Marie Skłodowska-Curie Actions Postdoctoral Fellowships 2021
Hosting offers at IMDEA Materials Institute

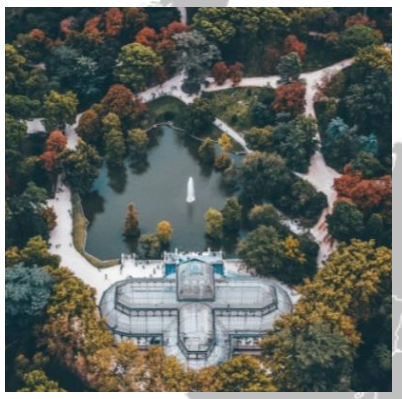
EURAXESS ASEAN
June 14th, 2021

Germán Infante
Head of the Project Management Office

institute IMDEA materials

UNIT OF EXCELLENCE MARÍA DE MAEZTU

MADRID REGION



IMDEA INSTITUTES

600 Researchers

40 Nationalities

1500 R&D projects

3 Seal of Excellence Severo Ochoa / María de Maeztu

IMDEA MATERIALS: MISSION

IMDEA Materials Institute, one of the 7 Madrid Institutes for Advanced Studies (IMDEA), is a public research centre (non-profit research organisation) founded in 2007 by Madrid's regional government.

The mission of the Institute is to **do research of excellence at the forefront of Materials Science and Engineering, contributing to tackle the challenges of society and fostering the sustainable development of the region of Madrid.**

science

excellence in materials **science** and engineering research

transfer

technology transfer to industry to increase competitiveness and maintain technological leadership

talent

attraction of talented researchers from all over the world to work in Madrid in an international and interdisciplinary environment

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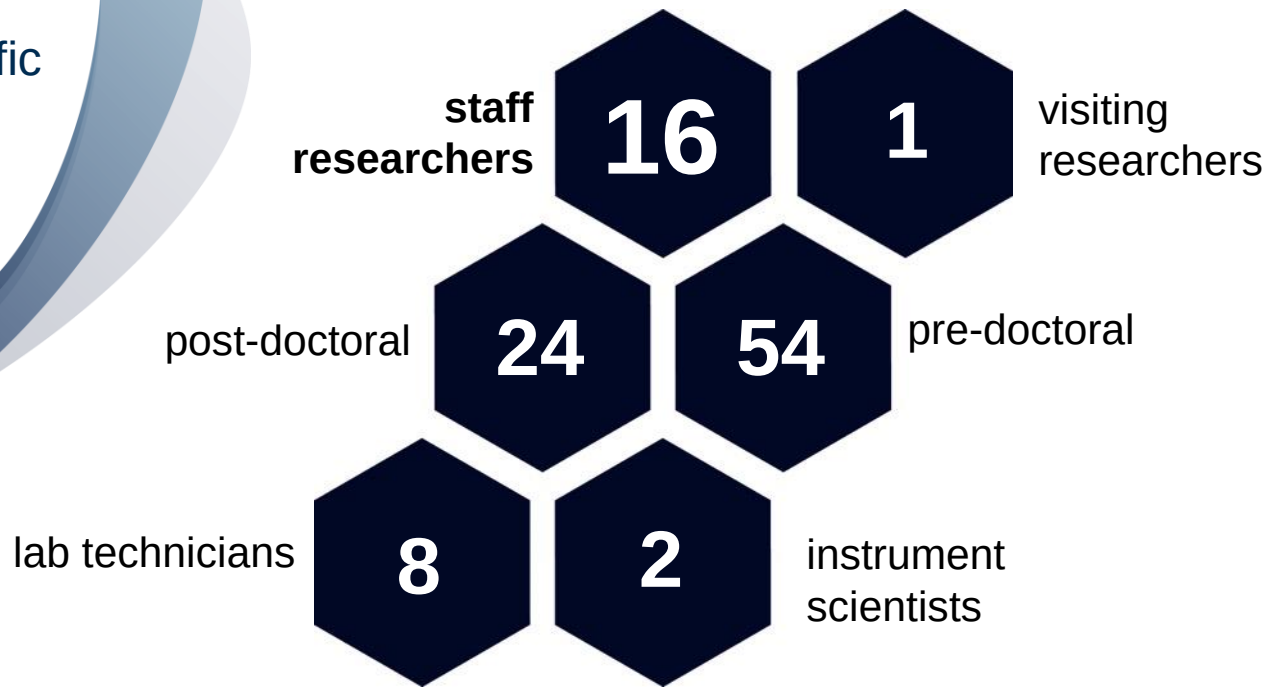
IMDEA MATERIALS: STAFF

