

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 behaviour of matter at the nanoscale. ICN2 has been awarded with the Severo Ochoa Center of Excellence distinction for three consecutive periods (2014-2018 and 2018-2022 and 2023-2026). 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: Postdoctoral Researcher**

**Research area or group:** Nanostructured Materials for Photovoltaic Energy Group

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

PV applications have the potential to expand even more by using built-in photovoltaics in the city architecture currently unexploited; e.g. façades, windows, bus stop roofs, or sunshades. The application of low cost photovoltaics with moderate efficiencies in all these –now unused areas would provide a substantial sun-harvested energy intake for powering the city. Nevertheless, the energy transition of large transport or heavy industry cannot be sustained by electricity, and thus requires high power density fuel alternatives such as hydrogen. Developing technologies for green H<sub>2</sub> generation is thus another strategic priority to substitute the current H<sub>2</sub> sources from methane or coal (which release CO<sub>2</sub>). Photoelectrochemical water splitting (PEC-WS) is a promising technology to enable this target: a simple (low-cost) setup of semiconductor electrodes immersed in water using solely direct sunlight to generate O<sub>2</sub> and H<sub>2</sub>. Practical applications of PEC-WS have been so far limited by the lack of available semiconductors that meet the four basic requirements: high photovoltage and photocurrents, good energy alignment with redox potentials and stability against corrosion. The development of semiconductors to improve PV and PEC-WS is now a matter of intense research. In this context, “CABIS-Sol” aims to develop a novel semiconductor material platform based on abundant non-toxic elements that can be tailored “on-demand” for PV and PEC-WS applications. To achieve that we will exploit the versatility of a particular metal halide system, the copper-silver-bismuth iodosulphates (CABIS) by designing new strategies for a controlled synthesis of tailored chemical composition to finely tune the material optoelectronic properties. This will be achieved by designing new solution-based synthesis approaches for fine control of the elemental composition and crystal structure to tune the bandgap and energy level positions. The CABIS stability will be improved by implementing intrinsic (chemical composition, molecular additives) and extrinsic (physical barrier or passivation by oxides) protection strategies. The main objectives are to demonstrate a record efficiency CABIS-based PV device and to demonstrate a proof of concept efficient and stable CABIS electrode for PEC-WS

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

- Synthesis of metal halide materials and its deposition of layered thin films via different methods (spin-coating, spray pyrolysis, vacuum evaporation, PLD) to fabricate solar cells and photoelectrodes.
- Design and execution of experiments to test the photocatalytic properties and/or photoelectrochemical efficiency of the as-synthesized materials.
- Characterisation of the individual materials used in the device by microscopy and spectroscopy techniques, as well as the complete solar cell devices by means of electrical and optical techniques.
- Process and analysis of the characterisation data, keeping the research data organised.
- Elaboration of periodic reports to keep track of the project progress.
- Preparation of scientific manuscripts and presentations in workshops or conferences to showcase your research results to the scientific community.
- PhD students supervision.

## Requirements:

- **Education:** PhD degree in physics, chemistry, materials science, nanotechnology, electronics or closely related discipline
- **Knowledge and professional experience:**  
Experience in synthesis of materials and nanoparticles via solution processing methods.  
Demonstrated labwork experience and experimental skills on photocatalytic and photoelectrochemical systems and devices, such as for water splitting.  
Experience in the fabrication of solar cells is optional but will be positively evaluated.  
Strong self-discipline to achieve reproducible results.  
Ability to work safely in the lab environment.
- **Personal Competences:**  
We encourage a high degree of responsibility and independence, but also stimulate interaction and discussion with colleagues.  
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(optional) Knowledge of Python or other programming language will be positively evaluated.  
Language: English (Advanced, written and spoken)  
Knowledge of Spanish or Catalan would be beneficial but not necessary.  
High level of motivation and availability to travel abroad to pursue international collaborations

## Summary of conditions:

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

Estimated Incorporation date: as soon as possible

"The contract is funded by the project CABIS-Sol (CNS2023-143942) granted in the Proyectos CONSOLIDACIÓN INVESTIGADORA - 2023 call of the Spanish Ministry of Science. The duration is 2 years, starting from April 2024, full time. The experimental research work will be carried out at ICN2 (ICN2 is within the UAB campus), offering a dynamic ecosystem with enthusiastic colleagues. The candidate will be specifically trained on materials synthesis, characterization, and solar cell fabrication and analysis. In addition to acquiring broad scientific multidisciplinary knowledge, the candidate will access the soft skill courses offered at ICN2. He/she will gain communication, project management and technology transfer skills and will be trained from the beginning to get familiar and follow the Good Laboratory Practice and Responsible Research and Innovation principles."

**How to apply:**

All applications must be made via the ICN2 website <https://jobs.icn2.cat/job-openings/623/postdoctoral-researcher-nanostructured-materials-for-photovoltaic-energy-group> and include the following:

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

Deadline for applications: 15 May 2024

**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.