Donostia International Physics Center

DIPC PhD STUDENT GRANTS

The Donostia International Physics Center DIPC is currently accepting applications for PhD students. This is a unique opportunity for highly motivated students, recently graduated from the University in physics or related fields, to develop a research career joining some of the DIPC high-profile research teams.

DIPC PhD grants last for just 12 months. An extension of the grant may be accepted just in some exceptional cases. DIPC PhD grants are intended to support the student during the first steps of his/her research career. Further financial aid to continue the PhD research project after this period should be obtained from other institutions.

Interested candidates please send an updated CV including an academic transcript with the obtained marks, a brief statement of interest, and contact information to phd@dipc.org. Reference letters are welcome but not indispensable. The particular PhD position(s) to which the candidate is applying should be stated as well.

Applicants are advised to hold, or be in the final year of a master's degree in physics, chemistry or material science.

Next review of applications is scheduled for December 9th 2016. Applications will be evaluated by a Committee designed by the DIPC board on the basis of the following criteria (with point weights indicated in parentheses):

- CV of the candidate (60%)
- Adequacy of the candidate's scientific background to the project (20%)
- Statement of interest and reference letters (10%)
- Others: Diversity in gender, race, nationality, etc. (10%)

Evaluation results will be communicated to the candidates soon after. Positions will only be filled if qualified candidates are found.

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PhD OPENINGS

- Spinorial structure of the electron-phonon interaction in surfaces with strong relativistic corrections

Contact person: Asier Eiguren (asier.eiguren@ehu.eus) eta Idoia Garcia de Gurtubay (idoia.gurtubay@ehu.eus). Reference: 2016/16.

The objective of this project is develop a computational approach for describing the fine structure details of the electron phonon in surfaces -and thin layers- with strong spin-orbit interaction considering a Wannier function approach. The motivated candidate should demonstrate a strong background in Solid State Physics and numerical analysis.

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- Computational Studies of Molecular Photosensitizers

Contact person: Eduard Matito (ematito@gmail.com). Reference: 2016/18.

Nowadays, 80% of the planet's energy spent by occidental countries comes from exhaustible energy fuels that contribute to climate change. It is estimated that in less than 45 years the known oil reserves will be exhausted. The most available renewable energy source on the planet is sunlight. The sunlight that the planet receives in one day could cover the energy consumption of the planet for more than 10,000 years. The conversion of solar energy into electronic energy using solar cells is one of the most attractive alternatives to use this natural resource. There are many types of solar cells, among which, the Dye Sensitized Solar Cells (DSSC) stand out for their easy and inexpensive production. Light Emitting Diodes (LEDs) and reduction/oxidation catalysts of water can likewise work with dyes that absorb in the ultraviolet- visible spectrum (UV-Vis). In the case of LEDs the process is exactly the inverse given in DSSC, where photons with energy falling in the UV-Vis part of the spectrum are emitted. Most LEDs are inorganic although in recent years the organic LEDs (OLEDs) have become fashionable, because of its flexibility, lightness and economy. Finally, the same photosensitizers can participate for example in the catalytic conversion of water into hydrogen and oxygen gas. Therefore, the investigation of the structural and electronic properties of the photosensitizers is helpful in designing DSSC, OLEDs and the discovery of new catalysts with important applications.

In this work, the goal of the PhD candidate will consist in the design of a complete computational protocol with well-established margins of precision that permits a full characterization of the electronic structure of several families of photosensitizers. The theoretical work will be carried in the DIPC in close collaboration with the groups of Prof. Lloret (ICIQ, Tarragona) and Prof. Castet (Bordeaux, France). Expertise in the calculation of time-dependent properties (TDDFT energies, UV-Vis spectra, photo-redox potentials, charge-transfer distancies, etc.) will be highly valued.

- Photopysical processes in complex systems

Contact person: David Casanova (david.casanova@ehu.eus). Reference: 2016/19.

The present project is devoted to analyze the influence of the electronic structure of the ground and excited states and the associated photophysical properties in a variety of complex chemical systems: large molecules, molecular aggregates and small to medium size clusters that exhibit unique photophysical properties potentially interesting for their application in optoelectronics and photovoltaic energy conversion. This is eminently a computational project within the field of quantum chemistry.

Initially, the candidate will explore the unique optoelectronic properties of covalent organic frameworks (COFs) and their application in the conversion of solar energy. So far, these systems have been explored mainly with respect to their capability to store small molecules, such as hydrogen or methane. On the other hand, not much is known with respect to their electronic excited state distribution and their optical properties. This work will be done in collaboration with the experimental group of professor Akshay Rao at the University of Cambridge (UK). The group of Prof. Rao is currently very interested in this topic and they are well known experts in the field.

- Spin and charge transport in low dimensional systems and hybrid structures

Contact person: Sebastián Bergeret (sebastian_bergeret@ehu.eus). Reference: 2016/20.

The student will conduct a PhD thesis on Theoretical Condensed Matter Physics in the area of electronic transport in low dimensional and hybrid structures. She/ He will explore the coupling between the electron charge andspin degrees of freedom and its consequence on the transport properties of different systems, consisting of semiconductors, ferromagnets and superconductors.

The student will be introduced to the quantum kinetic equations and Keldysh Green's functions techniques. Solid knowledge in quantum-mechanics and statistical physics is desirable. This call for PhD grant is within the framework of the ongoing collaboration between the DIPC and the National Center for Theoretical Sciences (NCTS) of Taiwan.