

The mission of the Catalan Institute of Nanoscience and Nanotechnology (ICN2) is to achieve the highest level of scientific and technological excellence in Nanoscience and Nanotechnology. Its research lines focus on the newly-discovered physical and chemical properties that arise from the behavior of matter at the nanoscale. ICN2 has been awarded with the Severo Ochoa Center of Excellence distinction for two consecutive periods (2014-2018 and 2018-2022). ICN2 comprises 19 Research Groups, 7 Technical Development and Support Units and Facilities, and 2 Research Platforms, covering different areas of nanoscience and nanotechnology.

### **Job Title: PhD Student**

**Research area or group:** Advanced Electron Nanoscopy (GAeN) Group

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

The Group of Advanced electron Nanoscopy (<https://gaen.cat/>) at the Catalan Institute of Nanoscience and Nanotechnology (ICN2) (<https://icn2.cat/en/>) is seeking an excellent and highly motivated PhD student to work in the field of the EU project SOLARUP (EICPathfinder OPEN) under the supervision of Dr. Maria Chiara Spadaro and Prof. Dr. Jordi Arbiol. The student will perform advanced electron microscopy studies applied to alternative materials for solar cell devices, combined with 3D atomic models creation and (S)TEM image simulation in order to comprehensively understand the material growth process, physical properties and device performance.

In order to optimise the design of next generation solar cells based on Zn<sub>3</sub>P<sub>2</sub> we need to develop a deep understanding of the correlations between structural, chemical and physical properties. For this reason, the PhD student will perform detailed atomic resolution structural and chemical characterisation of the grown materials by high-angle annular dark-field scanning transmission electron microscopy (HAADF STEM, 4D STEM, iDPC-STEM and ptychography) and related spectroscopies, such as electron energy-loss spectroscopy (EELS) and energy dispersive X-ray spectroscopy (EDX). She/He will access the new Electron Microscopy Center at ALBA (EMCA) (<https://www.cells.es/en/science-at-alba/alba-ii-upgrade/microscopy-platform>) and the sample preparation laboratory at ICN2. In 2023 another ultra-performing microscope will be installed for in-situ experiments, therefore the candidate will have the opportunity to explore the nanostructures both with ex-situ and in-situ experiments (i.e. biasing, annealing...).

### **Main Tasks and responsibilities:**

The successful candidate will be trained to perform (S)TEM experiments and evaluate the crystal quality of the nanomaterial under study.

She/he will also get the base knowledge to (i) create 3D atomic models for the main growth and physical mechanisms characteristic of the studied nanostructures, and (ii) to perform the corresponding image simulation in order to unveil all the image characteristic features.

Special attention will be devoted to defects (misfit dislocations, stacking faults and twins). She/he will also acquire chemical and physical information with atomic resolution performing STEM-EELS maps.

Furthermore, she/he will evaluate nanoscale strain fields, dilatation and rotation maps using the geometrical phase analysis (GPA) algorithm. These information will be essential for the synthesis optimization of Zn<sub>3</sub>P<sub>2</sub> and scaling of Zn<sub>3</sub>P<sub>2</sub> growth, doping mechanisms, as well as the implementation of PV cells, their modelling and design.

This PhD activity is performed in the field of the EU EIC Pathfinder Open project SOLARUP, therefore the candidate will have the opportunity to work side-by-side in collaboration with the other project partners in Switzerland (EPFL), Germany (FSU), Sweden (Lund University) and the Netherlands (AMOLF and TNO). The candidate will carry out independent research under supervision, write scientific papers for publication in peer-reviewed journals, and disseminate the work at international conferences. The position will include a couple of paid secondments (3 month/each) on two of the project partner labs.

### Requirements:

- **Education**

Master's degree in physics, chemistry, nanoscience and nanotechnology, materials science, engineering or related areas with an academic level equivalent.

- **Knowledge and Professional Experience:**

The candidate should have basic knowledge in transmission electron microscopy (TEM) and materials characterisation, knowledge on solar cell based materials is welcome.

- **Skills required:**

High interest on electron microscopy and materials science.

Excellent written and spoken communication skills in English are required.

The successful candidate will be able to develop experimental and some theoretical methods, advance the PhD project and work independently and as part of a team. Integrity, perseverance and resilience, innovation, teamwork and communication skills.

### Summary of conditions:

- Full time work (37,5h/week)
- Contract Length: Temporary ( 4 years)
- Location: Bellaterra (Barcelona)
- Salary will depend on qualifications and demonstrated experience.
- Support to the relocation issues.
- Life Insurance.

Estimated Incorporation date: October 2022

### How to apply:

All applications must be made via the ICN2 website <https://jobs.icn2.cat/job-openings/393/phd-student-advanced-electron-nanoscopy-gaen-group> and include the following:

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

Applications will be continuously reviewed. Shortlisted candidates will be invited for interview.

Deadline for applications: July 20th 2022.

**Equal opportunities:**

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

ICN2 is following the procedure for contract of people with disabilities according with article 59 of the Royal Decree 1/2015, of 30 of October.