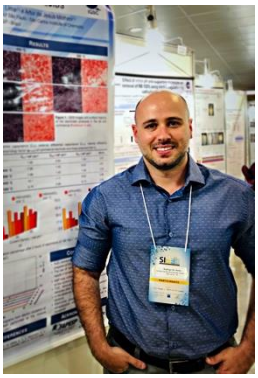
PhD Candidate Profile



Name:

Rodrigo de Mello

Research Group (if relevant):

- Interfacial Electrochemistry Laboratory (Brazil)
- Electrochemical and Environmental Engineering (Spain)

Research Centre (if relevant):

- São Carlos Institute of Chemistry (Brazil)
- Faculty of Science and Chemical Technologies (Spain)

Department/School(s) (if relevant):

- Physical Chemistry Department (Brazil)
- Chemical Engineering Department (Spain)

College:

Double degree co-supervised:

- University of São Paulo, São Paulo, Brazil
- University of Castilla La Mancha, Ciudad Real, Spain

Supervisor(s):

- Dr. Artur de Jesus Motheo
- Dr. Manuel Andrés Rodrigo Rodrigo

Funding body:

São Paulo Research Foundation - FAPESP

Area (field) of study:

Electrochemical degradation of pesticides, antibiotics and volatile organic compounds

Thesis Title:

Obtaining and characterizing hybrid nanomaterials from nanofibers for application in electrode materials for contaminants removal

Abstract:

The electrochemical processes have gained notoriety in the treatment of contaminated water and effluents, the importance of water reuse and, above all, the possibility of CO2 and H2O generation at the end of the procedure. Several factors have influence in such processes, among which the material of the electrode and the species that compose the aqueous medium can be highlighted. Among the materials most used, boron doped diamond anodes, which are characterized by the generation of hydroxyl radicals, and the metal oxide mixing electrodes, which present a lower generation of these radicals, but generate oxidant species from the present anions in the solution, and it should be noted

that the amount of substances generated is proportional to the electrochemically active area of the electrode. Thus, the use of nanomaterials is gaining space, since they generally have a high surface area. As an example, it is possible to highlight the nanofibers that, due to the combination of the high ratio between area and volume and the characteristics of 1-D confinement, promote a greater interaction with the medium. Agricultural defences that present in their constitution chlorine atoms are extremely efficient but resistant to decomposition in biological systems. Atrazine is one of the herbicides most used in the fight against weeds in various agricultural crops. The present project aims at the development of hybrid nanomaterials from the combination of nanofibers with nanoparticles. These materials will be analysed by physicochemical and electrochemical characterization techniques, such as scanning electron microscopy, X-ray diffraction and cyclic voltammetry. The evaluation of the efficiency of the materials produced will be done by means of the application in the electrochemical oxidation of atrazine, which will be accompanied by high performance liquid chromatography, mass spectrometry and measurement of total organic carbon.

Collaborations:

Dr. Luiz Henrique Capparelli Mattoso (Embrapa)

Publications:

de Mello, R.; Rodrigo, M. A.; Motheo, A. J. “Electro-oxidation of tetracycline in methanol media on DSA®-Cl2”. Chemosphere, v. 273, 129696, 2021.

Presentations:

de Mello, R.; Motheo, A. J.; Saéz, C; Rodrigo, M. A. R. Analysis of electrochemical oxidation of benzene in non-aqueous media. 29th Topical Meeting of the International Society of Electrochemistry, 2021.

de Mello, R.; Saéz, C.; Rodrigo, M. A.; Motheo, A. J. Eliminación de tetraciclina em médio no acuoso empleando um DSA-Cl2. V Workshop de la Red E3TECH and I Workshop Iberoamericano a Distancia ‘Aplicaciones Medioambientales y Energéticas de la Tecnología Electroquímica’, 2020.