

Multi-electron processes for light driven electrodes and electrolytes in conversion and storage of solar energy

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About the Project

The global demand for clean energy encompasses two equally important issues: production, but also access to energy. Although solar energy is the most promising and abundant renewable source, for a more sustainable energy development its storage is equally crucial. A more effective storage makes it possible to respond both to the intermittent nature of the source and to fluctuations in consumption demand. A very attractive solution consists in combining the absorption and storage of energy in a single device, thus also avoiding the losses associated with the compartmentalization of these two functions. In this context, the miniaturization and manipulation of materials at the nanoscale can offer a concrete answer to these needs.

The proposed research project is based on the exploration and analysis of low-dimensional materials, in which light harvesting can combine with very competitive charge storage capacity through multiple charge transfer processes. The objectives of the project therefore concern both the synthesis and the fundamental characterization of a new set of nanomaterials, but also of their mutual interactions. Starting from these materials, in fact, the preparation of composite/hybrid systems is envisaged, which bring together and coordinate the electro-optical properties for the fabrication of innovative devices based on flow cell systems and electrolytic-like capacitors. The PhD scholarship is based on the FET Proactive project "LIGHT-CAP" (<https://cordis.europa.eu/project/id/101017821>) carried out by a research consortium with highly interdisciplinary and collaborative environment involving a number of different groups from Italy, Germany, Spain and Switzerland. Within this framework, the PhD student will acquire an important experience in the management of extra-laboratory activities and dissemination and communication activities. The international character of the project also includes the periodic interfacing with the consortium, which constantly stimulates discussions on the research plan. Likewise, the project encourages the possibility of visits and short research stages within the different groups involved. The PhD project will be carried out within the Functional Nanosystems group (<https://www.iit.it/research/lines/functional-nanosystems>). The interdisciplinary research approach of the Functional Nanosystems group located between nanochemistry, material science, spectroscopy and optoelectronics delivers a stimulating environment, representing the atmosphere of the Central Research Lab at IIT, one of the biggest research centers in Europe.

Requirements: We especially look for candidates with degrees in Chemistry, Materials Science, Physics or Engineering and who are interested in a very interdisciplinary research approach between materials science and characterization, optical microscopy and spectroscopy, electrochemistry and theoretical modeling. We explicitly encourage female applicants for this position.

For further details concerning the research theme please contact Ilka Kriegel (ilka.kriegel@iit.it).

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