Transparent selection and evaluation by an independent Scientific Council

105 researchers from 21 countries



IMDEA MATERIALS: STAFF

48% **foreign nationals researchers**

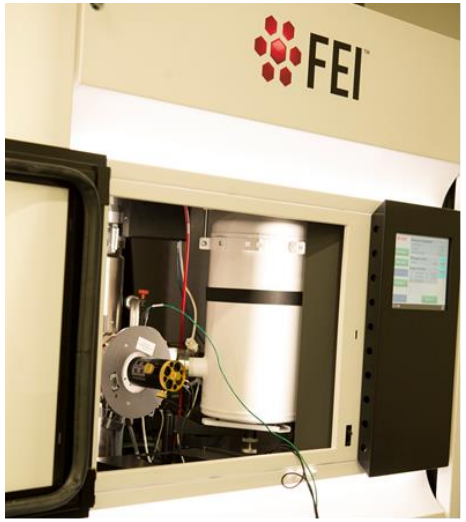
58% **PhD granted by foreign universities**

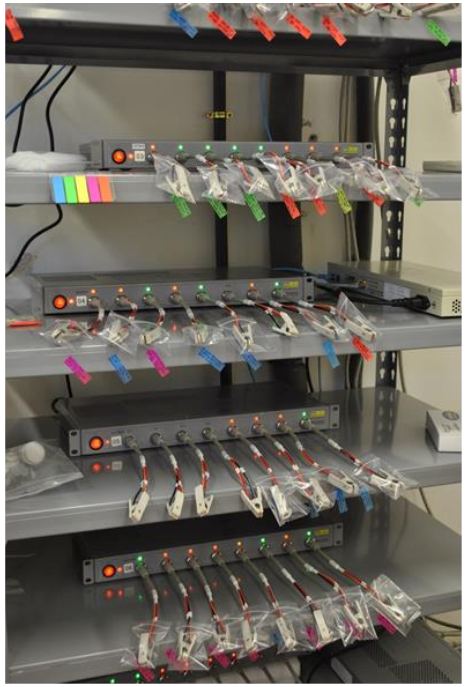
Who arrived in IMDEA Materials from prestigious universities around the world

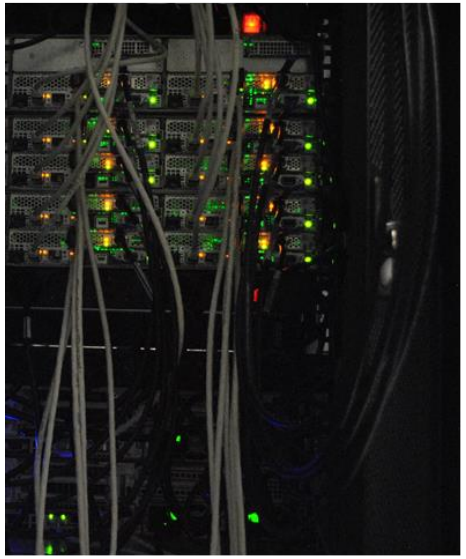
- Cambridge University
- Max Planck for Iron Research
- Delft University of Technology
- University of Leoben
- Dublin Institute of Technology
- Universität Erlangen-Nürnberg
- University of California Berkeley
- Mines ParisTech
- University of Queensland
- Catholic University of Louvain
- State University of Campinas
- Korea Advanced Institute of Science and Technology
- Chinese Academy of Sciences
- China Central South University
- Sichuan University
- University of Science and Technology of China
- …

