PhD Candidate Profile

Name:
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Research Group:
GERST – Group on Environment, Reaction, Separation and Thermodynamics

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Funding body:
N/A

Area (field) of study:
Removal of contaminants of emerging concern by photocatalysis

Thesis Title:
Polymeric Photocatalytic Membranes Applied for Contaminants of Emerging Concern Degradation by Light-Driven Processes

Abstract:
In recent years, alarm is being raising due to the presence, in water, of chemical contaminants of emerging concern (CEC), with origin in pharmaceutical and personal care products. This concern is due to the risks associated with their exposure, even in minimal amounts. Additionally, these complex compounds can not be removed or degraded by the existing technologies in wastewater treatment plants (WWTPs). Therefore, there is a need to develop advanced techniques for the treatment of wastewaters, capable of complementing the conventional WWTPs and capable of eliminating CEC.

Among them, photocatalysis stands out as it is cost-effective, especially if solar radiation is applied. However, conventional heterogenous photocatalysis has the disadvantage of requiring a time-consuming and costly process of separation and recovery of the catalyst. Therefore, the heterogeneous photocatalysis process, in which the catalyst is supported, is

preferable. Among the available supports, polymeric ones stand out, due to their favorable characteristics, such as their transparency, flexibility and stability.

In this context, the main objective of this study is to develop polymeric supports capable of immobilizing TiO_2 and to study the applicability of these materials in the degradation of CEC present in biologically treated effluents. This main goal can be divided into smaller ones: (i) optimize the characteristics and composition of the different materials; (ii) compare the performance of different polymers; (iii) optimize the operating conditions of the solar photocatalytic process; (iv) assess the materials reusability; (v) compare the performance of conventional photocatalysis with polymer-supported photocatalysis; (vi) assess the feasibility of the process on a pilot scale to continuously treat a real wastewater.

Collaborations:

N/A

Publications:

E. Domingues, M. J. Silva, T. Vaz, J. Gomes, R. C. Martins, “Sulfate radical based advanced oxidation processes for agro-industrial effluents treatment: A comparative review with Fenton's peroxidation”. Science of the Total Environment 2022 (832) 155029

M. J. Silva, J. Gomes, P. Ferreira, R. C. Martins, “An Overview of Polymer-Supported Catalysts for Wastewater Treatment through Light-Driven Processes”. Water 2022 (14) 825

E. Domingues, M. J. Silva, T. Vaz, J. Gomes, R. C. Martins, “Persulfate Process Activated by Homogeneous and Heterogeneous Catalysts for Synthetic Olive Mill Wastewater Treatment”. Water 2021 (13) 3010

Presentations:

N/A