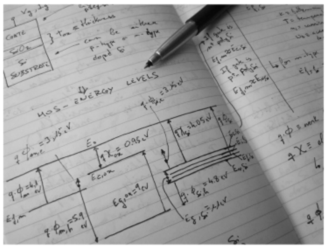

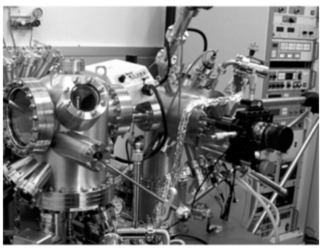

CFM Materialen Fisika Zentroa

Materials Physics Center

Centro de Física de Materiales

Centro de Física de Materiales - CFM is a joint centre by the University of the Basque Country - UPV/EHU and the Spanish Research Council - CSIC. The centre brings together several outstanding teams who develop frontier research using state-of-the-art facilities.

CFM's headquarters is located at Ibaeta Campus in San Sebastian, within walking distance from several institutions also committed to explore physics and material science, both at fundamental and applied levels. Altogether, we represent a thrilling international community devoted to innovation and discovery at the very edge of science.

Postdoctoral Positions

At CFM we are committed to provide future generations with the best opportunities to develop high profile careers.

This is a unique occasion to work in an intellectually stimulating environment in close interaction with all our scientific staff, a wide group of postdoctoral researchers and a large number of international, world-class visitors. There will be plenty of opportunities to develop collaborations and build a global network of contacts of great added value.

We also count with an efficient team that will provide support in many key activities, from laboratory and computing technical assistance, to administration and project management. This will relief researchers from non scientific duties, allowing them to strictly focus in doing science.

We are currently 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.

Next Deadline for Submission of Candidatures: 30th June 2015

Call is open for allocating 3 Postdoctoral appointments. Each position will cover a period of two years (1+1, with renewal for the second year subject to evaluation of performance). The salary will be 32 500 € per year (before taxes). Funding is provided by the Research Association MPC – Materials Physics Center.

Details about the available topics are provided in the following pages, together with general information on the application and evaluation processes.

http://cfm.ehu.es/

CSIC Consejo Superior de Investigaciones Científicas

MPC Materials Physics Center

eman ta zabal zazu UPV EHU

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Materialen Fisika Zentroa

Postdoctoral Appointments Application Process

The following documentation is required for applying:

- Updated CV
- Brief statement of interest
- Please provide clear contact information and specify which is the research topic or topics you are applying for.
- A letter of acceptance/support signed by the supervisor of the project is required.
- Reference letters are welcomed but not essential.

All documents must be sent to **mpc@ehu.es**

The deadline for this call is 30th June 2015, at 17:00 CEST-

Postdoctoral Appointments Evaluation Process

Applications will be evaluated by a Committee designed by the CFM Direction Board.
The following criteria will be applied (scoring weights are indicated in parentheses):

- CV of the candidate (45%)
- Adequacy of the candidate's scientific background to the position to which he/she is applying (45%)
- Reference letters (10%)

Only applications received before the deadline (30th June 2015 at 17:00 CEST) will be evaluated. Evaluation results will be communicated to the candidates soon after.

Positions will only be filled if qualified candidates are found. If this is not the case, the deadline for submission of applications may be extended.

Available Topics for Postdoctoral Stays

- **The list of available topics is shown in the following pages.** Only three positions will be selected among all applications to any of these topics.

- When applying, please quote the reference number of the topic you are interested in.

- If you have specific questions, or need further information on an specific topic, please get in touch directly with the contact person indicted in each topic description.

- For any general queries on the selection process, contact mpc@ehu.es.

Materials Physics Center
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Reference: PD/2015/1

Spintronics in low dimensional materials

Contact person: Angel Rubio (angel.rubio@ehu.es)

The general objective of the research project is to develop a practical theory of spin-charge transport phenomena mediated by spin-orbit coupling for spintronics applications in realistic materials and nanostructures. More specifically we will focus on spin-charge conversion effects, such as the spin Hall effect and the Edelshtein effect in normal and superconducting hybrid bilayer and multilayer structures. In these systems a strong interface spin-orbit coupling is expected, which we are going to study in detail. Our main goal is to bridge a model-based quantum kinetic theory of spin-charge transport phenomena and the modern first-principle electronic structure methods. As a result of this project we expect to develop a flexible parameter-free approach for modelling realistic spintronics devises.
Also, this project addresses the electronic and structural dynamics of extended systems (solids, 2D and topological materials) driven (and controlled) by laser pulses. The project will use the new time dependent density functional framework we have developed to -Treat quantum mechanically strong light-matter interaction processes. Among one of the envision applications would be the description of high-harmonic generation, photo-induced currents and electron emission.
The work would be done in collaboration with Prof. Ilya Tokatly, Prof. G. Vignale, Dr. S. Bergeret and Dr. A. Drogetthi (ab-initio modeling)

