



The Barcelona Materials Science Institute ICMAB-CSIC

Making a Material Transition for Tomorrow's World

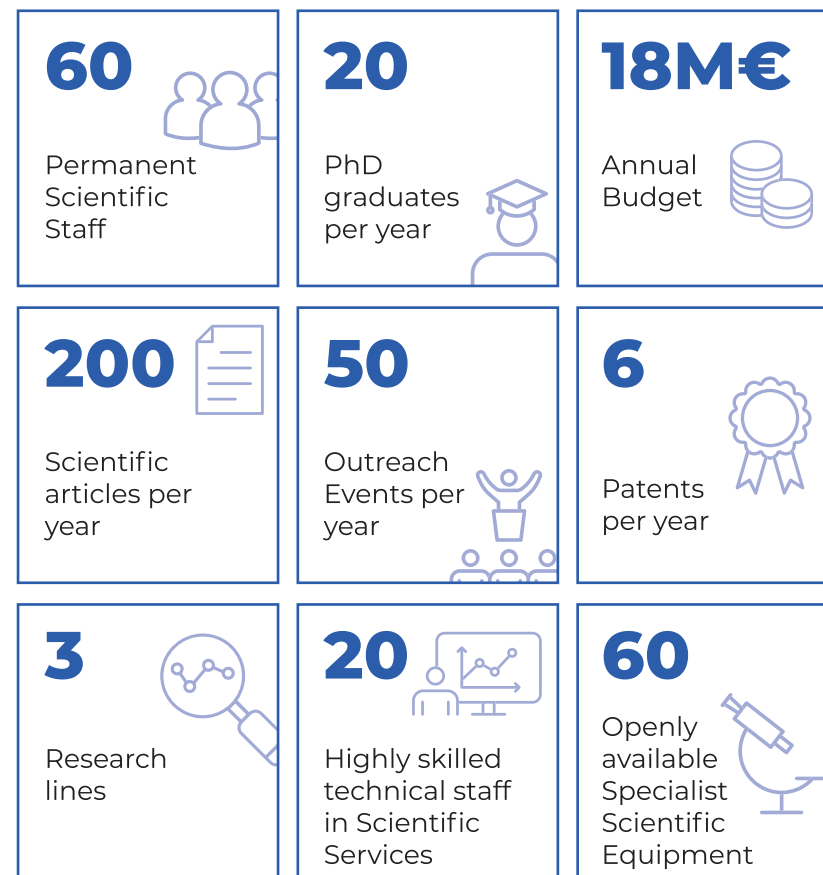
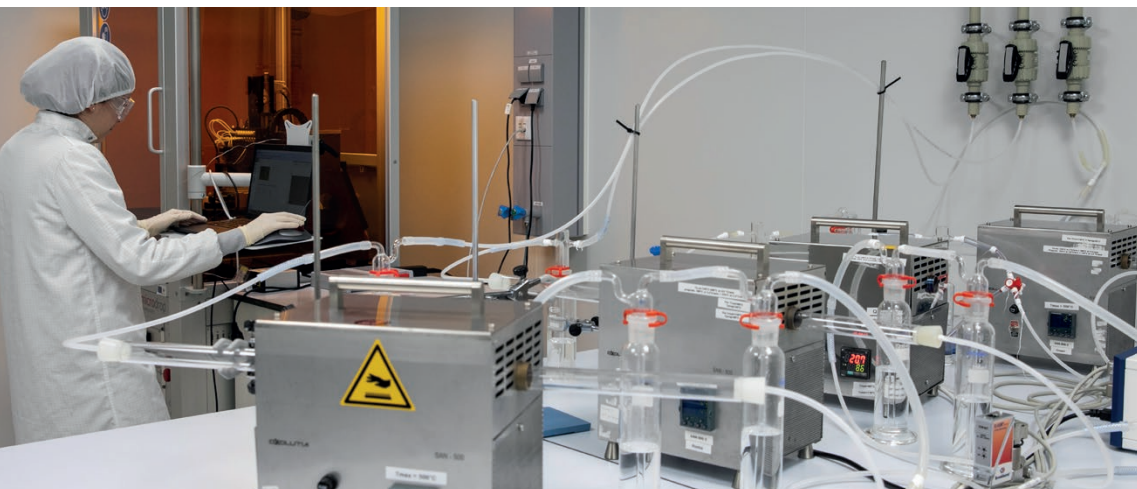
The Barcelona Materials Science Institute

ICMAB-CSIC

WHO WE ARE

The ICMAB is a centre of excellence for research into functional materials science, a key emerging technology. Our focus, in line with United Nations Sustainable Development Goals, is on materials for electronics, energy and health.

