applications, ZnO nanoparticles coated with organic molecules and cobalt based-nanoparticle systems embedded in amorphous matrix for spintronic devices.
In 2013, I joined the Laboratoire de Matière et Systèmes Complexes (France) to conduct a research activity based on nanotherapies for cancer treatment by means of thermal effect within a FP7-funded project (MAGNIFYCO). In 2014, I was granted with a Marie Curie Fellowship IEF within the project DUALNANOTHER (196 k), devoted to the evaluation of therapeutic potential of combined hyperthermia for cancer treatment introducing plasmonic-based hyperthermia in the host group.
In Sept. 2017, I joined the Materials for Health group (ICMM-CSIC, Spain) for 6 months with the aim to explore different synthesis protocols of nanostructures for magnetic nanotherapies.
In May 2018, I moved to IMDEA Nanoscience (Spain) to coordinate an interdisciplinary research project between the different groups of Nanomedicine (in the frame of the Severo Ochoa programme), opening a new line of research. Since 2019, I lead two projects (Atracción

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de Talento-2018 Mod. 1 (305 k) and Asociación Española contra el Cáncer (AECC Ideas Semilla 2019 (19.6 k)) developing novel technology and strategies based on multimodal hyperthermia-based methods through the use of magnetic, photo- and X-ray-activated nanomaterials in the cell and tumor environments. Recently, I have developed a new technique to measure the local temperature of nanoparticles subjected to hyperthermia based on X-ray absorption as a direct nanothermometry method.

I have contributed with 50 publications (16 (1st/corresponding author), 10 (2nd author)), h-factor = 24, over 2550 citations. The impact of publications has been illustrated in journals such as ACS Nano (x6), Adv. Funct. Mater (x3), Nanoscale (3x), Nano Letters, Small, Chem. Mater., PRB, PRL, among others. I also co-authored a book chapter. Participant in >50 international and national conferences (17 were selected as oral (6 invited)). Invited speaker in 6 seminars in Spain and Europe. 16 successful proposals for beamtime in Large Research Facilities (9 as main proposer). I have supervised 2 Master Thesis, 2 Degree projects (1 PhD Thesis in progress, 3 Master Thesis and 1 Degree project in progress). I have been involved in more than 14 research projects (3 as principal investigator) funded by European Commission and European governments (i.e. FP7-MC-IEF-2013 (PI) CAM-Atracción de Talento-2018 (PI), AECC-Ideas Semillas 2019 (PI), ERC Consol. Grant, FP7-NMP project). I have also participated as International Scientific Assessor in Biomedicine of National research projects and evaluator of grants (ANEP, ANECA).

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Turno de acceso general

Nombre: ATXITIA MACIZO, UNAI
Referencia: RYC2020-030605-I
Área Temática: **Ciencias y tecnologías de materiales**
Correo Electrónico: u.atxitia@gmail.com

Título:

Theory and modelling of ultrafast spintronics

Resumen de la Memoria:

I am a Junior Research Group Leader at the Physics Department of the Freie Universitat Berlin (Germany). I lead a team comprised of one PhD student, one Master student and two international visiting PhD students, and I mentor five PhD students of projects I participate as theory partner in Berlin area. I am member of Collaborative Research Centre CRC/TRR227 Ultrafast Spin Dynamics , where I take part of seven research projects. I have been able to successfully apply to German research projects as principal investigator. My scientific metrics can be summed up as: 2 review papers and 34 scientific papers (+3 submitted papers) in indexed journals, h index: 22, 2384 citations. I have been invited to give talks in several international conferences, seminars and workshops. I have gather more than 900k Euro of third-party funding as principal investigator, including Marie Curie Fellowship.
Extensive international mobility, including Paris (France), York (UK), Konstanz (Germany) and Berlin (Germany). Extensive network of collaborators, particularly, experimental groups in Cambridge (UK), Berlin (Germany) and Berkeley (US). Extensive experience in teaching, mentoring and professional service, and actively participating in outreach activities, popular talks, radio interviews.

My research is dedicated to identifying and addressing the challenges arising in the context of femtomagnetism ultrafast spin dynamics from a theoretical and computer modeling point of view. This undertaking includes the design and development of new computational techniques and algorithms aimed to find magnetic-related novel phenomena for a faster communication and storage of the digital information. The area of ultrafast spin dynamics has attracted a lot of attention recently due to its possible applicability for the development of new magnetic data storage devices. Femtosecond laser pulses, the fastest stimuli made by mankind, applied to magnetic structures can drive magnetization dynamics on time scales up to three orders of magnitude faster than conventional magnetization reversal. The theory behind the interaction between a high-power laser field and a magnetic material is, however, clearly not well understood. Partly this is due to the fact that many different subjects in theoretical physics are involved, namely thermodynamics and statistical physics, optics, and solid-state physics. Methods include atomistic and multiscale models to investigate ultrafast all-optical switching, antiferromagnetic spintronics, 2D magnets or relativistic kinematics of magnetic solitons. My studies have led to the discovery of previously unknown phenomena. I am considered an expert on multiscale modelling of magnetic materials, linking first principle calculations to mesoscopic models.

Highlights of our work have been published in Nature Comm., Advanced Science, and Physical Review Letters. Transfer of knowledge; our models have been implemented by industrial partners such as Seagate Tech. (US) and Hitachi-Cambridge (UK).
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Resumen del Currículum Vitae:

Scientific trajectory

08/2017 .: Junior Research Group Leader at the Physics Department at the Freie Universitat Berlin (Germany). My group consists of one PhD student Mr. Jakobs (sole supervisor), one Master student Mr. Griepe (sole supervisor), two visiting international PhD student (Mr. Rama-Eiroa and Mr. Hirst). Member of Dahlem Center Quantum Complex Systems at the FU Berlin. Principal Investigator of TRR227 'Ultrafast Spin Dynamics' funded by DFG. I mentor another five PhD students in collaborative projects within TRR227.

01/13 07/17: Marie Curie Postdoctoral Fellow at the University of Konstanz (Germany). Fellow of 'Advanced Studies Institute' Zukunfstkollege.

01/12 12/13: Experienced Marie Curie Fellow and Basque Country Postdoc Fellow at the University of York (UK).

01/07 12/11: PhD student at the Instituto de Ciencia de Materiales de Madrid-CSIC. 'Sobresaliente Cum Laude' and the European Doctorate flag.

To note, Dr. Atxitia has taken career breaks in 2012, 2016/17 and 2019 in the form of paternity leave (3 children).

Research activities

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Turno de acceso general

My scientific metrics can be summed up as: 2 review papers and 34 scientific papers (+3 submitted paper) in indexed journals, h index: 22, 2384 citations. I have 12 publications as first author and 3 as last author. One of my publications has been rated as highly cited paper by ISI.
I have participated in 13 national and international research projects, 3 of them as principal investigator including a Marie Curie Fellowship and a German national project (DFG). I have presented 7 invited talks, 25 oral presentations, 2 specialized courses. I organized the international conference SpinS (Konstanz, Germany, 2015). Extensive experience in teaching, mentoring and professional service, and actively participating in outreach activities, popular talks, radio interviews. Extensive international mobility, including Paris (France), York (UK) and Berlin (Germany) as well network of collaborators in Cambridge (UK), Berlin (Germany) and Berkeley (US). Visiting fellow at Donostia International Physics Center (Summer 2018), and invited visiting professor (2019) by CPP-Magnetism program in several British universities (Cambridge, Leeds, Southampton, Sheffield).

Research lines
My team research is dedicated to identifying and addressing the challenges arising in the context of ultrafast spin dynamics from a theoretical and computer modelling point of view. This undertaking includes the design and development of new computational techniques and algorithms aimed to find magnetic-related novel phenomena for a faster communication and storage of the digital information. Methods include multiscale models to investigate ultrafast all-optical switching, antiferromagnetic spintronics, 2D magnets or relativistic kinematics of magnetic solitons. Highlights of our work have been published in Nature Comm., Advanced Science, and Physical Review Letters. Transfer of knowledge; our models have been implemented by industrial partners such as Seagate Tech. (US) and Hitachi-Cambridge (UK).

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AYUDAS RAMÓN Y CAJAL
CONVOCATORIA 2020

Turno de acceso general

Nombre: BARRIOBERO VILA, PERE
Referencia: RYC2020-029585-I
Área Temática: **Ciencias y tecnologías de materiales**
Correo Electrónico: pere.barrioberovila@dlr.de

Título:

Real-time monitoring of engineering alloys for advanced manufacturing

Resumen de la Memoria:

My research line Real-time monitoring of engineering alloys for advanced manufacturing addresses a highly relevant topic in the area of metallurgy for Industry 4.0: namely the poor structural performance rendered by engineering alloys owing to the loss of microstructure-control during processing. Processing optimization is mainly focused on the property-control for metal 3D-printing and sustainable metallurgy using paths of minimum energy. I have more than 10 years of continuous international research experience abroad in Austria and Germany (2010-2021).