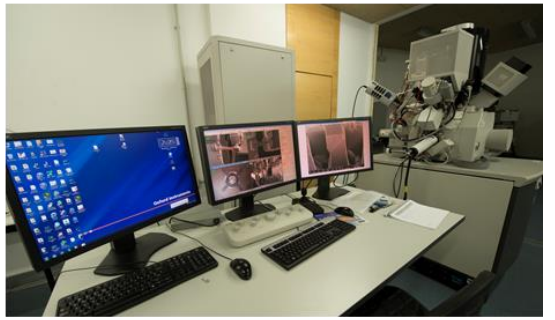
IMDEA MATERIALS: INFRASTRUCTURE

2.640 m² of research labs to manufacture, characterise and simulate advanced materials and nanomaterials, including their integration in laboratory scale prototypes and devices

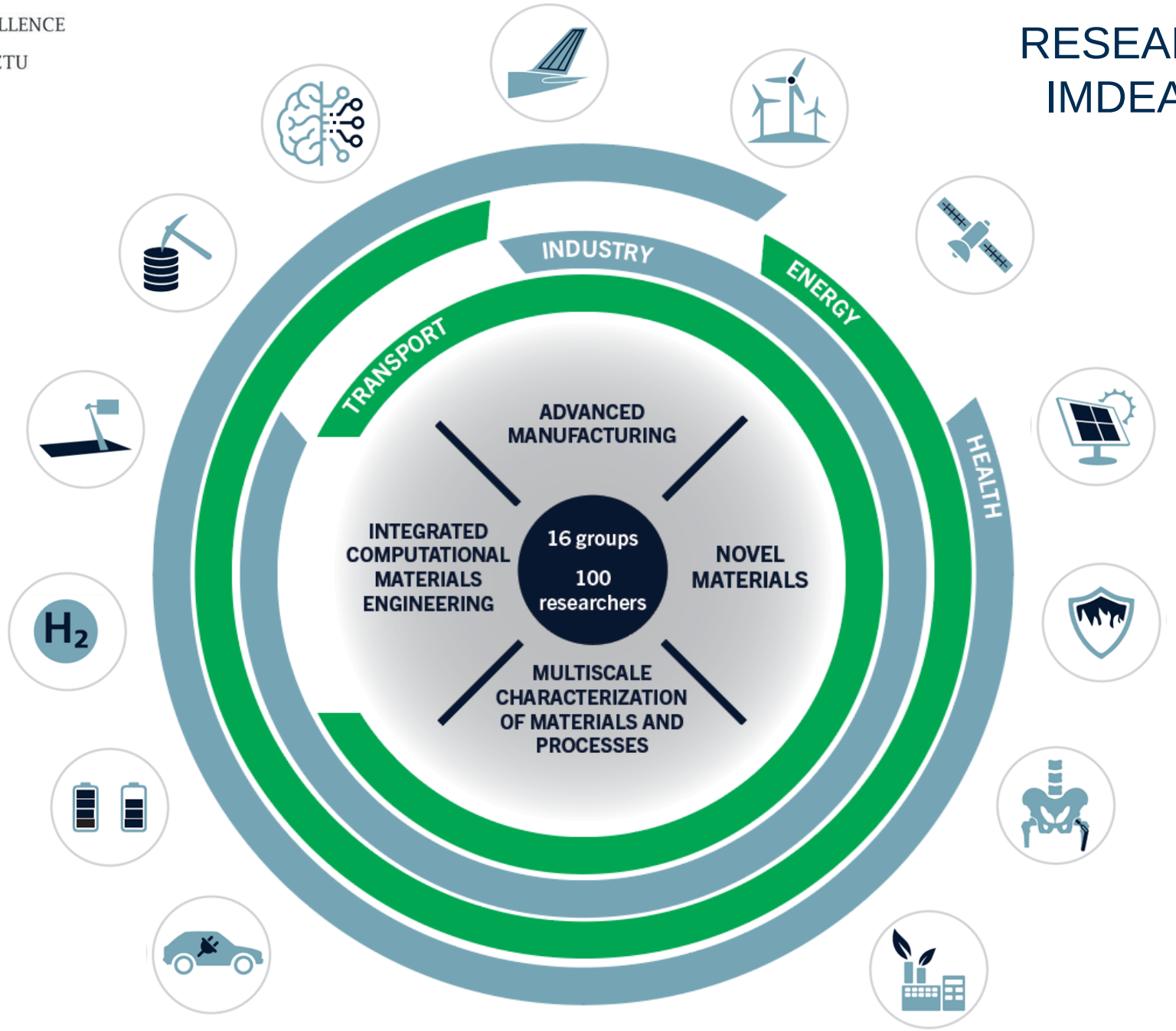








RESEARCH LINES AT IMDEA MATERIALS



RESEARCH LINES AT IMDEA MATERIALS

Industry 4.0

- Artificial Intelligence (AI)-guided smart manufacturing of structural composites
- Virtual Manufacturing (VM) & Virtual Testing (VT)
- Accelerated product development via AI guided materials design and chemical process optimization
- Structural Health Monitoring based on integrated nanostructured carbon fibres
- Impact and explosion damage prediction

Circular economy

- Bio-based polymer matrixes as sustainable and fire-safe PCMs for thermal energy storage applications
- Fire-retardant reprocessable epoxy-based composites
- Biobased, flame resistant all-solid state polymer electrolytes for fire-safe batteries
- Valorisation of carbon by-products of H_2 production reaction to produce carbon nanotubes (CNTs)
- Mechanical properties simulation of sustainable construction materials
- Nanocellulose functionalization of as filler for bio-based and high performance polymer composites

Materials for extreme conditions

- Artificial Intelligence (AI)-guided smart manufacturing of structural composites
- Virtual Manufacturing (VM) & Virtual Testing (VT)
