

Predoctoral open position in “Advanced Superconducting Coated Conductors enabling emerging technologies in High Energy Physics”

We offer a position for a predoctoral researcher in the framework of the recently started ERC Synergy grant DARKQUANTUM and related to “TecnoUnivers: advanced technologies for the exploration of the Universe” from the “Plan Complementario for Astrophysics and High Energy Physics” funded by the Spanish Ministry of Science and Innovation and Next Generation EU funds.

Main tasks:

The project aims to engage talent young students for a doctorate in the field of High Temperature Superconductors (HTS) by investigating the properties required for the integration HTS coated conductors (CC) in emerging High Energy Physics devices. We customize the HTS CC, and adapt them to the specific technical requirements and we evaluate them under real working conditions (temperature, magnetic field, injected current, frequency).

The PhD project is addressed towards the study of the physical properties of these material with special emphasis in electrical characterization at cryogenic temperatures under high-magnetic fields (up to 16 T), and under radiofrequency excitations.

Requirements :

- Degree in Physics, Electrical Engineering or equivalents.
- High motivation to experimental research.
- Working aptitudes in a collaborative group.
- High level in written/spoken English.
- Academic grades and research experience will be considered in the evaluation.
- Some experience and knowledge on superconductivity, superconducting materials, instrumentation, cryogenics, magnetic fields, automatization of equipment, program development or data management will be very valuable.

We Offer:

Full time-contract

Lenght: 4 years

Salary: Gross annual salary in accordance with the CSIC salary policy.

How to apply:

The selection process will be continuous until a good candidate is found, but strong effort will be done to finish it before end of December 2024. Interested persons should send an email to hr_suman@icmab.es attaching:

- CV
- Academic grades certificate

- Letter of motivation
- Contact details of a reference person.

ICMAB is an equal opportunity employer committed to diversity and inclusion of people with disabilities.

About SUMAN group and ICMAB. Why working with us:

The candidate will be integrated in **Superconducting Materials and Functional Nanoengineered Structures Group** (<https://suman.icmab.es/>), a large group with different background expertise in the field of High Temperature Superconducting (HTS) materials developing cutting-edge research in the physical understanding of these materials. The research group is very international and interdisciplinary, with more than 25 years' experience in HTS superconductivity. Superconductivity is a macroscopic quantum phenomenon based on the formation of a condensate at the energy ground state by electron-pairing (Cooper pairs), with outstanding properties and impact in many applications. Since high temperature superconducting cuprate materials were discovered more than 30 years ago, many additional applications were envisaged since large currents without losses could be expected at liquid nitrogen temperatures and under high-magnetic fields. Nowadays, the international community is able to fabricate HTS tapes (coated conductors) for high current energy efficient applications (high power cables, wind generators, electrical aviation but also compact fusion, circular colliders, or NMR beyond 1 GHz. Importantly, compact Fusion is driving presently this technology which is largely expanding. Nevertheless, the integration of CCs into devices usually require further customization of the tapes to fulfil specific electromagnetic, thermal or mechanical requirements. The study of how to adapt CCs to each specific functionality is an essential step to develop competitive devices. The ICMAB-SUMAN group has always been very actively investigating these goals through collaborative projects with industry or engineering teams. This strategy will be further followed in this research, centred in developing emerging superconducting technologies in the areas of High Energy Physics (i.e. future circular accelerators, axion cavities for dark matter search, muon colliders). In all these cases, the low surface impedance of the HTS in a wide temperature range and at high magnetic fields is the key enabler property. The objective is to study the physics of CCs under the working conditions of the devices (temperature, magnetic field, injected current, radio-frequency), and generate the electromagnetic-thermal-mechanical conditions for their customization and implementation in the devices. Ongoing collaborations with national and international key players in the field will be encouraged.

ICMAB – CSIC is a multidisciplinary global reference centre for the cutting-edge research of functional materials for electronics, energy and health which fosters knowledge transfer and it is characterized by its internationalization and its education, inclusion and diversity policies. ICMAB-CSIC is committed to know-how transfer to productive sectors as well as to participate in educational and outreach activities. Since 2016, ICMAB -CSIC has been awarded for three consecutive periods with the Severo Ochoa Centre of Excellence distinction.

ICMAB-CSIC, with over 250 members from 47 nationalities, is a more than three decades old research institute located at the Universitat Autònoma de Barcelona (UAB) campus, surrounded by other research and technological centres and with access to



many state-of-the art equipment and scientific facilities. Moreover, ICMAB-CSIC has its own scientific services equipped with the newest scientific instrumentation and with highly specialised technical staff available to the scientific community.

ICMAB-CSIC stands out for its great training activity at the doctoral level. Training on technical, scientific and transversal skills are offered to ICMAB-CSIC personnel. Moreover, ICMAB-CSIC has coordinated 2 Marie Skłodowska-Curie COFUND doctoral training programs on advanced functional materials: DOCFAM (2017-2022) and DOCFAM+ (2023-2028). In total, 48 doctoral students have been trained (18 at the ICMAB).



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