I obtained a Ph.D. in materials science and engineering (2015) at the Vienna University of Technology (TU-Wien, Austria) and received the Peter-Emil-Varga-Best-Dissertation Prize for this work. Here, I focused on optimized processing-paths for the sustainable metallurgy of light alloys, by applying cutting-edge diffraction- and tomography-methods available at international synchrotron facilities. This allowed me to study the continuous evolution of the materials-microstructure in real-time for creating cost-efficient manufacturing strategies. Such insights cannot be neither obtained at the lab nor by predictive-computational tools conventionally based on thermodynamic equilibrium.

During my postdoc at the TU-Wien (2015-2017) I demonstrated that the developed own expertise on forefront in-situ characterization can be exploited for developing alloys suitable for additive manufacturing, AM (metal 3D-printing) today, a global paradigm across multiple industries. This permitted me to build strategies for titanium- and steel-alloys outperforming the state-of-the-art materials which become poor damage-tolerant via AM.

After my postdoc I moved from Austria to Germany, where I am currently appointed principal scientist at the Institute of Materials Research of the German Aerospace Center, DLR (2017-2021) the Europe s largest aerospace research facility. Here, I lead the own research line alloys for additive manufacturing enabling metallic components with unprecedented functionalities. My major contribution to this area was awarded the prestigious DLR Science Award (2019) which aims at consolidating the career of young scientists.
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Resumen del Currículum Vitae:

I am currently appointed scientist at the German Aerospace Center (DLR) in Cologne, Germany (2017-2021) the Europe s largest aerospace research facility. I lead the novel research line alloys for additive manufacturing, AM (metal 3D printing); which allows for the fabrication of metallic components with unprecedented functionalities not achievable via conventional processing. My major contribution to this area was awarded the prestigious DLR Science Award (2019) aiming at consolidating the career of young scientists. I have more than 10 years of continuous international research experience abroad in Austria and Germany (2010-2021).

My postdoctoral activities were carried out in Austria at the Vienna University of Technology (TU Wien). There, I obtained a doctoral degree in materials science (2015) and received the Peter Emil Varga Best Dissertation Prize for this work. Before moving to Austria, I earned a MSc in materials science and a BSc in mechanical engineering in Spain.

My research line developed since the early Ph.D. work consists of alloy design based on the microstructure control monitored by cutting-edge time-resolved synchrotron techniques (light alloys as core area). Such insights cannot be obtained in the lab or using the conventional computational tools mostly based on thermodynamic equilibrium. My pioneering approach opens up solutions for sustainable metallurgy such as optimized processing with minimum energy not requiring costly deformation steps. This is highly relevant for near-net-shape techniques like AM. During my postdoc I exploited this strategy to provide structural performance beyond the state-of-the-art titanium- and steel-alloys for metal 3D printing today, a global paradigm across multiple industries.

My work as first author has been published in multidisciplinary peer-reviewed journals of high-impact such as Nature Communications (IF 12.121), and leading journals in materials science such as Acta Materialia (IF 7.565), Scripta Materialia (IF 5.079) or Materials Science and Engineering A (IF 4.652). My record (>87% in Q1) prioritises quality over quantity and includes >25 articles in high-quality journals (plus 3 undergoing peer-review) and 1 book chapter. As a result of the own research independence, >70% of the total citations (>550) derive from publications as first author. My work has been selected as scientific highlights for the international community by the large-scale synchrotron facilities ESRF and DESY. I held >23 talks in international conferences in Europe and USA including invited contributions.

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The competitive research projects I worked include 12 projects from H2020-EU, the DLR and national agencies in Germany and Austria; and 1 industry-academia project. Also, I have a successful record of accepted peer-reviewed proposals at international large-scale synchrotron facilities (equiv. >800keur). In 3 of those projects I participated as PI and coordinated 4 as work-package leader. The above mentioned achievements reflect my leadership to perform independent research and attract external funding. I have been involved in the organization of scientific events as advisory board member; I am reviewer of well-renowned materials science journals; have teaching experience at the university (AQU accreditation) and mentored candidates in undergraduate (12), doctoral (4) and postdoctoral programmes (2).

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CONVOCATORIA 2020

Turno de acceso general

Nombre: ARES GARCIA, PABLO
Referencia: RYC2020-030302-I
Área Temática: **Ciencias y tecnologías de materiales**
Correo Electrónico: pableras.ares@gmail.com

Título:

Advanced atomic force microscopy and 2D materials

Resumen de la Memoria:

In 2003, after obtaining my Physics degree at the Universidad Complutense de Madrid, I started working at Nanotec Eléctronica SL (Nanotec), a company devoted to the design, development and manufacture of Atomic Force Microscopes (AFM). I worked with AFMs in a company leader in the development of scientific instrumentation, maintaining contact with the scientific community and keeping abreast of advances in the fields of Microscopy and Nanotechnology. At this time I delved deeper into the different variants of the technique and also actively participated in research projects with groups worldwide (reflected in 8 scientific publications).
I also started a close collaboration with Prof. Julio Gómez Herrero from the Universidad Autonoma de Madrid (UAM) and Nanotec co-founder. To gain a long-term PhD, I got my MSc in Condensed Matter Physics and Nanotechnology (2011) while I began a series of experiments in the UAM.
In October 2014 Nanotec ceased its activity and I joined full-time the Condensed Matter Physics department of the UAM. I used and developed advanced AFM-related techniques to study novel low-dimensional systems. Here I can highlight the works on the properties of different nano-objects, including antimonene, a novel 2D material which I isolated during my PhD for the first time ever. I opened a new research line for many groups worldwide that started experimental studies encouraged by my results. I developed novel approaches for the fabrication of simple, clean and reliable nanoelectrodes based on the nanomanipulation and assembly of gold nanowires. I also designed and built new technological devices. I got my PhD in 2017, with the highest mark, Sobresaliente Cum Laude alongside recognitions like Doctoral Thesis Prize .
Then, I obtained a Research Associate position in the Condensed Matter Physics department (Graphene Group) of the University of Manchester, led by Nobel Laureates Profs. Andre Geim and Kostya Novoselov. Once there I gained extremely competitive self-driven fellowships: a Ramón Areces Foundation Scholarship and a Marie Sklodowska-Curie Individual Fellowship under the supervision of Dr. Laura Fumagalli. The research during this time was focused on the basic properties of 2D materials and combinations of them, and its use for studying the electrical properties of molecules under extreme confinement. Here I can highlight the quantification of the in-plane dielectric constant of interfacial water, the experimental evidence of piezoelectricity in single-layer hexagonal boron nitride (hBN) and the appearance of ferroelectric-like domains arranged in triangular superlattices of small-angled twisted hBN crystals. My leading role at the University of Manchester opened new research lines within the Graphene Group, allowing the exploration of novel properties of 2D materials and heterostructures at the nanoscale. From my postdoc I have already published 5 articles without my thesis supervisors in high impact journals, 1 is under revision and another 3 in preparation.
In September 2020 I moved back to Madrid, where I obtained a Juan de la Cierva-Incorporación Fellowship, declined in favour of my current position as Profesor Ayudante Doctor & IFIMAC Junior Group Leader at the UAM, where I will continue my research on fundamental properties of 1D and 2D materials and novel techniques for the fabrication of nanoelectrodes.
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Resumen del Currículum Vitae:

My research interests have a marked multidisciplinary character within nanoscience and nanotechnology, focusing on the use and development of scanning probe microscopies, mainly atomic force microscopy (AFM), for the study of low-dimensional systems.
I graduated in Physics at the Universidad Complutense de Madrid in July 2003 and then I joined Nanotec Eléctronica SL (Nanotec), a Spanish company dedicated to the design, development and manufacture of scanning probe microscopes. Here I accumulated both research experience, collaborating with clients worldwide, which led to several scientific publications, and teaching, giving training courses and workshops on AFM.
In October 2014 I joined the department of Física de la Materia Condensada at the Universidad Autónoma de Madrid (UAM) as a Teaching Assistant to carry out a PhD and teach in the Physics Degree. In April 2017 I defended my doctoral thesis under the supervision of Prof. Julio Gómez Herrero and Dr. Adriana Gil Gil, qualified with Sobresaliente Cum Laude and recognized with the Doctoral Thesis Prize. It presented a double scientific-technical aspect, with advances on the AFM technique itself, as well as with more fundamental science studies. I would like to highlight the isolation of antimonene, leading the worldwide experimental research on this novel 2D material. The double aspect of the thesis is also reflected with 3 patents in Spain, 2 of them with international applications and licensed to companies (Graphene Nanotech S.L. and Fourteen Energies S.L.).
In October 2017 I started a postdoctoral position at the University of Manchester (UoM), in the Condensed Matter Physics department (known as Graphene Group), as Research Associate in the group of Prof. Konstantin S. Novoselov, working with Dr. Laura Fumagalli. Once there I obtained highly competitive international grants: a Ramón Areces Foundation scholarship and a Marie Sklodowska-Curie Individual

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Fellowship. My research during this time focused on basic properties of 2D materials and van der Waals heterostructures, and their use for the study of electrical properties of molecules under extreme confinement. In 2020 I obtained a Juan de la Cierva-Incorporación Fellowship, declined in favour of a Profesor Ayudante Doctor & IFIMAC Junior Group Leader position at the Universidad Autónoma de Madrid.