- Accelerated product development via AI guided materials design and chemical process optimization
- Structural Health Monitoring based on integrated nanostructured carbon fibres
- Impact and explosion damage prediction

Lightweight

- Sandwich-structured composites with high mechanical, thermal shield and sound insulation properties
- Composite materials and alloys
- Hybridization
- Fire-retardant polymers and composites
- Ultra-fast processing of advanced metallic materials
- Materials for fire safety and energy efficient structures

3D printing

- New 3D-printed alloys for extreme conditions (Ni superalloys, intermetallics, steels)
- Predictive simulation of metal AM. From composition/processing to mechanical properties
- Quality control – In-situ monitoring
- Metallic powder design and optimization
- 3D printing of structural composites by using recycled fibers

Electrification of transport

- Multifunctional energy storage
- Carbon conductors for Integrated signal and power transmission
- High performance and lightweight components for EV batteries
- Fire safe batteries
- Hierarchical Radar Absorbing Materials (RAMs)

Singular characterisation

- 3D characterisation of materials (X-ray tomography and diffraction, SEM, TEM, Raman…)
- 4D characterisation: In-situ characterisation of deformation and processes across multiple length scales (X-ray tomography, SEM, TEM)
- Fire behaviour (cone calorimeter, vertical chamber and LOI)

