PhD Candidate Profile

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Funding body:
Foundation for Science and Technology (FCT), Portugal

Area (field) of study:
Removal of chemical and biological contaminants by solar ozone-based processes

Thesis Title:
Removal of Emerging Contaminants by Solar Photo-Ozonation Using Alternative and Modified Catalysts

Abstract:
The advanced oxidation processes (AOPs) rise as promising solutions to overcome the inability of present WWTPs to remove CECs. These technologies are based on the generation of multiple oxidative radicals, that can efficiently react with a large variety of chemical and biological contaminants. Photocatalysis is one of those processes, based upon the use of catalysts activated through photon irradiation, initiating a chain of reactions that lead to further mineralization of pollutants. Oxidant species can also be added to the reactions, such as ozone, that can greatly boost the processes results, acting as an efficient electron acceptor of the electron produced by catalyst photoactivation, and still possessing a high oxidative potential.

These catalytic materials still face some drawbacks that prevent their full-scale application, such as low specific surface areas and, more importantly, low activity under visible light irradiation, which limit their activation through solar light and increase their implementation cost. Thus, there is an incentive among researchers to develop and investigate

photocatalysts that present a more extended light absorption. As very resilient ii materials, multiple combinations and adaptations are also possible, based on the introduction of foreign atoms and structures that can enhance their properties.

In this context, this study intends to examine the application of photocatalysis and its combination with ozone in the elimination of chemical and biological contaminants of emerging concern, reference and alternative examples of catalytic materials currently being applied, TiO2, g-C3N4 and WO3, and different modifications regarding catalysts doping and composites that can be employed to improve these materials and obtain a more feasible treatment alternative.

Collaborations:

Faculty of Chemistry, Department of Environmental Technology, University of Gdansk – Collaboration in the development of carbon nitride catalysts

Publications:

E. Fernandes, S. Contreras, F. Medina, R.C. Martins, J. Gomes, N-doped Titanium dioxide for mixture of parabens degradation based on ozone action and toxicity evaluation: precursor of nitrogen and titanium effect, Process Saf. Environ. Prot. (2020). https://doi.org/10.1016/j.psep.2020.03.006.

E. Fernandes, R.C. Martins, J. Gomes, Photocatalytic ozonation of parabens mixture using 10% N-TiO2 and the effect of water matrix, Sci. Total Environ. 718 (2020) 137321. https://doi.org/10.1016/j.scitotenv.2020.137321.

Presentations:

N/A