

## MARIE SKŁODOWSKA-CURIE POSTDOCTORAL FELLOWSHIPS 2024

### EXPRESSION OF INTEREST FOR HOSTING MARIE CURIE FELLOWS

#### HOST INSTITUTION

UCIBIO – Applied Molecular Biosciences Unit, Caparica, Portugal

#### RESEARCH GROUP AND URL

BIONANOSENSORS - <https://ucibio.pt/research-groups/lab/bionanosensors>

#### SUPERVISOR (NAME AND E-MAIL)

Professor **Ricardo Franco**; [ricardo.franco@fct.unl.pt](mailto: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 NanoImmunoTech. 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 an Alexander von Humboldt 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 Bionanotechnology and Raman spectroscopy. In 2003-2004 he was Head of the Raman Spectroscopy Laboratory at ITQB-NOVA, Portugal. He is currently Leader of the Bionanosensors Lab in the Applied Molecular Biosciences Unit (UCIBIO), belonging to the i4HB Associate Laboratory (<https://www.ucibio.pt/research-groups/lab/bionanosensors>).

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 infectious or metabolic diseases; ii) development of bio-functionalized gold and silver nanostructured surfaces and nanoparticles for superior detection sensitivity by Surface 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 82 articles in journals with an average IF = 5.13. He has an h-index of 34, and 3,356 citations as of May 2024. He was the supervisor of 6 post-doctoral researchers, 4 Ph.D. students and co-supervised another 4. He supervised/co-supervised 32 M.Sc. students. He participated in five FCT, I.P. financed research projects, three as PI.

#### 5 SELECTED PUBLICATIONS

1. Silver nanostars-based SERS for discrimination of clinically relevant *Acinetobacter baumannii* and *Klebsiella pneumoniae* species and clones”  
Miguel Peixoto de Almeida, Ângela Novais, Filipa Grosso, Carla Rodrigues, Nicolae Leopold, Luísa Peixe, Ricardo Franco and Eulália Pereira  
*Biosensors* (2023) 13, 149, DOI:10.3390/bios13020149
2. Simple polystyrene microfluidic device for sensitive and accurate SERS-based detection of infection by malaria parasites  
Maria João Oliveira, Soraia Caetano, Ana Dalot, Filipe Sabino, Tomás R. Calmeiro, Elvira Fortunato, Rodrigo Martins, Eulália Pereira, Miguel Prudêncio, Hugh J. Byrne, Ricardo Franco, and Hugo Águas  
*Analyst* (2023) 148, 4053–4063; DOI: 10.1039/D3AN00971H

3. 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
4. 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
5. Synthesis and characterization of elongated-shaped silver nanoparticles as a biocompatible anisotropic SERS probe for intracellular imaging: theoretical modelling and experimental verification  
Carlos Caro, Pedro Quaresma, Eulália Pereira, Jaime M. Franco, Manuel Pernia Leal, Maria Luisa García-Martín, Jose Luis Royo, José Maria Oliva-Montero, Patrick J. Merkling, Paula Zaderenko, David Pozo, and Ricardo Franco  
*Nanomaterials* (2019) **9** (2), 256, DOI: 10.3390/nano9020256

## 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 optimized 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 biosensors 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)