RESEARCH SUPPORT AT IMDEA MATERIALS

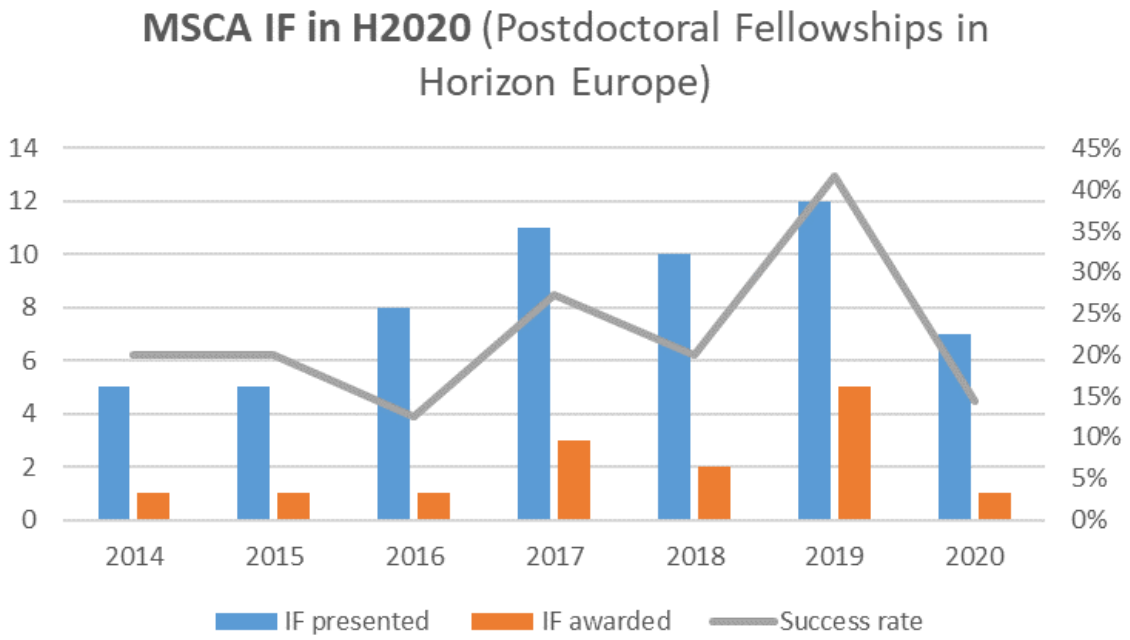
Our researchers are fully backed by a research support office:

- Visa and work permits, soft-landing (family and housing support)
- Social and outreach activities
- Training in soft skills, English & Spanish lessons
- Proposal writing, administrative management and technology transfer

HR EXCELLENCE IN RESEARCH

OUR PREVIOUS EXPERIENCE IN MSCA PF

Long track-record of hosting MSCA fellows. One MSCA postdoctoral fellowship awarded per year on average along the past 7 years.



HOSTING OFFERS AT IMDEA MATERIALS

The following hosting offers are available for call 2021. More details on our website. Please **submit your expression of interest** (resume + 2 page outline of the proposed research project) **before July 15th 2021**.

1. **Multiscale coupling of computational models of phase transformations and microstructure evolution in metallic alloys**
2. **Tissue engineering and regenerative medicine**
3. **Multiscale modeling in mechanics and multiphysical problems**
4. **Solution processing of 1D nanomaterials for assembly as macroscopic materials for energy storage and conversion**
5. **Data-driven materials discovery**
6. **Fire-safe energy storage materials for batteries**
7. **Smart manufacturing of structural composites by using Artificial Intelligence**
8. **Materials development using additive manufacturing**

HOSTING OFFERS AT IMDEA MATERIALS

Multiscale coupling of computational models of phase transformations and microstructure evolution in metallic alloys

Development, implementation, and multi-scale coupling of computational models of phase transformations and microstructure evolution in metallic alloys. Research directions include the development of modeling strategies for additive manufacturing of metals, using computational thermodynamics (CalPhaD), phase-field models, and developing novel multiscale models for dendritic growth and microstructure formation. Materials of interest range from superalloys for high-temperature applications (e.g. superalloys for aeronautics), to lightweight structural metals (e.g. Mg alloys for automotive). Research activities range from applied projects coordinated by industries (e.g. ITP Aero, ArcelorMittal) to more fundamental investigations into the mechanisms of microstructure formation.