Reference: PD/2015/2

Component Dynamics in Amino Acid Aqueous Solutions

Contact person: Arantxa Arbe (a.arbe@ehu.es)

The general framework of this project is to contribute to the understanding of the dynamic processes in aqueous solutions of biological systems such as proteins. The work here proposed can be considered as a first and necessary step, considering solutions of amino acids at different concentrations. By applying neutron scattering techniques on isotopically labeled samples, the component dynamics of the amino acid and water molecules in the solutions can be resolved and characterized. This is the main focus of the proposed project. To begin with, we already have a complete set of experimental results on proline solutions that need to be analyzed. This assures the immediate availability of neutron scattering results on an interesting system, while new experiments on other solutions will be planned and carried out along the duration of the contract. The information provided by neutron scattering may later be combined with dielectric and MD-simulation results from our group to reach a molecular understanding of the dynamics in these 'simple' biomolecular systems.

Reference: PD/2015/3

Luminescence upconversion in the microcavities with semiconductor colloidal nanocrystals

Contact person: Yury Rakovich (yury.rakovich@ehu.es)

The Nanomaterials and Spectroscopy Group is looking for a highly motivated post-doctoral researcher to work on a project focusing on the photon energy upconversion in the microcavities integrated with semiconductor colloidal quantum dots. This project involves the development of the protocols for controllable modification, functionalization and deposition of quantum dots and the fabrication of hybrid structures such as whispering-gallery resonators coupled with single nanocrystals. A big part of the project focuses on FLIM imaging, a steady-state, time-resolved photoluminescence and photon correlation spectroscopies of these samples with the highest spatial and temporal resolution at various temperatures. For this position, it is desirable to have combined experiences in optics of whispering-gallery microcavities and surface chemistry of quantum dots. Also good communication skills in English both oral and written will be considered as some advantage.

Reference: PD/2015/4

Scanning probe techniques at low temperature

Contact person: Lucia Vitali (lucia.vitali@ehu.eus)

The post-doctoral candidate will join the Spectroscopy at atomic scale group at the Centro de Fisica de Materiales.
The group focuses its research activity on the understanding of the physical and chemical phenomena occurring at local scale on surfaces. Our main research tools are scanning probe techniques (as scanning tunneling microscopy and spectroscopy as well as atomic force imaging) in ultra-high vacuum (UHV) at temperatures down to 1 Kelvin.
We are looking for an enthusiastic and self-motivated post-doctoral person able to enjoy scientific work working independently as well as in team.
The successful candidate will develop and/or reinforce one or more of the following projects:

- On-surface polymerization of organic molecules leading to the formation of covalently bonded organic structures on different substrates.
- Formation and characterization of surfaces of topological insulators and of their interfaces with metals or semi-metals

Previous experience with scanning probe techniques, ultra-high vacuum environment and low temperatures are required. Programming languages (Labview, Mathlab) are preferable.

Reference: PD/2015/5

Reasearch on Calcium Silicates: Phase Transitions and Chemical Properties

Contact person: Andrés Ayuela (swxayfea@sw.ehu.es)

We are currently looking for a Postdoctoral Fellow in the field of condensed matter physics and first principles calculations to carry research on the phases and nanostructure in calcium silicates present in cements and concrete. This work is in collaboration with a local technological center.
Experience in the use of ab-initio electronic structure calculations to study physical properties of condensed matter and to relate them to their chemical composition and atomic structure is preferred. Candidates will be expected to have

- Experience or strong interest in first principles calculations
- Experience or strong interest in silicate materials
- High scientific curiosity towards new research topics

You will work in a stimulating international environment with excellent opportunities for new initiatives.