Our international staff publish high quality research, have participated in many European projects, and lead over half of them, including prestigious European Research Council awards. We have an internationally recognised training programme, enhancing our Doctoral Experience. Spin-offs from an increasing patent portfolio demonstrate our commitment to knowledge transfer. Extensive outreach and communication of science has reached thousands of people worldwide.



Our talented, creative, committed staff make our inclusive, diverse centre an Internationally leading Materials Science Institute.

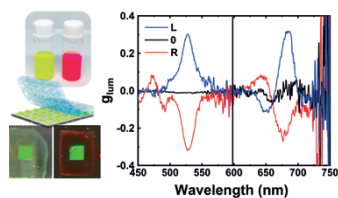


Materials for Energy

Clean energy production and storage are a key opportunity where new materials can provide solutions to existing challenges. ICMAB is an established international leader in the field of materials for this clean energy transition, in particular in the areas of:

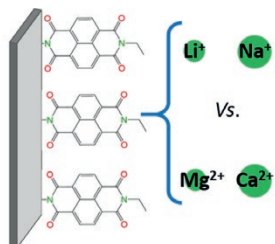


Light harvesting & management, involving mainly emergent photovoltaic technologies (organics, polar oxides and hybrid perovskites).



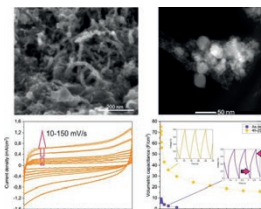
Nanoimprinted 2D-chiral Perovskite Nanocrystal Metasurfaces for Circularly Polarized Photoluminescence

Post-Li electrochemical energy storage systems like multivalent-ion and flow batteries and supercapacitors.



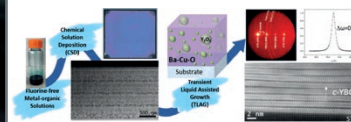
Organic Cathodes for Batteries with Divalent and Monovalent Cations

Heat harnessing & management, comprising organic and carbon-based thermoelectric nanocomposites as well as thermal transport at the nanoscale.



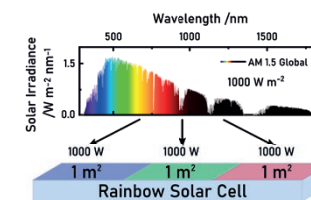
Functional enhancement of laser deposited carbon-based supercapacitor electrodes

High Temperature Superconductivity (HTS) from materials and physics to devices.



Chemical and Microstructural Nanoscale Homogeneity in Superconducting YBa₂Cu₃O_{7-x} Films Derived from Metal-Propionate Fluorine-free Solutions

Photocatalysts and their support for hydrogen production as well as efficient processes for CO₂ conversion into chemicals of industrial interest and fuels.



RAINBOW Organic Solar Cells: Implementing Spectral Splitting in Lateral Multi-Junction Architectures

Materials for Electronics

The digital world requires new materials that can process and store data in more energy efficient ways, with greater speed and with sustainable materials. The ICMAB research into electronics both based on molecular and oxide materials, has been a main pillar of research at ICMAB since its foundation. In particular, we focus on:

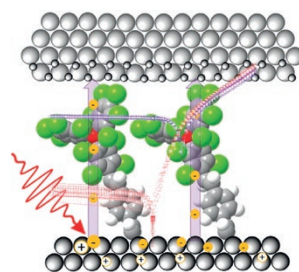
Quantum phenomena for new sensors and devices.

Understanding complex magnetism.

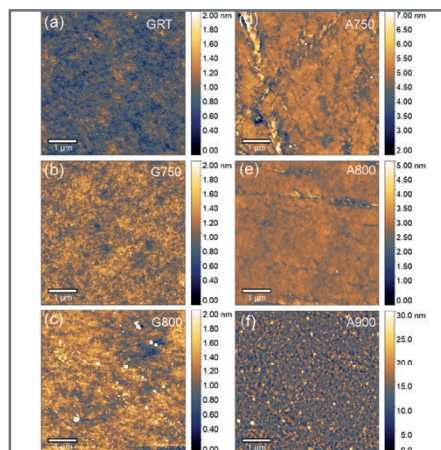
Materials for energy efficient ultrafast computing.

