

PhD in **Synthesis of nanocomposite materials for efficient hydrogen production through photocatalytic water splitting**

Application closing day: 30/09/2025

This project focuses on the development of advanced photocatalytic, graphene-based materials for efficient H₂ production using solar radiation through water splitting. The materials will be designed to improve charge separation, reduce electron-hole recombination, and extend light absorption into the visible range, thus enhancing solar-to-H₂ conversion efficiency. This project combines cutting-edge materials science, nanotechnology, and eco-friendly strategies, offering an exciting opportunity for doctoral candidates motivated to explore innovative solutions in solar energy and nanomaterials.

The candidate will be working closely with two interconnected groups:

Supercritical Fluids and Functional Materials Group (SFFM): The SFFM group specializes in supercritical CO₂ technology for the development of functional materials such as graphene oxide aerogels and MOFs, mainly for energy applications. The team includes experts in green technologies focusing on the preparation and characterization of porous nanostructured materials for gas storage, and catalysis.

Laser Processing Research Group: The group develops hybrid nanocarbon-metal oxide nanocomposites using laser-based synthesis techniques, for energy-related applications. Their recent research lines focus on synthesis of photocatalytic nanomaterials for environmental applications, water purification and H₂ generation.

Main tasks:

The project consists of interrelated tasks: design and installation of H₂ production equipment, materials preparation and physico-chemical characterizations, and H₂ generation performance evaluation.

- Synthesis and characterization** of photocatalytic graphene-based materials.

- H₂ production equipment:** Operating an H₂ production analysis system, composed of a gas chromatograph, photoreactor chamber, and reaction cell.

- Catalytic Performance Evaluation:** Evaluate the efficiency of synthesized materials for H₂ production via solar-driven water splitting.

Key responsibilities:

- Carry out the experiments in each step of the project: operate with high-pressure and laser equipment (no experience needed, as training will be provided).
- Record, analyse and write up the detail methods, findings, and results of the experiments.
- Present research findings and participate at meetings with other scientists and colleagues.
- Ensure that equipment is safe and maintained in working order.

Requirements

- A Msc in Chemistry, Materials Science, Nanoscience & nanotechnology or Physics
- Fluent English spoken/written.

Required Skills:

- Good background of general materials'/chemistry/nanomaterials laboratory practices.

Personal skills & others:

- Good interpersonal, presentation and communication skills.
- Capable of working without permanent supervision.
- Self-motivated and independent learner.

What it will also be valued (previous experience):

- Knowledge of common physico-chemical characterization techniques.

We Offer:

Position funded through a FPI (Formation de Personal Investigador) contract from the Spanish Ministry of Science, Innovation and Universities

How to apply:

Documents to be included: CV, cover letter and references to the **PhD CO-DIRECTORS**:

Prof./Dr: Ana M. Lopez Periago
Email: amlopez@icmab.es
Prof./Dr: Eniko Gyorgy
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What ICMAB is

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).