Reference: PD/2015/6

NanoDielectric Spectroscopy of Polymers and Soft Matter

Contact person: Gustavo Ariel Schwartz (schwartz@ehu.es)

The objective of the work is to study the local dielectric response of polymers and soft matter at the nano scale. The idea is to use a previously developed experimental setup, based on a combination of an AFM and a lock-in amplifier, to measure and quantify the local dielectric response in several glass forming materials. Different systems, like polymers, polymer blends, nano-particles composites and biological samples will be analysed by means of this new approach. In particular, the work will focus in investigating the nano-particle/polymer interphase and the polymer dynamics in different phases for heterogeneous polymer blends. The main purpose of this project is to continue previous works in order to gain further insight into the nature of the physical mechanisms that govern the polymer/nano-particle as well as the polymer/polymer interactions and its correlation with dynamic-mechanical properties. The dielectric characterization will be complemented with the measurement of the local mechanical behaviour at the nano scale by means of AFM. Only highly motivated candidates with a good background in polymer physics, polymer dynamics and experimental techniques are encouraged to apply for this position. The applicant should hold a Ph.D. in Physics, Chemistry or Materials Science before starting working. Experience in polymer dynamics and/or good knowledge of AFM techniques are strongly recommended. Please, send an updated CV and a letter of motivation to Dr. Gustavo Ariel Schwartz at schwartz@ehu.es in order to get a letter of acceptance to apply for this position.

Reference: PD/2015/7

Growth and characterization of silicide based heterostructures

Contact person: Celia Rogero (celia_rogero@ehu.es)

In this project two-dimensional, half-metallic silicides, consisting of a single atomic layer (AL) of rare earth (RE) atoms beneath two ALs of silicon will be used as the template for subsequent deposition of various capping layers, nanostructures, and molecules. Different insulating capping layers, e.g. silica, TiO, AlO, or CaF2 will be grown by appropriate methods such as atomic-layer deposition or molecular beam epitaxy. The capped silicides will be characterized using a variety of in-situ surface-science techniques, such as scanning probe methods, photoemission spectroscopy and magneto-optic Kerr effect in order to study whether the two-dimensional silicide prevails under the capping layer. Furthermore, the possibility to interface different silicides with novel materials such as topological and mott-hubbard insulators, complex magnetic materials such as spin-liquids or skyrmion lattices as well as with organic molecules will be explored. Promising samples will be further scrutinized toward applications in e.g. optics, data storage, or sensing together with our collaborators using different ex-situ methods.

Reference: PD/2015/8

Quasiparticle scattering interference on the surface of metals and semiconductors with strong spin-orbit interaction

Contact person: Evgueni Tchoulkov (evguenivladimirovich.tchoulkov@ehu.eus)

The post-doctoral position is focused on a theoretical study of quasiparticle scattering from point defects and one-dimensional barriers on surfaces, which is experimentally observed by STM through quasiparticle interference (QPI) imaging. A subsequent Fourier transform (FT) of the QPI yields momentum-resolved information of both occupied and unoccupied surface states with high energy resolution. Therefore, a theory is required that could account for spin-related effects in the FT-QPI.

The position will be a part of the project aimed at investigation of spin-orbit related phenomena in a rich variety of materials, from noble-metal-based surface alloys to non-centrosymmetric polar semiconductors and topological insulators, relevant for spintronic applications. Close collaboration with internationally recognized experimental and theoretical groups of CFM, DIPC, the University of the Basque Country, the University of Wurtzburg (Germany), Peter Grunberg Institut and Institute for Advanced Simulation, Forschungszentrum, Julich (Germany), and the University Bicocca (Milano, Italy) is planned. The study is intended to be based on performing both model and ab initio calculations taking explicitly spin-orbit interaction into account. The tasks include the analysis of spin-splitting signatures in QPI patterns observed at the surfaces, reflection and transmission through a one-dimensional barrier, and the structure and spatial decay of energy-resolved Friedel oscillations. The candidate is expected to have a strong background in multiple scattering theory and many-body perturbation theory. Experience with first-principles density functional and many-body methods is essential as well as excellent programming skills.

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Reference: PD/2015/9

Local dielectric spectroscopy by AFM. Application to polymer based materials

Contact person: A. Alegria (angel.alegria@ehu.eus)

During recent years we developed an Atomic Force Microscope (AFM)-based dielectric spectroscopy method to investigated dielectric relaxation phenomena in micro/nano-structured materials with a nanometer spatial resolution. This is based on detecting the phase lag between a locally applied electric field (using an AFM probe) and the resulting displacement current, which originates dissipative electrical processes in the material under investigation. This experimental approach opens a two-fold opportunity. On one hand, fundamental problems related to the molecular dynamics of nano/micro segregated polymer based systems can be readily investigated. On the other hand, by this experimental method one can gain access to technological information relevant for a wide range of applications: materials for energy storage, composite materials, biomaterials, among others.
Taking all this into account, we are looking for a highly motivated candidate with a good background in polymer based materials, relaxation methods and experience in using AFM. The main tasks to be developed during the project are exploring the feasibility and limitations of using this new experimental approach for both fundamental understanding in polymer physics and the material properties relevant for technological applications.