MARIE SKŁODOWSKA-CURIE POSTDOCTORAL FELLOWSHIPS 2022

EXPRESSION OF INTEREST FOR HOSTING MARIE CURIE FELLOWS

HOST INSTITUTION

Instituto de Tecnologia Química e Biológica António Xavier (ITQB NOVA)
Researech Unit: Microbiologia Molecular, Estrutural e Celular (MOSTMICRO)

RESEARCH GROUP AND URL

Bioelectrochemistry and Electrobiotechnology Lab

https://www.itqb.unl.pt/research/biological-chemistry/bioelectrochemistry-and-electrobiotechnology

SUPERVISOR (NAME AND E-MAIL)

Dr. Felipe Conzuelo

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SHORT CV OF THE SUPERVISOR

Felipe Conzuelo studied Chemistry at the Complutense University of Madrid, Spain, where he continued to obtain his MSc (2011, Chemical Science and Technology) and Ph.D. (2014, Advanced Chemistry). During his doctoral work in the group of Prof. José M. Pingarrón, he conducted research mainly dedicated to the design and fabrication of electrochemical biosensors for quality control and healthcare applications. After completing his Ph.D., he moved to the group of Prof. Wolfgang Schuhmann at the Ruhr University Bochum, where he performed postdoctoral research in the field of electrochemical energy conversion and storage. He later became a Senior Research Scientist and leader of the Local (Photo)Bioelectrochemistry Group at the same University, performing research primarily devoted to the investigation of semi-artificial photosynthetic devices. At the end of 2021, he moved to ITQB NOVA in Oeiras where he is the head of the Bioelectrochemistry and Electrobiotechnology Lab, within the Biological Chemistry Division. He has developed new strategies for investigating the electrochemical communication between biological entities and electrodes, including enzymes, photosynthetic protein complexes, and microorganisms, providing new insights into the fundamental understanding of bioelectrochemical processes. In addition, his research has been focused on the implementation of practical biotechnological devices, ranging from biosensors for health care and quality control to the development of bioelectrochemical devices for energy conversion.

5 SELECTED PUBLICATIONS

- F. Zhao, A.C. Brix, A. Lielpetere, W. Schuhmann, F. Conzuelo, On the mediated electron transfer of immobilized galactose oxidase for biotechnological applications. *Chem. Eur. J.* (2022) *28*, e202200868.
- P. Wang, F. Zhao, A. Frank, S. Zerria, A. Lielpetere, A. Ruff, M.M. Nowaczyk, W. Schuhmann, F. Conzuelo, Rational design of a photosystem I photoanode for the fabrication of bio photovoltaic devices. *Adv. Energy Mater.* (2021) *11*, 2102858.
- F. Zhao, P. Wang, A. Ruff, V. Hartmann, S. Zacarias, I.A.C. Pereira, M.M. Nowaczyk, M. Rögner, F. Conzuelo, W. Schuhmann, A photosystem I monolayer with anisotropic electron flow enables Z-scheme like photosynthetic water splitting. *Energy Environ. Sci.* (2019) *12*, 3133–3143.
- F. Zhao, A. Ruff, M. Rögner, W. Schuhmann, F. Conzuelo, Extended operational lifetime of a photosystem-based bioelectrode. *J. Am. Chem. Soc.* (2019) *141*, 5102–5106.
- F. Conzuelo, N. Marković, A. Ruff, W. Schuhmann, The open circuit voltage in biofuel cells: Nernstian shift in pseudocapacitive electrodes. *Angew. Chem. Int. Ed.* (2018) *57*, 13681–13685.

PROJECT TITLE AND SHORT DESCRIPTION

Electrochemical study of biocatalytic cascade conversions at biotic/abiotic interfaces

Towards a better understanding of biochemical processes at the cellular level, the possibility to establish enzymatic cascade reactions in vitro and under electrochemical control is a powerful tool, as it enables a detailed characterization of the enzymatic conversion reactions. In this project, the idea is to make use of enzymes participating in the glycolytic pathway for establishing an *in vitro* model of a cellular cascade reaction. The dependence of several enzymes, which take part in the conversion, on the presence of inorganic cofactors for ensuring sufficient activity will be used as a means of control of the relative conversion rates. Moreover, the nature of microenvironments established at biologically modified electrodes will be also a central focus of attention, to optimize the abiotic/biotic interfaces and to acquire a better understanding of the principle of localized confinement for boosting the overall conversion performance.

SCIENTIFIC AREA WHERE THE PROJECT FITS BEST*

Chemistry (CHE)

***Scientific Area where the project fits best** – Please select/indicate the scientific area according to the panel evaluation areas: Chemistry (CHE) • Social Sciences and Humanities (SOC) • Economic Sciences (ECO) • Information Science and Engineering (ENG) • Environment and Geosciences (ENV) • Life Sciences (LIF) • Mathematics (MAT) • Physics (PHY)