Dr. Damien Tourret

damien.tourret@imdea.org

Tissue engineering and regenerative medicine

Materials development for tissue engineering and regenerative medicine. Candidates with specific interest and experience in hydrogel chemistry, biofabrication/bioprinting, biological characterization of 3D tissue constructs, and/or computational materials design are particularly encouraged to make contact. The hosting group bridges research on fundamental materials chemistry through processing to in vitro and in vivo testing of novel approaches to regenerate damaged or diseased tissues for a variety of biological applications

Dr. Jennifer Patterson

jennifer.patterson@imdea.org

HOSTING OFFERS AT IMDEA MATERIALS

Multiscale modeling in mechanics and multiphysical problems

Candidates with specific interest in crystal plasticity and polycrystalline homogenization, micromechanics based fatigue and fracture simulation, higher order constitutive models (gradient plasticity, non-local approaches), multiscale problems in polycrystals, FFT based homogenization, coupled multiphysical problems and acoustics and dynamical problems in polycrystals are encouraged to make contact. The host group has developed state-of-the-art simulation codes and crystal plasticity simulations, some of them being now licensed and commercial.

Prof. Javier Segurado

javier.segurado@imdea.org

Solution processing of 1D nanomaterials for assembly as macroscopic materials for energy storage and conversion

The candidate will start by studing the behavior of dispersions of 1D inorganic nanowires in the group. He/she will then will apply methods for controlled assembly of nanowires as macroscopic architectures, such as sheets, fibres, fabrics, coatings, etc. The group will make available its expertise and facilities for structural studies of these new materials through advanced spectroscopic and X-ray diffraction methods, including measurements at synchrotron facilities. The final part of the project will study the properties of nanostructured networks for electrochemical energy storage and conversion, both in-house and with our international network of collaborators.

Dr. Juan José Vilatela

juanjose.vilatela@imdea.org

HOSTING OFFERS AT IMDEA MATERIALS

Data-driven materials discovery

Design of advanced functional porous materials for various applications from energy to health and food. The group is interested in development and applications of computational and material informatics tools to discovery framework-based as well as molecular porous materials, and data-driven experimental approaches that lead to practical realizations of optimal material designs. The candidate will gain experience in building multidisciplinary approaches and complex workflows that combine aspects of molecular simulations, material informatics and machine learning, and apply them in the context of design of next generation materials for molecular storage, separations and other technologies. This opportunity welcomes candidates of various technical backgrounds, from chemistry and material science to applied mathematics and computer science

Dr. Maciej Haranczyk

maciej.haranczyk@imdea.org

Fire-safe energy storage materials for batteries

The candidate will work in fire-safe energy storage materials for batteries (new generation fire-safe energy storage materials for battery or self-powered fire-safe nanogenerator as new generation sensors). The host group has solid expertise in fire retardant materials, functional nanomaterials and high-performance polymers. The Institute has facilities for chemical synthesis, polymer processing, functionalization of nanomaterials, battery fabrication and fire tests. Another strength of the Institute is the multiscale characterization techniques (including *in situ* methods) and the integrated computational engineering, which can interact with any material development.

Dr. De-Yi Wang

deyi.wang@imdea.org

HOSTING OFFERS AT IMDEA MATERIALS

Smart manufacturing of structural composites by using Artificial Intelligence

The candidate will work in smart manufacturing of structural composites by using Artificial Intelligence as core technology coupled with advanced virtual processing. The host group is involved, among others in research lines related with multiscale virtual processing and virtual testing methods for structural composites. In addition, the Institute has state-of-the-art facilities to manufacture composites (injection, infusion, compression moulding, additive manufacturing, …), multi-scale mechanical characterization (experimental micromechanics and X-ray tomography) so any modelling in the area is strongly connected with detailed experimental work for correlation.

Prof. Carlos González

carlosdaniel.gonzalez@imdea.org

Materials development using additive manufacturing

The candidate will work in materials development using additive manufacturing (AM) as core technology within the solidification processing and engineering (SPRING) group. The SPRING group is involved, among others research lines, in the development of structural materials for transport applications and has facilities to cast pre-alloys, produce powders by gas atomization and process them by AM. Another strength of the Institute is the multiscale characterization techniques (including in-situ methods) and the integrated computational materials engineering (ICME), which can interact with any material development

Dr. Srdjan Milenkovic

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