Marie Skłodowska-Curie POSTDOCTORAL Fellowships 2022

EXPRESSION OF INTEREST FOR HOSTING MARIE CURIE FELLOWS

HOST INSTITUTION

UCIBIO – Applied Molecular Biosciences Unit, Caparica, Portugal

RESEARCH GROUP AND URL

BIONANO - https://ucibio.pt/research-groups/lab/bionano

SUPERVISOR (NAME AND E-MAIL)

Professor Ricardo Franco; ricardo.franco@fct.unl.pt

SHORT CV OF THE SUPERVISOR

José RICARDO Ramos FRANCO Tavares (https://orcid.org/0000-0002-5139-2871) is an Associate Professor, with Habilitation in Physical Biochemistry, at Department of Chemistry, NOVA School of Sciences and Technology, NOVA University of Lisbon, Portugal. He is a researcher at Applied Molecular Biosciences Unit (UCIBIO and Associate Laboratory i4HB) in the Research Group Nano-Immuno Tech. He obtained his PhD in Chemistry, at the NOVA University of Lisbon, in 1995, in Bioinorganic Chemistry. He then had post-doctoral stays on Protein Biochemistry and Spectroscopy at TiHo, Hannover, Germany, with Dr. Juan Calvete, to which he was recipient of a Alexander von Humbolt scholarship; and at the College of Medicine, University of South Florida, USA, with Prof. Gloria Ferreira. From several post-doctoral stays with Prof. John Shelnutt at the Sandia National Laboratories and University of New Mexico, USA, he started a new research area in Bioanotechnology and Raman spectroscopy. In 2003-2004 he was Head of the Raman Spectroscopy Laboratory at ITQB-NOVA, Portugal. His current scientific interests are i) development of molecular diagnostic rapid tests (point-of-care), based on gold nanoparticles to detect specific nucleic acid sequences, antigens or antibodies for diseases such as tuberculosis, malaria, fungal infections, or metabolic diseases; ii) development of bio-functionalized gold and silver nanostructured surfaces and nanoparticles for superior detection sensitivity by Surfaced Enhanced Raman Spectroscopy (SERS); iii) physical-chemistry of bio/non-bio interactions, e.g., antigens/antibodies/enzymes with gold nanoparticles. He is co-author of 80 articles with an h-index of 31, and 2613 citations as of May 2022. He was the supervisor of 6 post-doctoral researchers, 4 Ph.D. students and co-supervised another 4. He supervised/co-supervised 29 M.Sc. students. He participated in five FCT/MCTES financed research projects, three as PI.

5 SELECTED PUBLICATIONS

1. "Reusable and highly sensitive SERS immunoassay utilizing gold nanostars and a cellulose hydrogel-based platform"
Maria João Oliveira, Inês Cunha, Miguel P. de Almeida, Tomás Calmeiro, Elvira Fortunato, Rodrigo Martins, Luís Pereira, Hugh J. Byrne, Eulália Pereira, Hugo Águas, and Ricardo Franco
J. Mater. Chem. B, (2021) **9,** 7516–7529; DOI: 10.1039/d1tb01404h

2. Development of a gold nanoparticle-based lateral-flow immunoassay for *Pneumocystis* pneumonia serological diagnosis at point-of-care
Ana Luísa Tomás, Miguel P. de Almeida, Fernando Cardoso, Mafalda Pinto, Eulália Pereira, Ricardo Franco and Olga Matos
Frontiers in Microbiology (2019), **10**, 2917, DOI: 10.3389/fmicb.2019.02917

3. Office paper decorated with silver nanostars - an alternative cost effective platform for trace analyte detection by SERS
Maria João Oliveira, Pedro Quaresma, Miguel Peixoto de Almeida, Andreia Araújo, Eulália Pereira, Elvira Fortunato, Rodrigo Martins, Ricardo Franco and Hugo Águas
Sci. Rep. (2017) **7**, 2480, DOI:10.1038/s41598-017-02484-8

4. Star-shaped magnetite@gold nanoparticles for protein magnetic separation and SERS detection
Pedro Quaresma, Inês Osório, Gonçalo Doria, Patrícia A. Carvalho, André Pereira, Judith Langer, João Pedro Araújo, Isabel Pastoriza-Santos, Luis M. Liz-Marzán, Ricardo Franco, Pedro Baptista and Eulália Pereira
RSC Adv. (2014), **4** (8), 3659 – 3667, DOI: 10.1039/c3ra46762g

5. Gold nanoparticle-based fluorescence immunoassay for Malaria antigen detection
B. Guirgis, C. Sá e Cunha, I. Gomes, M. Cavadas, I. Silva, G. Doria, G. Blatch, P.V. Baptista, E. Pereira, H. Azzazy, M. Mota, M. Prudêncio and R. Franco
Anal. Bioanal. Chem. (2012), **402**, 1019–1027, DOI: 10.1007/s00216-011-5489-y

PROJECT TITLE AND SHORT DESCRIPTION

NANOIMMUNOSERS - The development of robust and sensitive point-of-care testing platforms is necessary to improve patient care and outcomes. Surface-Enhanced Raman Scattering (SERS)-based immunosensors are especially suited for this purpose. The objective of this Project is to address the three main challenges for application of SERS-based immunosensors at point-of-care, namely, increased reproducibility, sensitivity, and specificity. Our approach and efforts have been at two levels of a typical sandwich design: (i) plasmonic gold nanoparticles and their interaction with the detection antibodies to form robust and stable bioconjugates; (ii) capturing platform, namely by tailoring its plasmonic properties and the immobilization of capturing antibodies. We are a leading research group on the application of bionanotechnology to biosensors, at the levels of bioreceptors and gold nanoparticle-based plasmonic translation. Our group will work closely with the candidate to elaborate a detailed Project in the context of SERS-based immunosensors and taking into consideration their scientific goals.

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)