I am author of 29 scientific articles (+ 1 in press) and 2 book chapters that have received in total more than 1730 citations (WoS). Throughout my career, I have given 22 talks in international congresses, workshops and seminars, 8 of them invited. I am qualified by the ANECA for the position of Profesor Contratado Doctor. Along my career I have supervised 4 people in their R&D activities in Nanotec, 3 experimental End-of-Degree projects (TFG-EXP) at the UAM, informally co-supervised 2 Master of Physics (MPhys) Projects (due to university policy) and actively participated in the supervision of 3 PhD students at the UoM. I am currently co-supervising 2 PhD students at the UAM. My research and teaching activities are completed with outreach actions, most of them during my postdoc, such as carrying out lab tours for students, talks in schools and science fairs, tv (Madrileños por el Mundo: Manchester) and radio interviews, popular science articles, press releases to disseminate my scientific results or managing the Twitter account of GEFES.

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Turno de acceso general

Nombre: MARTIN CANO, DIEGO
Referencia: RYC2020-029730-I
Área Temática: **Ciencias y tecnologías de materiales**
Correo Electrónico: diego.martin.cano@uam.es

Título:

Novel quantum optomechanical materials via solid-state emitters & nanophotonic environments

Resumen de la Memoria:

My research covers a wide range of physical processes associated to the study of light-matter couplings. My main motivation is to understand the interaction limits between photons & solid-state emitters and propose new nanostructured materials that allow surpassing those bounds. For this goal I developed several theoretical research lines within the frameworks of nanophotonics, condensed matter and quantum optics. These models deal with many-body electronic, photonic & phononic excitations that I solve with high-end computational and analytical methods. This effort allows exploring new realistic platforms for quantum optical technologies and discovering novel photonic materials with applications surpassing the state of the art.

I obtained my PhD exploring strong light confinement phenomena in 1D metallic waveguides, supervised by Profs F.J. García-Vidal & E. Moreno at Autonomous University of Madrid. We proposed a pioneer universal subwavelength circuitry at THz frequencies by conceiving extremely robust waveguides consisting of metallic particle chains. Then we firstly studied optical plasmonic waveguides for creating efficient energy transfer and nonclassical entanglement between separated quantum emitters. These works were corroborated experimentally by several groups and are object of intense research (>1000 cites).

In 2013 I was awarded with a Max Planck cooperation postdoc grant to start developing my research independence on nonclassical interactions of quantum emitters and optical nanostructures at the center QSTAR (Italy). As corresponding author and for 1st time, I showed how nanoantennas assist the generation of nonclassical quadrature squeezing from single emitters (PRL 2014); an outstanding problem at that time measured after based on similar ideas.

In 2014-20 I become Head of Theory within the experimental division of Prof. V. Sandoghdar at the Max Planck Institute for Science of Light (Germany), where I supervise 1 PhD and formerly 2 postdocs. There I developed and led independent theoretical research lines on realistic material issues of organic molecules for quantum optics. In our ACS Phot. 2015 I directed a research of 2-photon mechanisms on nanostructures that elude poor collective interactions between molecules of very different emission frequencies. This problem due to the host matrix adds to the decoherence caused by vibrations. About this crucial issue I developed a theory of microcavities showing that narrower bandwidths enhance the resonant quantum coherence of molecules limited by vibrations; as I corroborated with experimentalists at Sandoghdar division (PRX 2017, Nature Phys. 2019). To go beyond state-of-the-art micro & nanocavities, I proposed an unexplored hybrid mechanism between a resonator and nanoparticles to create extremely strong interactions that suppresses quenching (ACS Phot. 2017); a crucial problem of emission on metals.

Since 2019 I started my long-term project on molecular optomechanics that exploits the mechanical properties of molecules as an advantage to control these solid-state systems. This project, invited by the Emmy Noether program, was funded by the MPL and currently under development (several articles & ongoing works). Since Sept 2020, my project is funded by La Caixa Junior Leader program at IFIMAC (UAM) that enabled me to establish my own independent research group with a PhD.
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Resumen del Currículum Vitae:

I obtained my PhD in the Autonomous University of Madrid (UAM) with the thesis "Plasmonic waveguides: classical applications & quantum phenomena (2013), supervised by Profs E. Moreno & F.J. Garcia-Vidal (Jaume-I prize, Highly Cited researcher). With my FPU grant (2008-12), I taught the physics laboratories (86h) and earn a short research stay in UCSD San Diego. After several invited seminars at diverse institutions due to my PhD impact (cited>1000), I earned a Max Planck postdoctoral grant (2013) to collaborate with Prof. M. Agio at the center QSTAR (Florence, Italy). There I carried out several works where I started developing my research independence on the interaction between quantum emitters and nanostructures. Next, I became head of theory group within the experimental division of V. Sandoghdar at the Max Planck Institute for the Science of Light (MPL, Germany). In this period (2014-20), I took the chance to develop independent theoretical research lines, create my own long-term project on molecular optomechanics, and supervise a small theory group: including 2 postdocs & 1 PhD, B. Gurlek. Furthermore, I taught at the FAU Elite Program (28h) and assisted in the MPL seminars. Due to my interest on physical realizations of my research, I have collaborated directly in experimental projects on strong interactions of organic molecules and optical microresonators (PRX, Nature Phys...), including mentoring theory to multiple experimental PhD & postdocs. In 2020 I started my own research group at IFIMAC to develop my project on molecular optomechanics supported by La Caixa Junior Leader

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program (~0.3M , 1 PhD).

Overall, I have been invited to give multiple talks: 8 international conferences and 16 seminars at several institutions. These include 4 oral invitations for forming a junior group: 1 by the Emmy Noether Program (DFG) -exclusive for young postdocs with both excellent independent career and scientific project (2017, worth 1M). I have participated in 9 projects (5 international & 4 national ones), 1 as PI. In 2019-20 I received the accreditation as Prof. Contratado Doctor and Certification I3.

Publications & referee activity:23 articles in peer-reviewed journals (cited>2000, 4 with more than 200 cites, h-index=15), 2 invited book chapters. These include 12 first-authorships and multiple high-impact journals: 1 Nature Phys., 1 PNAS, 3 PRL, 2 PRX, 1 Nature Phot., 3 ACS Phot. & 1 Nano Lett. Three of the articles were labelled as High Cited Paper in Physics by Clarivate. My research independence is supported by 8 publications as a corresponding author and main leading researcher (1 labelled as High Cited Paper). I have participated as Referee in committees (CONACYT & UAM 2020, Czech Science Foundation 2017) and several international journals (PRL, ACS Phot., Nature Comm..)

Collaborators: V. Sandoghdar, F.J. García-Vidal, L. Martin-Moreno, C. Galland, C. Genes, N. Rotenberg, S. Goetzinger, T. J. Kippenberg, M. Agio, A. Gonzalez-Tudela.

Grants & prizes: La Caixa Junior fellowship (2020). Max Planck cooperation postdoctoral grant (2013). Master's studies grant (2007) at UAM and the PhD grant 'Formación de Profesorado Universitario' (FPU, 2008). 3 early-career prizes in Certamen Arquímedes (2007), including 'Best research at CSIC'. 'Excellence Diploma' (2005) and 'Beca de colaboración' (2006).

Outreach activity:1 Dissemination talk (UAM 2020), 2 MPL Newsletters, Long Night of Science organization (2019) & a radio interview.

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Turno de acceso general

Nombre: BAILON GARCIA, ESTHER
Referencia: RYC2020-029301-I
Área Temática: **Ciencias y tecnologías de materiales**
Correo Electrónico: estherbg@ugr.es

Título:

Design of multifunctional catalysts for environmental and energetic applications: towards digitally controlled advanced catalysts through 3D printing

Resumen de la Memoria:

My main research line has been the design of advanced and multifunctional catalysts for energy and environmental applications. This includes: i) Biomedical Applications, ii) Selective hydrogenation, iii) Environment protection: Solar-Driven Photocatalysis, soot combustion and pollutants adsorption, iv) Fuel cell technology and H2 market: ORR and CO-PrOx reactions, v) Biomass valorization: energy storage, vi) Valorization of CO2: methanation and electroreduction and vi) 3D-engineered materials for environmental processes.

During my Ph.D. (2011-2015, UGR), I focused on the synthesis of advanced carbon-based materials for the selective hydrogenation of a,b-unsaturated aldehydes and solar-driven photocatalysts for the complete mineralization of water pollutants. The excellence of my Ph.D. allowed to achieve important scientific contributions, leading to 4 patents, 13 JCR-articles, 3 book chapters, and the Doctorate Award 2015 for the best Ph.D. Thesis and the Young researchers award of the Spanish Carbon Group.

