PhD Candidate Profile

Name:
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Research Group (if relevant):
Thermodynamics and Environment

Research Centre (if relevant):
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Department/School(s) (if relevant):
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Supervisor(s):
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Funding body:
Fundação para a Ciência e a Tecnologia (FCT)

Area (field) of study:
Advanced oxidation process; chemical oxidation of wastewater; heterogeneous photocatalysis; intensification of photocatalytic processes; CO_2 reduction.

Thesis Title:
Intensifying CO_2 photoreduction into value-added fuels using microscale illumination

Abstract:
The increasing of fossil fuels consumption together with the anthropogenic CO_2 emissions led to an energy crisis and global warming. One of the best methods to address these two problems is artificial photosynthesis. Accordingly, this work aims to overcome barriers in the CO_2 photoreduction into renewable fuels using improved heterogeneous photocatalysts, with high activity and selectivity, and innovative microreactors with microscale illumination. The photoreactor consists of a back stainless steel slab (BSSS), where a network of static mixing chambers interconnected by transport channels is mechanically imprinted, and a frontal borosilicate/quartz slab is irradiated by LEDs lighting. The BSSS will be coated with thin films of catalyst (TiO_2 based zeolites or metal organic frameworks-MOFs), using different methods. Afterwards, the influence of the catalyst morphological characteristics, reactor illumination and operating conditions on CO_2 photo-conversion rate into high-value products will be detailed assessed to attain a more mature technology.

Collaborations:
n/a

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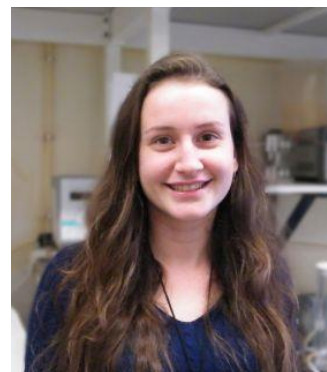
Publications:

A.M. Díez, F.C. Moreira, B.A. Marinho, J.C.A Espíndola, **L.O. Paulista**, M.A. Sanromán, M. Pazos, R.A.R. Boaventura, V.J.P. Vilar. *A step forward in heterogeneous photocatalysis: Process intensification by using a static mixer as catalyst support*. Chemical Engineering Journal, v. 343, p. 597-606, 2018, doi.org/10.1016/j.cej.2018.03.041.

B.A. Marinho, M.J. Martín, L.P. Mazur, **L.O. Paulista**, R.O. Cristóvão, J.M. Loureiro, R.A.R Boaventura, M.M Dias, J.C.L. Lopes, V.J.P Vilar. *A novel micro-meso-structured reactor (NETmix) for photochemical UVC/H2O2 processes - oxidation of As(III) to As(V)*. Issue 9, p. 1179-118, 2018, doi.org/10.1039/c8pp00006a.

S. Santos, **L.O. Paulista**, T. Silva, M.M. Dias, J.C.B. Lopes, R. Boaventura, V.J.P. Vilar. *Intensifying heterogeneous TiO$_2$ photocatalysis for bromate reduction using the NETmix photoreactor*. Science of The Total Environment. In Press, Accepted Manuscript, 2019, doi.org/10.1016/j.scitotenv.2019.02.045

Presentations:

B.A. Marinho, L. Mazur, M.J. Martin, **L.O. Paulista**, R.O. Cristovão, J.M. Loureiro, R. Boaventura, M. Dias, J. Lopes, V.J.P. Vilar, V.J. *Photochemical UVC/H2O2 System for the Oxidation of As(III) to As(V) using a Micro-Meso-Structured Reactor (NETmix): Effect of Illumination Power and Configuration*. In: Cipoa 2017 -3rd Iberoamerican Conference on Advanced Oxidation Technologies, 2017, Medellin.

P. Peri, T. Silva, **L.O. Paulista**, R. Martins, P. Soares, R. Boaventura. *New Designs of Solar Collectors for Heterogeneous TiO2 Photocatalytic Processes*. In: Cipoa 2017 -3rd Iberoamerican Conference on Advanced Oxidation Technologies, 2017, Medellin.

S. Santos, **L.O. Paulista**, T. Silva, R. Boaventura, M.M. Dias, J.C.B. Lopes, V.J.P. Vilar. *Intensifying Heterogeneous Photocatalysis for Bromates Reduction using the NETmix Photoreactor*. In: 13th International Chemical and Biological Engineering Conference (ChemPor 2018), Aveiro, Portugal, 2018.

S. Santos, **L.O. Paulista**, T. Silva, R. Boaventura, M.M. Dias, J.C.B. Lopes, V.J.P. Vilar. *Bromates Removal by Heterogeneous Photocatalysis in a Drinking Water Treatment Plant*. In: 13th International Chemical and Biological Engineering Conference (ChemPor 2018), Aveiro, Portugal, 2018.

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