MARIE SKŁODOWSKA-CURIE INDIVIDUAL FELLOWSHIPS 2020

EXPRESSION OF INTEREST FOR HOSTING MARIE CURIE FELLOWS

HOST INSTITUTION

FCT NOVA | School of Science and Technology
Research Unit: CEFITEC

RESEARCH GROUP AND URL

Functional Molecular Systems Group
URL: https://sites.fct.unl.pt/rabbit/pages/affiliated-research-groups

SUPERVISOR (NAME AND E-MAIL)

Maria de Fátima Raposo
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SHORT CV OF THE SUPERVISOR

Maria Raposo received the PhD degree in Materials Sciences and Engineering by Universidade de São Paulo, Brazil in 1999 and the Habilitation degree in Physics Engineering by Universidade Nova de Lisboa, Portugal in 2019. Since 2000, is professor at Physics Department of Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa, lecturing Solid State Physics, Surface and Interfaces Technology, Conducting Polymers, Molecular Electronics and Physics of Functional Macromolecular Systems. She is member of the Functional Molecular Systems group which research interests include electric and optical properties of ultra-thin films of polymers and biomolecules, interfaces and nanotechnology, colloids, molecular architectures for electronics, photonics magnetism and sensors, biomimetic membranes and radiation effect in biological systems. She is deeply committed to the quality and relevance of physics in interdisciplinary research and present research topics as instrumentation and development of sensing devices to detect traces of molecules in complex aqueous systems such as tap water, wastewater and waters bodies. She has over 100 research papers and 1 book to her name, h-index 23, i10-index 40 (http://orcid.org/0000-0003-4710-0693). She serves on Editorial Boards of international journals and she has been program chair of PHOTOPTICS, an international conference series on photonics, optics and laser technology.

5 SELECTED PUBLICATIONS

- Magro, C., Zagalo, P., Pereira-da-Silva, J., Pires Mateus, E., Branco Ribeiro, A., Ribeiro, P., Raposo, M. 2020. Polyelectrolyte Based Sensors as Key to Achieve Quantitative Electronic Tongues: Detection of Triclosan on Aqueous Environmental Matrices. Nanomaterials, 10, 640.

- Pires, F., Magalhães-Mota, G., Geraldo, V. P.N., Ribeiro, P. A., Oliveira Jr., O.N., Raposo, M. 2020. The impact of blue light in monolayers representing tumorigenic and nontumorigenic cell membranes containing epigallocatechin-3-gallate. Colloids and Surfaces B: Biointerfaces,193, 111129.

- Magro, C., Mateus, E.P., Paz-Garcia, J.M., Sério, S., Raposo, M. and Ribeiro, A.B., 2019. Electronic Tongue Coupled to an Electrochemical Flow Reactor for EOC Real Time Monitoring. Sensors, 19(24), p.5349.

- Magro, C., Mateus, E.P., Raposo, M. and Ribeiro, A.B., 2019. Overview of electronic tongue sensing in environmental aqueous matrices: Potential for monitoring EOC. Env. Reviews, 27(2), pp.202-214.

- Marques, I., Magalhães-Mota, G., Pires, F., Sério, S., Ribeiro, P.A. and Raposo, M., 2017. Detection of traces of triclosan in water. Applied Surface Science, 421, pp.142-147.

PROJECT TITLE AND SHORT DESCRIPTION

Autonomous Microfluidic System for Water Quality Analyses

With global demand rising faster than availability, fresh water is quickly becoming a limited resource. In fact, the United Nations estimates one third of the world´s population is living in water-stressed regions, and by 2025 this number is expected to double and the global population living in urban areas is expected to exceed nine-billion by 2050 (United Nations, 2019). Access to clean and safe water has become one of the major challenges of our modern society, water scarcity is the result of increasing consumption but also of pollution of freshwater, due to large number of pathogens and chemicals entering the water cycle. Water pollution is a growing challenge that affects all countries: worldwide revenue from the sales of pharmaceuticals has almost doubled over the last 10 years, and will continue to grow with aging populations and improved access to healthcare globally. In this context, sensing techniques used to characterize liquid composition are of fundamental importance for studies of interactions of liquid–liquid in mixture reactions. Therefore, the routine monitoring of critical pollutants/micro pollutants involving expensive technologies and pre-mixing of water samples with chemical reagents, to characterize the condition and state of aquatic ecosystems, the real-time quantification and monitoring of the main nutrients (e.g., nitrate, phosphate, and silicate), trace metals (e.g., dissolved iron) and other dissolved gases, including oxygen and methane, is required. Typically, most of the above-mentioned physicochemical parameters are measured after water sampling and adding reagent before performing analyses. Generally, liquid samples must be collected from given site and at specific period of time, preserved, and then transported to designated laboratories for analysis. This is performed using a number of standard sensing methods based on colorimetric, UV spectrophotometry fluorescence, THz spectroscopy or atomic absorption spectroscopy. Such analytical protocols necessarily involve fairly complex and non-portable equipment and are usually complex and time-consuming, as well as expensive. Most important, they are not suitable for fast, on-the-spot direct monitoring of multiple pollutants in complex matrixes. We propose **a portable microfluidic multi-sensing platform for water quality analyses, with fully integrated microfluidic reactors and embedded sensors as well as electronic tongues (e-tongue) based on thin films deposited on interdigitated electrodes**. In order to analyze water quality parameters on-the-spot, we propose an automated injection liquid system, with integration of microfluidic reactors and multiple sensor techniques. Micro reactors will be fabricated based on microfabrication cleanroom facilities on glass, silicon and polydimethylsiloxane(PDMS), using microfabrication techniques and organic and oxides thin films will be deposited by layer-by-layer and sputtering techniques, respectively.

SCIENTIFIC AREA WHERE THE PROJECT FITS BEST

Physics (PHY) | Chemistry (CHE) | Information Science and Engineering (ENG) | Environment and Geosciences (ENV)