During my first year of post-doctorate at UGR, I actively collaborate with international research groups from France, Mexico, Colombia, Egypt, Morocco and Bosnia and Herzegovina to develop different carbon gels-based composites and carbon materials derived from agricultural wastes for its use in energy storage and solar-driven photocatalysis. I also did a post-doctoral internship at the Department of Chemical and Pharmaceutical Sciences of the University of Trieste (Italy) where I worked in the organic functionalization of carbon nanospheres-carbon nanofibres composites for their use in cell growth.

In 2017 I joined the ERANETMED Network (solar-assisted catalytic reforming: a hybrid process to transform municipal waste into energy). During this post-doctorate at the IST Lisbon (Portugal), funded by the EU-FP7 program, I developed carbon-based advanced materials for the catalytic abatement of NOx for the purification of syngas produced from MSW gasification and the synthesis of modified TiO2-based catalysts for the photocatalytic production of solar fuels from this syngas. I also acquired leadership by the direction of 3 master thesis in collaboration with research groups from the GH University of Science and Technology of Krakov and KU Leuven.

In 2018 I was granted a Juan de la Cierva fellowship and I joined the University of Alicante where I developed structured rare earths-based catalysts for CO2 methanation and oxidation reactions like soot combustion and CO-PrOx. I also conducted 2 research stays at the Universite Pierre and Marie Curie (France) and the National University of Colombia. I acquired knowledge in the design of materials by 3D-printing as well as experience in the use of singular research installations such as NAPP-XPS of Alba Synchrotron. This new knowledge joined with my previous experience in the synthesis of carbon gels motivated the creation of my own research line: Toward digitally controlled advanced catalysts: design of carbon-based monoliths for the valorization of CO2 through 3D-printing. This own research line allowed me to obtain funding as Principal Investigator of 4 research projects and be the supervisor of 7 Ph.D. theses.

My research career has been recently recognized by the Son Pioneras platform whose objective is the recognition of Women scientists, entrepreneurs, and leaders.

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Resumen del Currículum Vitae:

1. Scientific and technical contributions: I have demonstrated the ability to conduct high-quality multi-disciplinary research at the interface of several fields. For a researcher in my field in an early-stage of my career (Ph.D. in 2015), I have an outstanding publication track record: 5 books chapters, 51 research articles (plus 11 in peer-review) with an average IF of 7.4 and an increasing trend of publications per year being as high as 21 in 2020. Since 2016, I receive ~600 citations. 51 % of my articles have been published in the top 10% journals of its field (D1), 80 % in the top 25% (Q1), ~50% of these in journals with IF > 7, and 55 % of them in collaboration with international research groups. My research has been published in high-impact journals highlighting 1 Adv. Funct. Mater. (IF 16.8), 5 Appl. Cat. B (IF 16.7), 1 ACS Catalysis (IF 12.4), 1 J. Mater. Chem. A (IF 11.3), 2 J. Hazard. Mater. (IF 9.0), 4 Carbon (IF 8.8), 2 ACS Appl. Mater. Interfaces (8.8). I have been first or corresponding author of 70% of these publications. Moreover, I have presented more than 50 oral and poster communications to national and international conferences and I have participated in more than 15 international and national projects (6 of these as Principal Investigator). I have acted as member of 3 Examination Boards of doctoral thesis and as evaluator of 30 top-ranked journals (ACS Catal., Appl. Catal B, Adv. Funct. Mater., carbon). Moreover, I have 6 years (320 h) of teaching experience.

2. Mobility and internationalization: I have conducted research stays in different countries (25 months): Colombia with Prof. Farid Cortés, Italy with Prof. Maurizio Prato, Portugal with Prof. Filipa Ribeiro and France with Prof. Patrick da Costa. Additionally, I have participated in international collaboration projects (ERANETMED Network) whose objective is to improve Euro-Mediterranean cooperation. In this case (project ERANETMED/0003/2014), the cooperation network involved research groups from France, Italy, Spain, Lebanon and Portugal. Moreover, I have directed the work of international students in collaboration with research groups led by Prof. Farid Cortés (Colombia),

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Prof. Raúl Ocampo Pérez (Mexico), Prof Johan Martens (Belgium), Prof. Alexander Santamaria (Colombia), Prof. Amra Brotovcic (Bosnia and Herzegovina) and Prof. Teresa Grzybek (Poland). All of this has resulted in 24 publications, 2 projects and 4 Master and 2 doctoral theses in co-tutelage. So, I have established a wide and solid international collaboration network with recognized research groups worldwide. Also, I am International Project Evaluator of the FONDECYT (Chile) and FONCYT (Argentina) and Member of the Organizing Committee of the CICAT 2018 and the Scientific Committee of the EMCEI 2019, as well as guest editor of two Special Issues of Materials MPDI journal and member of the Editorial Board of Frontiers.

3. Leadership: My leadership skills are in evidence in the direction of 7 doctoral and 5 Master s theses, 1 Degree Thesis, 11 international stays, 6 projects as principal investigator, 3 contracts and the role of corresponding author in more than 70 % of my publications. Moreover, I have opened my own research line named Toward digitally controlled advanced catalysts: carbon-based monolithic catalysts through 3D printing being financed by FEDER funding.

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Turno de acceso general

Nombre: ORTIZ VITORIANO , NAGORE
Referencia: RYC2020-030104-I
Área Temática: **Ciencias y tecnologías de materiales**
Correo Electrónico: nortiz@cicenergigune.com

Título:

Development of high-performing and sustainable rechargeable metal-air batteries

Resumen de la Memoria:

Since 2018, I am leading the metal air research line at CIC energiGUNE (Spain) as an Ikerbasque Research Fellow. My research career has focused on both rational design of electrode and electrolyte materials for energy storage (e.g., solid oxide fuel cells SOFCs , Na-ion and metal-air batteries), as well as fundamental research aimed at elucidating key processes in order to facilitate rapid future developments at both the material and system levels.
I completed my PhD in the field of SOFCs at the University of the Basque Country in 2011, where I was awarded a predoctoral fellowship from the Basque government. I graduated with summa cum laude, European, and distinction (Premio Extraordinario de Doctorado) honors. My work during this time primarily consisted on the synthesis and characterization of novel materials for SOFCs. My thesis successfully presented several highly optimized and competitive new materials and a roadmap for refining production processes. During my PhD I undertook external research stays at Risø DTU (Roskilde, Denmark) and Imperial College London (UK). Following my PhD, I spent a month at Imperial College London as a post-doctoral visiting scientist to further investigate the relation between surface composition and oxygen reduction in SOFC, prior to accepting a position as a post-doctoral associate in the Department of Inorganic Chemistry at the UPV/EHU where I continued investigating the surface chemistry of SOFC materials to better understand the factors influencing the oxygen reduction reaction. In 2012 I was awarded a 2-year postdoctoral fellowship by the University of the Basque Country which I held from January 2013 until September 2013 and included a further 2-month research stay at Imperial College London. During that time, I continued my work on SOFCs, as well as expanding to the development and investigation of catalytic materials for Li-air batteries. Metal-air battery research was an emerging field of tremendous potential due to theoretical specific energies significantly higher than current battery technologies and I was quick to identify the similarities between my areas of expertise and the obstacles preventing metal-air battery commercialization. Afterwards, I started my Marie Curie fellowship at MIT in the Electrochemical energy Lab where I worked on Li-air batteries, the development of new nanostructured materials for oxygen electrocatalysis and initiated a new line of research into Na-air batteries.
In 2016, I was awarded an Ikerbasque Research Fellowship to develop the metal-air battery research line at CICe, of which I became leader in 2018. My research has primarily focused on two emerging technologies: aprotic Na-air and aqueous Zn-air batteries. This has consisted on the development and study of catalytic materials for the oxygen reduction and evolution reactions (e.g., graphene), as well as electrolyte materials for both technologies. In this sense, I have developed - along with my research team - novel electrolytes for both technologies (e.g., biopolymer-based electrolytes for Zn-air batteries). Currently, I supervise 2PhD students, 2 postdocs and 2 technicians; during this period I have manage (inter)national and industrial projects. In addition, I have conducted research stays at ORNL, Deakin and Chalmers Universities to further develop this research path.
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Resumen del Currículum Vitae:

