



## **Job Title: PhD Student in Advanced Surface Electromechanics**

### **Description**

ICN2 is a renowned research centre. Its research lines focus on the newly discovered physical and chemical properties that arise from the fascinating behaviour of matter at the nanoscale.

The Institute promotes collaboration among scientists from diverse backgrounds (physics, chemistry, biology, and engineering) to develop basic and applied research, always seeking interactions with local and global industry. ICN2 also trains researchers in nanotechnology, develops numerous activities to facilitate the uptake of nanotechnology by industry, and promotes networking among scientists, engineers, technicians, business people, society, and policy makers.

ICN2 was accredited in 2014 as a Severo Ochoa Centre of Excellence.

The Severo Ochoa Program, sponsored by the Spanish Ministry of Economy and Competitiveness, aims to identify and support Spanish research centres that are among the world's best in their specialty. This award is the highest recognition of centres of excellence in Spain, and it is granted after international scientific committees carry out a rigorous evaluation of project proposals submitted by Spanish research centres.

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**Area or Group of research:** Oxide Nanoelectronics Group (ON)

### **Description of Group/Project:**

The research in the Oxide Nanoelectronics group, led by Prof. Gustau Catalan at the Institut Català de Nanociència i Nanotecnologia (ICN2) in Barcelona concerns the solid state physics of functional oxide materials; current topics of interest include but are not limited to strain gradient coupling (flexoelectricity), surface electromechanical characterization, domain wall nanoelectronics, oxide interface effects and nano-confined phase transitions. The research group has developed unique European facilities for the characterization of flexoelectricity, and leads an Advanced AFM lab which is a referent for the nanoscale characterization of piezoelectric and ferroelectric materials.

### **Main Tasks and Responsibilities:**

The PhD student will fully develop the work in the frame of the ADVanced Surface Electromechanics project from the Spanish Government, devoted to quantify the different phenomena that contribute to nanoscale electromechanical response as

measured by an Atomic Force Microscope (AFM) instrument, including polarization-dependent mechanical properties of ferroelectric domains and domain walls, electro-ionic migration and electrochemistry, electromechanical coupling by adsorbates or skin layers, and flexoelectricity.

The PhD student will be trained in the state of the art of Piezoresponse Force Microscopy (PFM), and will pursue the development of Advanced PFM modes, to evolve this technique from its current status as the main tool for qualitative analysis of ferroelectrics into a reliable instrument for accurate quantitative measurement of electromechanical properties in ceramics, thin films, and MEMS. The main tool will be a cryogenic Atomic Force Microscope (Attocube) that works at temperatures down to 5K with in-situ magnetic fields of up to 9T, and an environmental AFM platform (Asylum) with high versatility of operation modes and environments. Special emphasis will be placed on the study of adsorbates and their role as surface polarization screening charges on ferroelectric materials, and their interplay with the detection of surface electromechanical properties.

The PhD student will also use complementary techniques for the study of surfaces and dielectric, piezoelectric, flexoelectric and ferroelectric properties, from general electric characterization equipment available in our laboratories to in-home and synchrotron XPS techniques.

### **Education, Experience, Knowledge and Skills Required:**

ON research group seeks strongly motivated young researchers willing to achieve a PhD with high level of excellence. PhD students of ON research group are prepared to lead their own research lines from the experimental base to the final publication of the results.

Related to the offered position, the applicant should ideally have a background on physics, electronic engineering or materials science, oriented to nanoscience and nanotechnology areas. The main requirement is the willingness and skill to get involved in the setting up of the experimental facilities: the researcher will have the chance to use cryogenic systems and all types of instrumentation for electrical characterization.

Our group focuses on original research, so we place a strong premium on fresh thinking; the ideal applicant should therefore be an independent thinker, enthusiastic about learning and doing good research, as well as a friendly communicator in English, both in writing and in oral presentations. For the experimental work, it is also essential a well-organized and methodological candidate. Good inter-personal skills are essential since the group is committed with excellent team spirit environment.

### **Research Career Profile (According to the European Framework for Research Careers):**

R1 First Stage Researcher

**Summary of Conditions:**

- Contract Length: 3 years.

**How to apply:**

All applications must be through <http://jobs.icn2.cat/job-openings/95/phd-student-in-advanced-surface-electromechanics> and include:

1. A cover letter.
2. A full CV including contact details.
3. 2 Reference letters or referee contacts.

**Deadline for applications:**

December 23rd.

**Estimated Incorporation date:**

Starting date can be negotiated from January 2017 on.

**Equal opportunities:**

ICN2 is an equal opportunity employer committed to diversity and inclusion of people with disabilities.