Organic materials for photodetection.

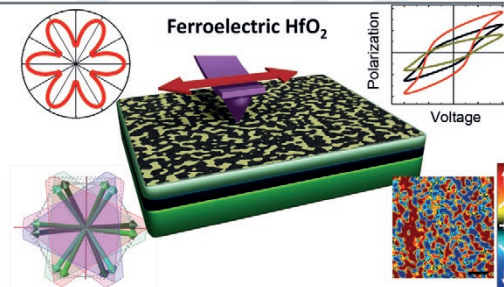
Studying curved materials for electronic applications.



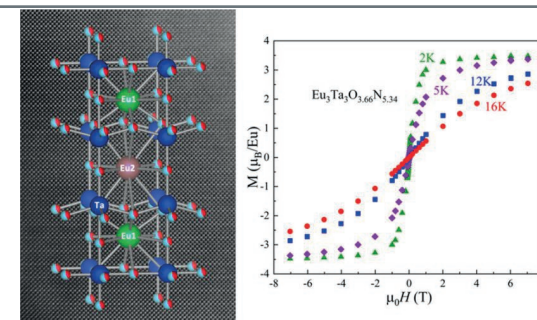
Organic Radicals for Enhancing Metal-Monolayer-Semiconductor Junction Performance



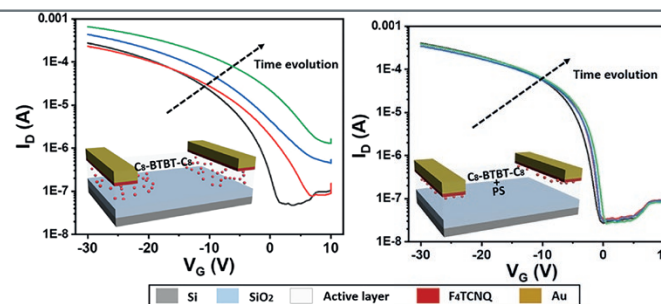
Sputtered terbium iron garnet films with perpendicular magnetic anisotropy for spintronic applications



Vector Piezoelectric Response and Ferroelectric Domain Formation in Oxide Films

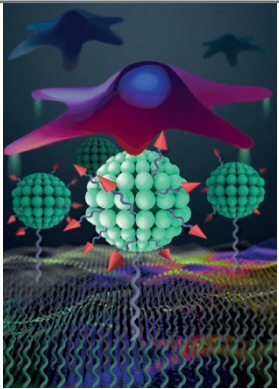


High-Temperature Synthesis of Ferromagnetic $\text{Eu}_3\text{Ta}_3(\text{O,N})_9$ with a Triple Perovskite Structure

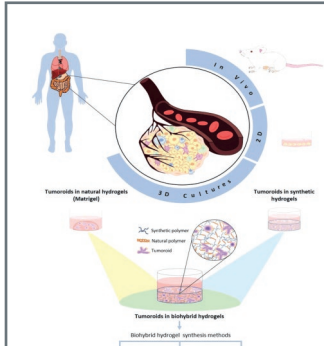


Dopant Diffusion Inhibition in Organic Field-Effect Transistors Using Organic Semiconductor/High-Molecular-Weight Polymer Blends

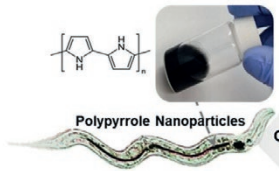
Materials for Health



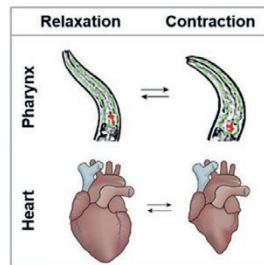
Nanoarchitectonic Surfaces for Enhanced Cell Adhesion