Publications: my research has led to the publication of 43 articles in peer reviewed journals (40 in the highest quartile (Q1), 14 as first author, 10 as corresponding author), 3 book chapters and 6 articles in conference proceedings and these publications have been cited more than 1300 times giving an h-index of 17 scopus - (google scholar 19).
Conferences: Overall, 68 works submitted to conferences of which 8 are invited talks in international conferences (2nd Na ion conference (2015), 85th IUVSTA workshop (2018), ICYRAM (2018), 235th ECS Meeting (2019), IcNAB (2019), ICESI (2020), 14th Annual International Electromaterials Science Symposium (2020), Virtual Symposium on "Beyond Li-Ion Batteries 2021). In addition, invited talks are various research institutions include University of Gottingen, Deakin University, Oak Ridge National Laboratory, Chalmers University and College de France.
R&D projects and intellectual property: I have participated in a total of 10 competitive R&D projects, 5 as PI (funding: 977,541.06). I have also participated in 4 industrial projects with Cegasa company (funding: 150,288.38) and 1 patent on application.
Evaluation and review of R + D + i projects and articles: evaluation and project monitoring of EU calls (Fuel Cells and Hydrogen Joint Undertaking, Central Finance and Contracting Agency (CFCA) of the Republic of Latvia. Industry-Driven Research 2020, INNOWWIDE Call 2 for applications for Viability Assessment Projects (VAPs) in international markets 2020) and The National Fund for Scientific and Technological Development (Chile). In addition, reviewer of scientific journals: Nature Communications. Batteries & Supercaps, Joule, ACS Sustainable Chemistry & Engineering, Chemical Communications, etc.
Grants and scholarships: Ayudas para la promoción de empleo joven e implantación de la garantía juvenil en I+D+I (Ministerio de Economía, Industria y Competitividad); Ikerbasque Research Fellow (postdoctoral); Ikermugikortasuna (mobility grant, Basque Government); Marie Curie International Outgoing Fellowship (IOF) (EU); best oral presentation award in Beyond Lithium Ion VIII

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(2015);Premio Extraordinario de Doctorado; Specialisation for Doctoral Researcher Fellowship UPV/EHU; Beca para la formación de investigadores (predoctoral, Basque Government).
Mobility and internationalization: research stays at: DTU Energy Conversion and Storage, Technical University of Denmark; Departments of Materials, Imperial College London; Electrochemical Energy Lab, Massachusetts Institute of technology; Materials Science and Technology Division, Oak Ridge National Laboratory. Deakin University (Australia); Chalmer University (Sweden).
Obtained accreditations: evaluación positiva de profesor de universidad privada /Profesor contratado doctor /profesor ayudante docto. Agencia Nacional de Evaluación de la Calidad y Acreditación. Profesor Adjunto Ciencias Experimentales, UNIBASQ.
Teaching experience: Electrochemical Energy Storage-2. Master¿s degree. (MESC+); Matemáticas Aplicadas a las Ciencias Sociales (UNED). Multifunctional Complex Oxide Materials by Design. Master¿s degree. (MIT, U.S.A).
PhD Thesis: (1) Ms. Estíbaliz García (2018 present): development of a solid electrolyte for ecological and sustainable Zn-air batteries. (2) Mr. Iñigo Lozano (2018 present): development and study of glyme-based electrolytes for NaBs.

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Turno de acceso general

Nombre: PALAZON HUET, FRANCISCO
Referencia: RYC2020-028803-I
Área Temática: **Ciencias y tecnologías de materiales**
Correo Electrónico: francisco.palazon@uv.es

Título:

Semiconductores inorgánicos para la energía solar fotovoltaica

Resumen de la Memoria:

My research career started during my undergraduate engineering studies. Indeed, I was interested in nanomaterials already at the end of my Bachelor. I therefore decided to do a first short-term research internship on nanocomposites at the University of Tohoku (Japan) in 2010, followed by a second internship at the University of Sherbrooke (Canada) in 2011 within my Master s degree in Nanoscale Engineering.

I then completed my PhD in the field of materials chemistry at the University of Lyon (France) in 2014. During my PhD I focused on different chemical functionalization of gold and silica surfaces for the selective anchoring of different biomolecules and colloidal nanoparticles. I published 4 articles, 1 review, and 1 book chapter all as first author from my PhD work (2013-2015).

In 2015 I joined the Italian Institute of Technology to work on the ERC-Consolidator project TRANS-NANO led by Liberato Manna. From 2015 to 2017 I worked on halide perovskite colloidal nanocrystals and their multiple post-synthesis reactions. During this short period, I published 25 articles. Out of these, 9 are as first author and most of them are in the highest-ranked journals of my field of research such as Nature Energy, Nature Communications, JACS, ACS Energy Letters, ACS Nano... etc. Some of these articles were highlighted as journal covers (JACS, September 27, 2017, and Chemistry of Materials, May 23, 2017) and 4 articles from 2016-2017 have already received over 100 citations each.

In 2017 I obtained the highly-competititve Marie-Curie Fellowship to develop my own project at the Institute of Molecular Science (ICMol) of the University of Valencia (Spain) where I work since January 2018, first with the aforementioned European fellowship and at present with a Juan de la Cierva incorporación grant.
In the last three years I have maintained the same high standard of publications (over 50 in total, 26 as first and/or corresponding author, and more than 1500 citations) and also made important steps towards achieving a permanent position:

(i) I am responsible for one of the 6 main strategic research lines of the institute, which is a Maria de Maeztu excellence unit as recognized by the Spanish Ministry.
(ii) I have supervised one PhD thesis (Yousra El Ajjouri, defense on September 2020) and currently supervise another 3.
(iii) I contribute to the teaching duties of the Chemical Engineering department of the University of Valencia.
(iv) I have obtained the PAD and PCD professor accreditations from the Spanish Ministry.

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Resumen del Currículum Vitae:

I am a senior post-doc at the Instituto de Ciencia Molecular (ICMol) of the University of Valencia since January 2018. I first joined as a Marie-Curie Individual Fellow (2018-2020) to develop my project PerovSAMs (ID: 747599) after which I obtained a Juan de la Cierva Incorporación Fellowship. I am also responsible for one of the 6 strategic research axes of the Institute, which is a centre of excellence (Unidad Maria de Maeztu) recognized by the Spanish Ministry of Science.

Prior to this, I worked as research intern for 3 and 5 months at the University of Tohoku (Japan; 2010) and the University of Sherbrooke (Canada; 2011). Then, I obtained my Master of Science and PhD from the University of Lyon (France; 2011 and 2014) and worked as post-doctoral researcher at the Italian Institute of Technology in the ERC project Trans-Nano lead by Prof. Liberato Manna (Italy; 2015-2017).

Throughout this highly international career I have made significant contributions in the fields of materials' chemistry, colloidal inorganic nanocrystals, surface analysis and halide perovskites' optoelectronic devices among others. I have co-authored 1 book chapter and 51 articles (26 as first and/or corresponding author) in international peer-reviewed journals. Most of my publications are in the most significant and highest impact factor journals of my field of research such as Nature Energy, Advanced Materials, and Journal of the American Chemical Society (JACS). My work has been featured on the cover of JACS, Chemistry of Materials and Journal
of Materials Chemistry C, and my personal career has been highlighted in the 'Emerging Investigators issue 2020' from Journal of Materials Chemistry A (IF>10). My publications cumulate a rapidly increasing number of citations (>1600 citations in total, out of which 600 in 2020

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according to Google Scholar). I have also presented my work at several international conferences in Korea, Russia, Switzerland, Italy, France, and Spain.
I have supervised a PhD thesis (Yousra El Ajjouri; defended on 10/09/2020 with honors), and currently supervise three other, among which one in collaboration with Monica Morales Masis at the University of Twente (the Netherlands). I also have several international collaborations with world-leading groups in materials science and optoelectronics in Korea, Italy, the Netherlands, and France.

Aside from my research and supervision activity, I also have an important teaching activity, with over 300 hours of lectures at undergraduate and graduate level already fulfilled. Since 2019 I am accredited by the Spanish Ministry of Science, Innovation, and Universities for the positions of Profesor Ayudante Doctor and Profesor Contratado Doctor.

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Turno de acceso general

Nombre: MERINO MATEO, PABLO
Referencia: RYC2020-029800-I
Área Temática: **Ciencias y tecnologías de materiales**
Correo Electrónico: p.merino.mateo@gmail.com

Título:

Atomically-precise carbon nanomaterials for optoelectronic applications

Resumen de la Memoria:

My research expertise focuses on multidimensional carbon-based nanostructures from an experimental perspective. My research lines have special emphasis on the atomic scale characterization of structural, electronic and optical emerging properties of individual low-dimensional carbon structures. My investigations lie at the horizon where the fields of surface science, astrophysics and nanophotonics meet, yet I am further interested in any problem where carbon physics and chemistry dominates.

My passion about carbon materials is originated from the extraordinary complexity that they can display. Carbon-containing prebiotic molecules may represent the first steps toward life; carbon-containing nanostructures are exquisitely linked to the physico-chemical conditions of their local environment; and carbon-containing materials can be tailored to engineer photonic devices with complex and novel functionalities.

During my PhD (2009-2013), I carried out a combined study on the growth mechanisms, rotational configurations (Moirés) and electronic structure of graphene layers on model metal Pt(111) and semiconductor SiC(0001) surfaces. I also studied the reactivity of graphene surfaces with physisorbed and chemisorbed adsorbates using scanning tunneling microscopy in combination with advanced -synchrotron based- spectroscopies. During my PhD I opened a research line merging the surface science and astrophysics fields and proposed a mechanism for the origin of aromatic molecules in space (Merino, Nat. Commun, 2014). I discovered that PAHs can be efficiently formed from graphitized SiC dust grains in circumstellar regions, thus proposing a solution for the long-standing riddle of aromatics in astrophysics. I was awarded the extraordinary price in Physics of the Universidad Autónoma de Madrid.

