

**MPC Open call to cover 3 Postdoctoral appointments.**

The deadline for this call is 7th September 2020, at 12:00 CEST.

**Centro de Física de Materiales - CFM** is seeking for bright, highly motivated young researchers who will be able to make the most of this opportunity and take the chance for boosting their visibility and integration within the research community.

In this open call, **Nanophysics Lab** is offering the following **4 projects**.

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**Project P3. Understanding catalytic reactions at the atomic scale: curved surfaces at ambient pressure.**

Contact person: **Enrique Ortega** ([enrique.ortega@ehu.eus](mailto:enrique.ortega@ehu.eus))

Reference: PD/2020/3

Catalysis is extremely important in industrial processes with notorious relation with energy and environmental problems. However, the most relevant catalytic reactions are still optimized following a trial-and-error philosophy. Further improvement requires a rational atomic-scale understanding through new sample designs and techniques that can bridge the gap with real catalyst materials. In a bid to model industrial nanoparticles in-operando, our Lab investigates curved metal surfaces exposed to millibar pressures of reactants, using novel atom-sensitive techniques that operate under ambient-pressure conditions, such as X-ray photoemission.

The candidate must possess a Physics or Chemistry, and proven experience with Surface Science techniques. She/he will focus on the exploration of structure and electronic properties of curved crystal surfaces, interacting with chemically active gases, such as CO, NO, O<sub>2</sub>, CO<sub>2</sub>, and water, using STM and micro-focus XPS in our Lab. This work will be combined with Ambient Pressure XPS experiments performed in Synchrotron Radiation facilities to examine the in-situ interaction of mixtures of reactants and products with such curved surfaces. The candidate will also take responsibility for the strong collaborative action, within this Project, with local theorists in San Sebastián and experimentalists at the University of Lund.

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**Project P9. Light-induced on-surface synthesis of functional molecular materials.**

Contact person: **Celia Rogero** ([celia.rogero@ehu.eus](mailto:celia.rogero@ehu.eus)),

**Martina Corso** ([martina.corso@ehu.eus](mailto:martina.corso@ehu.eus))

Reference: PD/2020/9

The postdoc candidate will join the Nanophysics Laboratory (NanoLab) in the Centro de Física de Materiales in San Sebastián (Spain) (<https://cfm.ehu.es/nanophysicslab/>). The NanoLab is an experimental surface science group devoted to the study of structural, electronic, magnetic and chemical properties of nanostructures. Among the different research lines, the NanoLab

has a strong expertise on the bottom-up fabrication of functional molecular carbon-based nanomaterials. Specific graphenic nanoscale materials can be grown with atomic precision on metallic surfaces by means of on-surface synthesis. Nevertheless, the use of such materials as functional units in various technological applications as spintronics or optoelectronics, requires non-metallic substrates as their support.

In this project the postdoctoral candidate will explore the concept of photopolymerisation, i.e. illumination with violet light to induce molecular covalent cross-linking, for the direct onsurface synthesis of graphenic nanoscale materials on non-metallic substrates, as oxides. The first goal will be the comparison between chemical reaction mechanisms upon light and thermal activation on metallic and non-metallic substrates.

The project is part of a national collaborative project between six Spanish groups of different disciplines (organic chemists, theoreticians and surface science experimentalists) aimed to fabricate complex covalent molecular nanostructures and test their potential operability as functional units in various technological applications.

The successful candidate should have a PhD in physics or chemistry, and demonstrated experience in ultra-high vacuum and in surface science characterization techniques (as STM, LT-STM or XPS). We are looking for highly motivated candidates, able to work in a dynamic environment and to contribute with his/her own ideas to the group.

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### **Project P11. Unveiling the structure-activity relationships for water electrolysis.**

Contact person: **Sara Barja** ([sara.barja@ehu.eus](mailto:sara.barja@ehu.eus))

Reference: PD/2020/11

Development of optimized catalyst requires a comprehensive atomic scale picture of the chemical and physical properties of surfaces, in connection to their macroscopic catalytic performance. This project focuses on relevant metal-oxide surfaces for oxygen evolution reaction, and proposes to bridge the gap between surface science studies and real electrocatalytic systems. The experimental approach combines ultra-high-vacuum characterization (scanning tunneling microscopy, X-Ray photoemission spectroscopy and temperature programmed desorption), and parallel electrochemical test on the very same sample. The candidate will study the catalyst before and after the electrochemical reaction to unveil catalyst structure-activity relations. The main role of the Postdoc will be to take responsibility for the electrochemical tests in connection with the surface science characterization of the target electrocatalyst.

We seek a well-motivated candidate, with strong interest in electrocatalysis, and willing to work in a collaborative environment with complex experiments. Initiative, creativity and an independent working attitude will be highly valued. The candidate is expected to have a PhD degree in Chemistry, but candidates with appropriate background and a PhD in Physics or Chemical Engineering will also be considered. It is mandatory that the candidate has extensive experience in electrochemistry. Experience working with ultra-high-vacuum methods will also be valuable.

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**Project P17. Synthesis and electronic structure of graphene and hexagonal boron nitride nanostripes on curved crystals.**

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Contact person: Frederik Schiller ([frederikmichael.schiller@ehu.eus](mailto:frederikmichael.schiller@ehu.eus))

Reference: PD/2020/17

The candidate will join the NanophysicsLab that focuses on experimental studies of nanostructures at surfaces by means of electron spectroscopies (X-ray absorption-XAS and photoemission-PES) and scanning tunneling microscopy (STM).

Aim of this project is to grow and investigate physical-chemical properties of 2D materials, namely Graphene-GR, hexagonal boron nitride-hBN and mixtures of them on vicinal substrates. 2D materials, stripes or wires of this material group attract interest due to their promising electronic, magnetic, or mechanical properties, among them the heavily investigated graphene, a material that was once supposed to replace silicon in device fabrication. GR-devices have been realized in certain fields (Sensing, Biomedicine), but GR cannot be used in electronics because it lacks a semiconducting band gap. Hexagonal boron nitride (hBN) is the isostructural semiconducting counterpart of graphene, and hence of fundamental importance in the development of nanoelectronics applications. Yet the synthesis and electronic characterization of 2D hBN-GR monolayers and 1D nanostructures, such as nanostripes, is poorly developed, requiring intensive search of appropriate growth substrates and characterization. We recently demonstrated that hBN can be grown on curved Ni and Rh crystals, leading to homogenous coating and one-dimensional nanostripes.

The candidate should have a PhD in physics, experience in either STM or photoemission. Travelling to European synchrotrons is mandatory for this project.

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This is a unique occasion to work in an intellectually stimulating environment. There will be plenty of opportunities to develop collaborations and build a global network of contacts of great added value. If you need further information about our project, please write us to the e-mail addresses provided.

Each position will cover a period of two years (1+1, with renewal for the second year subject to evaluation of performance), start date will be the last quarter of 2020. The salary will be 34.642,20€ per year (before taxes). Funding is provided by the Research Association MPC – Materials Physics Center.

All the information and instructions regarding application can be found in <https://cfm.ehu.es/about-cfm/job-offers/> and [https://cfm.ehu.es/view/files/POSTDOCTORAL-POSITIONS\\_2020.pdf](https://cfm.ehu.es/view/files/POSTDOCTORAL-POSITIONS_2020.pdf)