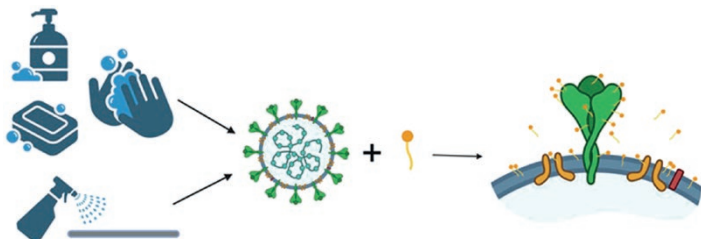
Biohybrid Hydrogels for Tumoroid Culture



Cardiac-like effects



Arrhythmic Effects Evaluated on *Caenorhabditis elegans*: The Case of Polypyrrole Nanoparticles



Effect of surfactants on SARS-CoV-2: Molecular dynamics simulation

Materials are finding increasing applications in health, from diagnosis to prevention of infections and treatment of diseases and injuries. In the ICMAB, there is a rapidly growing activity with established internationally recognized researchers, leading national and international teams, and infrastructures such as NANBIOSIS ICTS that provides services in house and externally, especially in the framework of the CIBER-BBN network.

Especially, our materials are aimed at:

Interface engineering for infection prevention.

Preparation of soft materials to battle cancer.



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Scientific Services

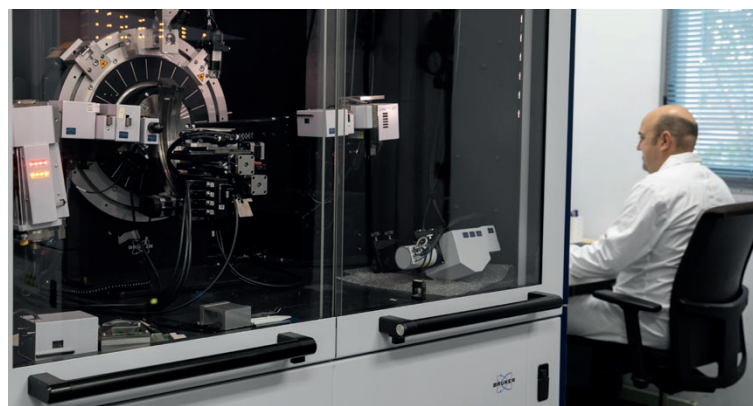
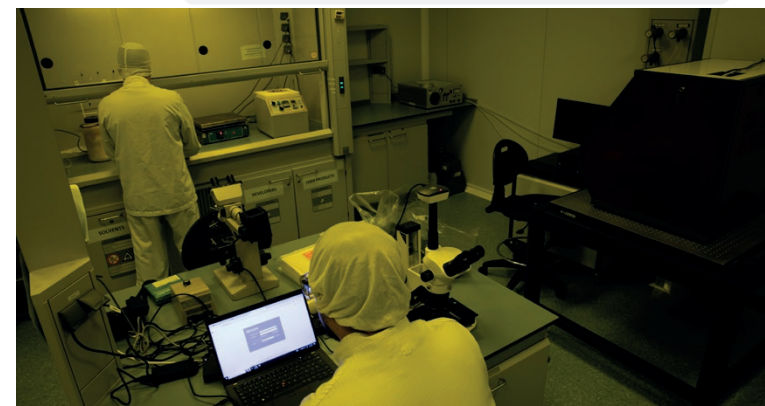
ICMAB has world-class scientific equipment that has dedicated expert technicians to ensure quality and reliability in the measurements that are made.

Capabilities include:

- » Preparation and characterization of colloidal systems.
- » A clean room facility with controlled environment allowing chemical manipulation, thin film deposition, photolithography, device characterization.
- » Low temperature characterisation of magnetic and electronic properties of materials.
- » Powder X-ray diffraction.
- » Electron and scanning probe microscopes for studying the morphology and composition of materials.
- » Preparation of thin films of inorganic and organic materials.