In 2014 I moved to Germany to join the department of Prof. K. Kern in the Max Plank Institute of Solid State Research with a Max Planck fellowship for Foreign researchers. In 2015 I was awarded a competitive Humboldt Fellowship to develop a research line on light-energy conversion at the nanoscale of carbon-based materials. Since then I am strongly interested in the optical excitations (excitons and plasmons) of C60 films (Merino, Science Advances, 2018). During this period, I developed new instrumental tools merging time-resolved correlation spectroscopy with scanning tunneling microscopy. Using this setup, I demonstrated single photon emission with picosecond and picometer resolution (Merino, Nat. Commun. 2015) and characterized the dynamics of individual H2 molecules on surfaces (Merino, Nano Lett., 2018).

Since 2017 I carry a research line on photophysics and astrophysics at the nanoscale under the auspices of the ERC Synergy Grant Nanocosmos in ICMM-CSIC. In Madrid I manage three projects devoted to the study of carbon multidimensional materials: i) the growth of 0D dots made of pure carbon in the Stardust machine (a beyond-state-of-the-art instrumentation devoted to Laboratory Astrophysics located at ICMM-CSIC), ii) the characterization of the optical properties with sub-nm resolution of individual molecular emitters by tip-enhanced spectromicroscopies, iii) The functionalization of graphene and 2D materials. Combining all my research lines, I have been finalist in two ERC StG calls obtaining an A without funding in 2020.

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Resumen del Currículum Vitae:

I am currently a researcher of the ERC Synergy project Nanocosmos in the Institute for Material Science of Madrid (ICMM-CSIC), where I conduct a research on structural, electronic and optical characterization of multidimensional carbon-materials. Previously I have been Humboldt Research Fellow and Max Planck Foreign Research Fellow in the Max Planck Institute for Solid State Research (MPI-FKF, Stuttgart, Germany). There I am co-principal investigator of the research lines on C60 STM-induced electroluminesce (STML) and time-resolved STML the research lines continue as I perform regular stays in the MPI-FKF under the sponsor of the MPI foundation. Together with the two PhD students which I co-mentored, we have published 8 publications in top-tier nanoscience (including the reference review on the field in Chemical Review) and multidisciplinary (1 Nat. Commun. and 1 Sci. Adv., both as only corresponding author) journals.

I performed my PhD under the basis of a competitive Rafael Calvo Rodés funding in the Center for Astrobiology (Spain) associated to NASA Astrobiology Institute. During my PhD I have obtained competitive time in 2 User Facility proposals (ESRF ID3 and ELETTRA SuperESCA) and performed several international stays in major Synchrotron Facilities (ESRF, ELETTRA, ALBA) as well as international and national research Centers (Academy of Sciences of the Czech Republic, LNA, IMDEA Nanoscience).

The scientific results attained during my career include 33 publications (and four more are under review) in high-impact journals (average IF: 11.5), with so far more than 1084 citations (Google Scholar). 9 as corresponding author, 10 as first author and 6 as second author. I have an H-index: 17 in ten years of scientific career (Google Scholar). It must be highlighted the increase in research productivity in the last year, ten publications in 2020, including 4 ACS Nano, 1 Angewandte and 1 Nature Astronomy). I have participated in 8 national and international scientific projects (1 ERC Synergy, 1 Consolidator, 2 Plan Nacional) and secured 3 as principal investigator (Humboldt Fellowship, 82k ;

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Comunidad de Madrid Young Excellent Investigator, 80 k ; Marie Curie Intertalentum, 145 k). In 2018 I was finalist of the ERC Starting Grant obtaining a B in Step 2 of evaluation. In 2020 I was again finalist of the ERC Starting Grant obtaining A without funding in Step 2 of evaluation, which secures me funding as PI under the auspices of Plan Nacional: Acciones de dinamización Europa excelencia .
I have been invited to give 10 talks in major nanotechnology centers (CNRS, Academy of Sciences of the CZ, Nanogune, IMDEA Nanociencia, IFIMAC) and nanophotonics and nanotechnology conferences (Frontiers in scanning probe methods, GEFES X, N2D, FyT) and had the opportunity to present my work in more than 50 conference contributions. During my career I have co-mentored 2 MSc, 2 PhD and 1 postdoc and I am actually the principal supervisor of a PhD and a MSc student. I am an active disseminator of the science: I have given outreach talks in the university for a broad audience, I have participated in Astrojuenes Fleurance in 2011 and in the Science Week of Madrid in 2017. I am regular reviewer for a number of journals including Nanoscale, Applied Surface Science, ACS Omega, Surface Science, and a reviewer for the projects of the Polish Academy of Sciences.

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Turno de acceso general

Nombre: CORDOBA CASTILLO, ROSA
Referencia: RYC2020-029075-I
Área Temática: **Ciencias y tecnologías de materiales**
Correo Electrónico: rosa.cordoba.castillo@gmail.com

Título:

Towards to Three-Dimensional Superconducting Nanoarchitectures

Resumen de la Memoria:

Dr. Córdoba is a world expert in the preparation and characterization of advanced nanomaterials created in the 3 dimensions, particularly in superconducting and magnetic nanostructures. The fabrication of these nanostructures opens a new world, in which its geometry, topology and chirality, among others, would be interconnected, allowing new physical phenomena to emerge. These nanostructures would be integrated into future highly energy efficient electronic components.
She started her research career in 2005 at the ICMA in Zaragoza, Spain with Prof. De Teresa. She worked on the synthesis and characterization of magnetic materials, with 2 publications. In 2007, she finished her MSc on the project "Nanostructures grown by focused electron/ion beam induced deposition techniques" in the INA, UZ, with 1 publication and 1 workshop organized. During her PhD (2017-2012) supervised by Prof. De Teresa and Prof. Sesé, she worked on the fabrication of functional nanostructures by focused electron/ion beam induced deposition, giving rise to 25 publications (Nat Phys, ACS Nano, PRL). She was co-supervisor of 2 MSc students and 3 undergraduate, leader of 1 scientific proposal for the access to the Ion Beam Center (Germany) and, 1 international workshop organized. She received the award for the most outstanding PhD Research at the UZ (2013) and the Springer Theses award (2014). She got a postdoctoral position (2013-2015) within the FNA group led by Prof. Koopmans, Applied Physics Dep, TU/e, The Netherlands. Her main project was focused on the fabrication of highly pure magnetic nanostructures (1D-3D) and its magnetization manipulation with high spatial and time resolution, resulting in 13 publications. She was supervisor of 2 MSc students and 2 undergraduate students. In 2016, she returned to ICMA as a Juan de la Cierva Incorporation-2014 Fellow (105/7 in Material Science area), 64 k and since then is leading a new research line devoted to the fabrication of nanostructures from 1D to 3D by focused ion beam techniques, giving rise to 1 patent ES1641.1387, 4 publications (Nano Lett), co-supervision of 1 PhD candidate and 1 MSc student. She acts as senior corresponding author, conceiving original ideas, obtaining the funding from public calls and designing and supervising research. She has obtained funding as IP in the scientific regular calls to access facilities such as High Magnetic Field Lab, HFML-EMFL (2018), Ga-, He- and Ne-FIB instruments in France funded by NFFA-Europe (2017, 2018) and by ECOSTSTSM-CM1301 (2016) and organized 1 conference. In 2019, Dr. Córdoba has been awarded a prestigious Junior Leader Retaining (444/11) project from "la Caixa" Foundation (ca. 298k) which has served to establish her independent career at ICMol, UV and broaden her expertise in the field of 2D hybrid heterostructures. She is scientific co-coordinator of 2D Materials research line in the "María de Maeztu" Unit of Excellence (2020-2023), organizer of a MC in onlineCMD2020GEFES, 7 publications (Nano Lett) and supervised 1 MSc student and 1 undergraduate. She has established new collaborations with academics (Prof. Coronado ICMol, Prof. Cantarero ICMol, Prof. Fomin IFF Dresden, Prof. Zeitler HFML). She has been awarded the Young Investigator Award and Lecturership 2020 Microelectronic Engineering and is member of the Editorial Committee in 3 scientific journals.

