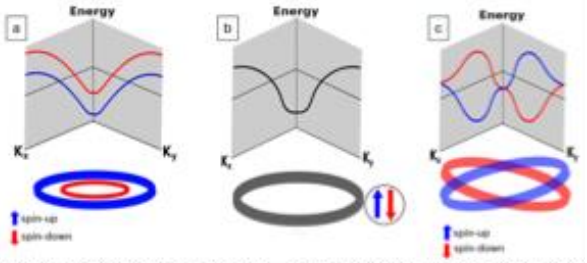
PhD position in ALTERMAGNETS FOR SPINTRONICS

We invite applications for a four-year PhD position within the **ETMOS Project** (Exploring Transition Metal Oxides for Energy-Efficient Spin-Orbit Torque Devices for Next-Generation Magnetic Memories) at the ***Advanced Characterization and Nanostructured Materials*** **group (ICMAB).**

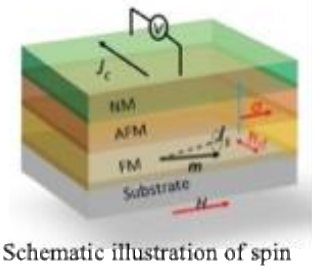
This position offers an exceptional opportunity to join an ambitious research program at the frontier of quantum materials and spintronics. The PhD project will delve into the fascinating world of altermagnets—a recently discovered class of magnetic materials that merge the key advantages of antiferromagnets and ferromagnets. With zero net magnetization and symmetry-protected spin splitting, altermagnets open new possibilities for ultrafast, energy-efficient spin-based information technologies.

As a PhD researcher, you will develop multidisciplinary expertise encompassing thin film growth, microstructural and physical characterization of altermagnetic thin films and complex oxide heterostructures. You will work in a stimulating research environment equipped with state-of-the-art facilities and be part of an international network pushing the boundaries of spintronics and quantum materials science.

This position entails the pursuit of a PhD thesis under the guidance of Dr. Alberto Pomar and Prof. Benjamín Martínez within the framework of the UAB doctoral program in Physics.



Band structures and energy iso-surfaces show spin-split bands in ferromagnets (a), a spin-degenerate band in antiferromagnets (b) and bands with alternating sign of the spin splitting in altermagnets (c). Blue and red color depict opposite spin states.



Schematic illustration of spin current generation via spin pumping in a NM/AF/FM heterostructure.

Main tasks:

In this interdisciplinary research, the candidate will be responsible for the following tasks:

- Designing and growing complex heterostructures based on magnetic oxides.
- Conducting comprehensive structural and physical characterization of the prepared thin films and multilayers.
- Evaluating the efficiency of spin-based devices by understanding the physical mechanisms governing spin transmission and spin-charge interconversion.

Requirements:

- Bachelor´s degree in Physics, Materials Science, Nanotechnology or similar.
- Official master´s degree, essential for enrolment in the PhD programme, with strong background in Materials Science, Physics, Nanotechnology or related disciplines.
- Fluency in written/spoken English.

Personal skills & others:

- High motivation for experimental research.
- Working aptitudes in a collaborative group.

We Offer:

- Full-time contract
- 4 years
- Gross annual salary in accordance with the CSIC salary policy.

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

How to apply:

Interested candidates should send an email to apomar@icmab.es including the following information:

- CV.
- Letter of motivation.

About ACNM group and ICMAB.

The primary objective of the "Advanced Characterization and Nanostructured Materials" group (https://acnm.icmab.es/) at ICMAB is to develop both fundamental and applied knowledge for the implementation of functional oxide materials in emerging technologies, such as spintronics. We possess extensive expertise in understanding the relationship between microstructure and properties, and its potential application in the design and fabrication of innovative magnetoelectronic devices. In recent years, our research has concentrated on exploring spin-orbit phenomena in complex oxides, particularly spin-orbit coupling (SOC) and spin-transfer torque (STT), to elucidate the physical mechanisms governing spin current generation and transmission in ferromagnet (FM)/non-magnetic (NM) structures.

Your PhD at ICMAB: 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 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. Located at the Universitat Autònoma de Barcelona (UAB) campus is surrounded by other research and technological centres and with access to many state-of-the art equipment and scientific facilities.

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 Sklodowska-Curie COFUND doctoral training programs on advanced functional materials: DOCFAM (2017-2022) and DOCFAM+ (2023-2028) where a total of 48 doctoral students have been trained (18 at the ICMAB).