The services are open to external users of all types. We offer:

- » **Characterization and synthesis services in our own laboratories, with state-of-the-art equipment and diverse techniques.**
- » **Interpretation of the results and reports elaboration upon request.**
- » **Highly qualified technicians and scientists, experts in the development new techniques.**
- » **Accuracy and formality - trust, security, accuracy.**
- » **Supervision in all stages of the work.**
- » **Organization of courses and seminars on novel techniques and equipment and their applications in many scientific and technical problems.**



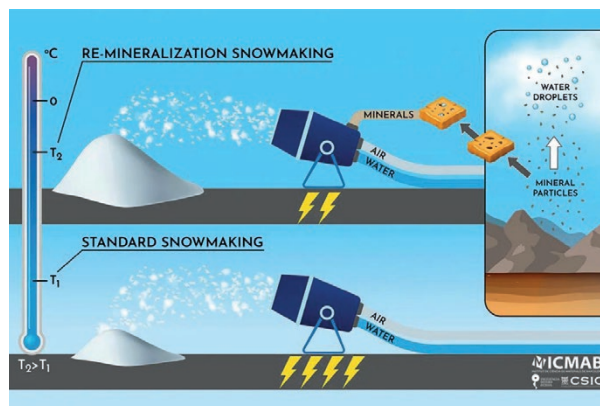
Knowledge Transfer

A priority mission of the ICMAB is to transfer the new, breakthrough knowledge it generates to society, for the benefit of all, through multiple routes.

To achieve this overall goal, we work inside and outside the ICMAB with results suitable for industrial applications analyzed and protected. Contacts with different stakeholders (production companies, investors, final users, etc.) are done to find the best way to put the technologies in the market. The ICMAB files an average of 6 patents per year, building a portfolio that has contributed to the creation of 5 spin-off companies by its researchers, crossing multiple sectors. The ICMAB is a trusted ally to industry, with which we have industrial secrets and the Institute also signs an average of 20 confidentiality and development agreements with companies per year. Co-creation with a variety of stakeholders is another valuable route to transfer.

Support for these activities comes from public and private funds, especially through proof-of-concept actions, and joint projects at the national and international level.

The ICMAB has a Prototype Laboratory to design and make functional prototypes in order to validate technologies and to improve commercialization.



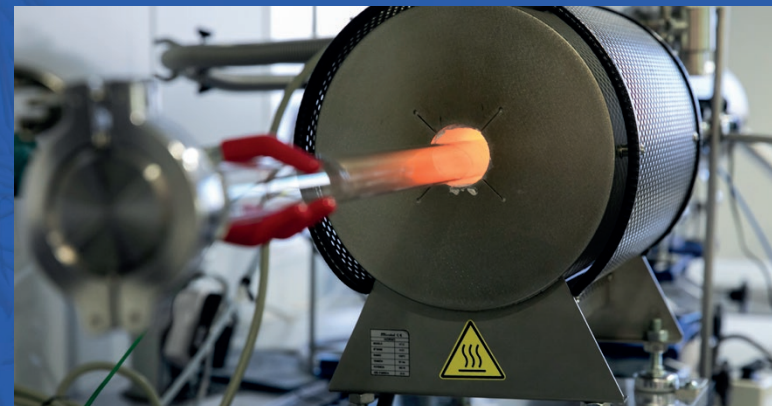
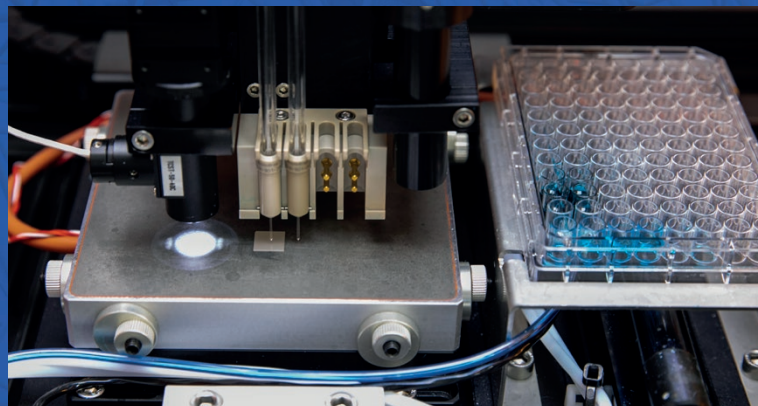
Soluciones

- Tamaño de partículas y Morfología
- Contador Partículas
- Sorción Gravimétrica
- Cromatografía
- Conductividad Térmica
- Homogeneización Alta Cizalla
- Reología on line
- Control de Emisiones y Procesos
- Microscopía Óptica Digital y Electrónica

Caracterización Física, Química y Biológica de Materiales y Nanopartículas


SOLUCIONES DE CARACTERIZACIÓN DE MATERIALES

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