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Resumen del Currículum Vitae:

Dr. Córdoba is a world expert in the preparation and characterization of advanced nanomaterials created in the three dimensions, particularly in superconducting and magnetic nanostructures. The fabrication of these nanostructures opens a new world, in which its geometry, topology and chirality, among others, would be interconnected, allowing new physical phenomena to emerge. These nanostructures would be integrated into electronic components that would have an impact on the development of the next generation of highly energy efficient electronic devices.
54 scientific articles in high impact journals, 1 more accepted (D1: 9 (WoS), Q1: 33 (WoS) and Q2: 7 (WoS)) including: Nature Phys (2), Nature Comm (1), Nano Letters (2), ACS Nano (2), PRL (1) Adv. Elec. Mat. (1) and Sci Rep (3) and 1 book and 5 book chapters. She is 1st author in 10 articles, 2nd author in 9, Last author in 1 and Corresponding author in 11.
h-index: 21(WoS), 23(Google Scholar); Citations: 1311, 1 article >100, 10 articles >50 (WoS), 1782(Google Scholar); Average Citations/article: 24(WoS). After PhD (2013-2020), articles: 26(WoS), average citations/year: 49(WoS).
To date, she has participated in 14 national (MICINN) and 7 international (EU) projects. She was included in the Reserve List in the calls "Ramón y Cajal" 2018 and 2019, MICINN. As PI, she has secured 362 k in research income to date.
She is co-inventor of 1 Spanish patent ES1641.1387 in 2018 and the international extension has been submitted PCT/ES2019/070526 in 2019.
She is Member of the Editorial Committee in 3 scientific journals: Micromachines (2020-), Micro and Nano Eng. (2020-) and MicroElectronic Eng. (2020-).
She is acting as Guest editor in the Special Issue "Nanofabrication with FEBID/FIBIP" in Micromachines (2020).

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She is scientific co-coordinator of 2D Materials research line in the "María de Maeztu" Unit of Excellence at the ICMol in the UV (2020-2023), 2 M . Co-organizer of 1 international mini-colloquium "Focused Ion Beam Induced Processing" in online CMD2020GEFES, 3 international workshops: FEBIP 2012 , "Microscopy at the Frontiers of Science 2017" and 1st Nanolito 2007 and Open Day of the Science Faculty, UZ, (2017 2018).
Young Investigator Award and Lecturership 2020 Microelectronic Engineering.
She has invited to participate as invited speaker in 15 international conferences (Fall MRS Meeting 2019; FEBIP2018; EIPBN2018; CMD DPG conference 2018; JMC14CMD25).
24 activities to disseminate her results on web pages, blogs, newspapers.
Seven stays abroad in research centers or universities (26 months and 18 days).
She is supervisor of 1 Ph.D. candidate (thesis defence date: 15/02/2021) and supervised 6 MSc students and 4 undergraduate students.
Positive evaluation of ANECA for Assistant Professor and Associate Professor for public and private universities (15/07/2015) and the I3 certificate (04/12/2019).
1 NJP (2008) highlighted in Europhysics News; 1 Nat Phys (2009) in Physics Today; 1 Nat Comm (2013) in ScienceDaily, BES US DOE 2013 summary report; 1 Nat Phys (2014) CienciaXplora, GEFES (RSEF); 1 Nano Lett (2018) in Advances in Engineering, GEFES (RSEF), Scientific highlights NFFA-EU; 1 Nano Lett (2019) in EMFL NEWS Scientific highlights, Scientific highlights NFFA-EU; 1 Sci Rep (2019) in Cadena Cope, Aragón Radio, El Periódico de Aragón.

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Turno de acceso general

Nombre: GARNICA ALONSO, MANUELA
Referencia: RYC2020-029317-I
Área Temática: **Ciencias y tecnologías de materiales**
Correo Electrónico: elagarnica@hotmail.com

Título:

Synthesis and characterization of 2D materials by means of scanning probe microscopies

Resumen de la Memoria:

My research is focused in the on-surface synthesis of 2D materials and hybrid metal-organic structures and the investigation of their fundamental structural, electronic and magnetic properties by means of scanning probe microscopies.

During my PhD, I got extensive experience working with a low-temperature scanning tunneling microscopy (LT-STM) in ultra-high vacuum performing scanning tunneling spectroscopy (STS), spin-polarized-STS and inelastic tunneling spectroscopy measurements on individual molecules adsorbed on graphene grown on different metallic substrates. In particular, I was interested in the addition of new functionalities to the graphene layer by self-assembly on and below its surface, with an emphasis on engineering magnetic interactions. With this work we provided the first experimental and theoretical evidence for the existence of magnetic order in a purely organic molecular monolayer deposited on epitaxial graphene, which can be used to produce an efficient spin filter out of graphene.

In 2014 I joined to Professor Willi Auwärter's group (Chair of Molecular Nanoscience) at the Technical University of Munich as a postdoc. With a team of 3 PhD students, I worked exploring single-molecule processes and their interaction with 2D materials. In particular, we focused in three complementary honeycomb sheets: graphene (semi-metal), h-BN (insulator) and SiC (semiconductor). We combined novel and well-established protocols like CVD, e-beam evaporation, intercalation or ion gun assisted deposition, for the synthesis of the 2D layers on metallic substrates and later, we focused on the subsequent functionalization of such structures, paving the way to add new functionalities. The most important outcome of this work was an in-situ covalent coupling mechanism yielding for the very first time tetrapyrroles fused to graphene edges. This study introduced a distinct, novel approach towards functionalization of nano-graphene providing an avenue to refined designs for applications in bioinspired technologies. In addition, we reported the first on-surface synthesis of non-metal porphyrins, namely, silicon and germanium tetraphenylporphyrin. The undercoordinated Si center could be accessible by axial ligands, introducing interesting prospects for heterogeneous catalysis and sensing applications. I was also involved in the setting up of a new experimental system consisting of two UHV chambers: an STM chamber and a XPS-chamber with detector and X-ray source, and completed my expertise in surface science with atomic force microscopy (AFM) technique.

Currently, I lead a new research line at IMDEA-Nanoscience. In particular, my research consists of exploring the topological properties of 2D materials based on transition metal dichalcogenides, such as predicted topological semimetals 1T-MoTe2 and 1T¿-IrTe2, combining my expertise in STM/STS and the manipulation of novel materials at the atomic scale.

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Resumen del Currículum Vitae:

I graduated in Physics in 2008 and obtained my M.Sc. in Nanoscience and Molecular Nanotechnology in 2010 at the Universidad Autónoma de Madrid. During my PhD (2010-2013), I was awarded with a FPI-UAM grant and developed my research at the Surface Science Laboratory in the Condensed Matter Physics Department (Universidad Autónoma de Madrid) under the supervision of Prof. Amadeo López Vázquez de Parga and Prof. Rodolfo Miranda. During this period, I spent three months at the Empa laboratories (Switzerland) in Prof. Roman Fasel s group. My PhD thesis Electron acceptor molecules deposited on epitaxial graphene studied by means of Low Temperature Scanning Tunneling Microscopy/Spectroscopy was awarded with summa cum laude honours.

After a brief postdoc at IMDEA-Nanoscience in Madrid, I moved to Germany in 2014 at Professor Willi Auwärter's group (Chair of Molecular Nanoscience) at the Technical University of Munich. First, I enjoyed a contract by the ERC advanced grant NanoSurfs, followed by a Marie Curie Intra-European Fellowship.

In February 2018, I joined IMDEA-Nanoscience and started an independent research line at IMDEA Nanoscience Institute in Madrid, with financial support from the Spanish Ministry of Science, Comunidad de Madrid and La Caixa Foundation.

My work has resulted in 35 peer review publications in journals such as Nature Physics, Nature Chemistry, JACS, Nano Letters and PRL, with more than 1200 citations, resulting in a h-index of 17. I have participated in more than 20 national and international conferences, 4 of them as invited speaker and winning the second best poster price in one of them. I am also co-inventor in two patents. Further, I

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collaborated in the training of several undergraduate students, mentored three PhD students during my postdoc and currently I am supervising two PhD students.

I have also contributed to several Spanish and European projects (ERC Consolidator Grant NanoSurfs, Nanobiomagnet, MAD2D, CONSOLIDER-INGENIO en Nanociencia Molecular) and I am principal investigation of a 2018 knowledge generation R&D project. I have established collaborations with international research institutions. I would like to emphasise the collaboration with the experimental groups (Prof. Matthias Batzill, Tampa USA; Dr. D. Farias, Universidad Autónoma de Madrid, Spain; Dr. A. Politano, Universit degli Studi dell'Aquila, Italy; Dr. D. Pacile, Universitá della Calabria, Italy; Prof. W. Auwärter, Technical University of Munich, Germany) and the theoretical physicists (Prof. Fernando Martin, Universidad Autonoma de Madrid; Dr. M-L. Bocquet, CNRS Paris; A.P. Seitsonen, Paris; Dr. A. Arnau, Donostia Theoretical Physics Center, San Sebastian; Dr. Mikhail Otrokov and Prof. Eugene Chulkov , Centro Mixto CSIC-UPV/EHU,San Sebastian).
As an important part of my research, I have been involved in several outreach activities part of them to promote the interest of women in science.

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Turno de acceso general

Nombre: FERNANDEZ DIAZ-CARRALERO, ANGEL GABRIEL
Referencia: RYC2020-028787-I
Área Temática: **Ciencias y tecnologías de materiales**
Correo Electrónico: angel.gfdc@gmail.com

Título:

Online corrosion monitoring tool applied to high temperature industrial processes

Resumen de la Memoria:

The research experience of the candidate is focused on the development of new thermal energy storage (TES) material, including the analysis of the main physio-chemical properties and their corrosive potential at high temperature. The interest of his research relies on the implementation and synthesis of inorganic additives using lithium base component and nanoparticles to improve the thermal storage properties as well as the development of different corrosion mitigation strategies to reduce the impact of TES systems in the corresponding target industry.

His specialization area has moved from sensible heat storage using nitrate molten salts to higher thermal stability salts as carbonate and chlorides including the proposal of latent heat storage using inorganic phase change material or sorption materials for thermochemical heat storage applications. The large background and knowledge acquired during his PhD and postdocs will allow the candidate to start a new research line entitled in Online corrosion monitoring tool applied to high temperature industrial processes . This promising research line will be based on the combination of different electrochemical corrosion techniques, such as electrochemical impedance spectroscopy (EIS), to understand the corrosion mechanism, linear polarization resistance (LPR), to obtain the corrosion rate, electrochemical noise (ECN), to predict unplanned shutdowns of protective layers and cyclic voltammetry (CV), to monitorize and follow up the impurities or aggressive components producing corrosion damages. These electrochemical techniques, investigated during his postdocs will configurate a new corrosion monitoring tool to predict corrosion failures and a better follow-up during the industrial operational process. This idea came from the molten salt pilot plant designed by the applicant in Chile, since he could evaluate the dynamic corrosion effect by high volumes of molten salt but not obtain a corrosion rate prediction during the operation tests.

The first step towards his research line Online corrosion monitoring tool applied to high temperature industrial processes has been performed during his last project as PI, a Tecniospring fellowship (Marie Curie cofund project) entitled InhibiTES (117k). In this framework, the applicant has combined the electrochemical impedance spectroscopy and linear polarization tests developed during his postdoc stage at NREL (USA) with high temperature corrosion mitigation techniques based on anodic and cathodic protection of commercial alloys in aggressive TES system >700ºC.

The basic concepts and results have insightful scientific and technological impact in areas as Climate Change and Decarbonization, Advanced Materials and Advanced Manufacturing. These areas have been addressed as highly important Key Enabling Technologies in both Estrategia Española en Ciencia, Tecnología y de Innovación 2021-2027 (Annex 2) and Horizon Europe planning.

The goal of the applicant is not only to establish tan improved corrosion monitoring tool using advanced electrochemical techniques in Spanish laboratories, bringing home the know-how acquired during his postdoctoral periods, but to combine them with the knowledge acquired during his PhD and Marie Curie postdoctoral return.

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Resumen del Currículum Vitae:

He graduated in Chemistry in 2009 and started his research career at Metallurgical and Materials Engineering Department with a PhD fellowship at Universidad Complutense de Madrid. His PhD, focused on the development of new thermal energy storage (TES) materials applied to concentrated solar power (CSP) technology and the effects of corrosion in these high temperature environments, was defended in 2013 obtaining the highest mark (cum laude). It is worth mentioning that during his PhD, the applicant received an Honorary Mention, awarded by the Dean of the Department.

In 2013, he started his postdoc in the Solar Energy Research Center (SERC-Chile) funded by the Universidad de Chile. He was integrated in the TES research line to investigate the physico-chemical characterization of by-products present in the Atacama Desert with potential use in CSP plants.

After one and half year, he obtains his first two project as PI funded by Conicyt-Chile (90k) and the Atacama Regional Government (161k) focus on the development of low melting point molten salts and dynamic corrosion assessment at TES pilot plant scale. In 2015, the applicant was invited to a research stay at the National Renewable Energy Laboratory (NREL) during six months, under the supervision of Dr. Judith Gomez-Vidal to collaborate in a DOE project focus on corrosion evaluation studies for the new generation of CSP plants. The applicant moved to the Antofagasta Energy Development Center (CDEA), at Universidad de Antofagasta in 2015 as postdoc and in 2017 obtained a tenure track position as Assistant Professor, where he led the sensible TES and corrosion research group. During this period, the applicant obtained other two research projects as PI funded by Antofagasta Regional Government (193k) to analyse the thermal and corrosion behaviour of lithium nitrate salts at pilot plant scale. The important results obtained have enabled him to obtain an additional industrial project with Albemarle company (38k) to enhance the industrial production of lithium nitrate at Salar de Atacama.

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In 2018, the applicant obtained a Tecniospring research fellow (Marie Curie cofund project) to come back Spain, at Greia research group at Universidad de Lleida leaded by Prof. Luisa F. Cabeza (h=70), as PI of the InhibiTES project (135k), to develop corrosion inhibitors in new chloride molten salts at high temperature using corrosion monitoring tools.
The candidate has participated in 46 peer review papers (5 D1, 34 Q1, 28 as first author and 30 as corresponding author, 5 reviews Q1) and 3 book chapters with >1000 citations, 270 per year in the last 4 years and h-index= 21 (Google Scholar) 19 (Scopus), 2 patents, 22 conference communications (16 oral) in international conferences and participation in 12 research projects (5 as PI), 2 H2020, 6 Companies, 2 Regional, 1 National and 1 linked to fellowship. He has contributed to more than 230h of lectures during his career between UCM and UA including the supervision of 2 master thesis and 2 PhD. He has participated as a technical advisor of the solar energy storage committee in the Energy Chilean Ministry, in scientific committees for prestigious conference as Eurosun, Eurotherm and SolarPACES, dissemination activities (European researchers night 2018 and 2019) and revision of manuscripts (Corr. Sci, Solmat, Apen, RSER).

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Nombre: SERANTES ABALO, DAVID
Referencia: RYC2020-029822-I
Área Temática: **Ciencias y tecnologías de materiales**
Correo Electrónico: david.serantes@gmail.com

Título:

A Physics-Based Model for the Heating Performance of Magnetic Nanoparticles in Viscous Media: Taking Hyperthermia Cancer Treatment and Magnetogenetics to the Next Level

Resumen de la Memoria:

My main research line is the development of a general framework for the comprehension of the heating performance of magnetic nanoparticles (MNPs) under AC magnetic fields in viscous media. The motivation is the fact that despite the promising perspectives for biomedical applications arisen in the last years (mainly for hyperthermia cancer treatment or drug release, but also novel applications as the remote control of cellular activities -magnetogenetics-), the success in reaching routine clinical practice is very scarce. From the physics point of view, a main difficulty is the lack of theoretical models able to describe the behaviour of MNPs in the viscous biological environment, what results in the absence of accurate tools able to guide the experiments. The failure in the current models involves several key factors, including procedural (complete impossibility to explain successful heating effects on cells when the global heating is negligible); interpretative (current heating mechanisms cannot account for accurate heat-triggering experiments - other mechanisms at play?); and descriptive ones (available models are limited to short timescales, far from those of the experiments). My objective is to go beyond the state-of-of-the art and overcome the above limitations; for that, the complex nature of the problem requires a multiphysics approach able to; provide an explanation in terms of local (single-particle level) heating, vs. the usual global (entire system) approach; simultaneously embrace superparamagnetic and Brownian processes; provide alternatives to current heat generation mechanisms; and efficiently deal with the different timescales involved. Due to the lack of analytical theories the provision of advanced computational models is essential to my research.
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Resumen del Currículum Vitae:

I have been dedicated to full-time research since October 2005, including the completion of my PhD in 2011 and 9.5 years of postdoctoral experience. My expertise is on theoretical nanomagnetism, and my research is characterized by a strong interaction with experimentalists. I have worked on various areas: my PhD dealt with magnetocaloric properties in nanosystems; my first postdoctoral period dealt with ultrafast magnetisation dynamics; and afterwards I have mainly focused on the study of magnetic nanoparticles for biomedical applications. Particularly, I study their response under external AC fields to be used as heat mediators for applications such as hyperthermia cancer treatment, or the remote magnetogenetic control of cellular activities.
My work has mainly taken place in 3 different institutions: Universidade de Santiago de Compostela; and Materials Science Institute of Madrid (ICMM-CSIC); and the University of York (United Kingdom). In addition, I spent working periods (months) in several institutions worldwide (Germany, USA and Japan). My track record built over these years includes 56 published papers (1457 citations and h-index 19, according to Web of Science [20.01.2021]), intense participation in international conferences (including 8 invited talks), and the development of an extensive network of international collaborations. I have participated in teaching at public universities and Summer specialization courses; student supervision (I have supervised 1 PhD and 1 Master theses; currently I supervise another PhD and one undergraduate student). I have participated in regional, national, and international projects. Currently, I am the P.I. of a project funded by the Agencia Estatal de Investigación (Spanish Ministerio de Ciencia e Innovación). I am certified by ANECA as Profesor Contratado Doctor - Associate Professor- in Spain since 2016, and in 2019 I achieved the I3 Certificate.