



PhD Candidate Profile



Name: Elisabeth Cuervo Lumbaque

Research Group (if relevant): Group of analytical methodologies and advanced oxidation processes (GMAPS)

Research Centre (if relevant):

Department/School(s) (if relevant): Inorganic chemistry

College: Universidade Federal do Rio Grande do Sul

Supervisor(s): Carla Sirtori

Funding body: National Council for Scientific and Technological Development of Brazil (CNPq)

Area (field) of study: Environmental chemistry

Thesis Title: Degradation of pharmaceuticals in real hospital wastewater by solar photo Fenton processes



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Abstract:

The presence of pharmaceuticals in wastewater represents a serious environmental problem that demands the use of increasingly time consuming and costly treatment processes to allow the elimination of contaminants present in this matrix. In this context, this research aims to evaluate the applicability of Fenton, photo-Fenton solar and advanced Fenton processes at pH values close to neutrality for the treatment of hospital wastewater. The optimization of experimental conditions, analytical process monitoring, identification of transformation products and their toxicological/biodegradability prediction in each of the aforementioned treatment processes are developed in this research. The physicochemical characterization of the hospital effluent was also performed periodically in order to have more complete information of the actual work matrix. According to the obtained results, the employed processes present results that indicate positive aspects since they allow the degradation of the pharmaceuticals in different aqueous matrices. Transformation products (TPs) generated during the different treatment processes are identified using a specially designed database that considers such TPs as target compounds. In most cases initially, such TPs exhibited high to moderate toxicity and persistence in the environment but throughout the treatment process(s) the TPs are converted to simpler and less harmful structures. Finally, it will be evaluated the best small-scale process on a larger scale in a low-cost reactor. In these large scale studies QSAR in silico assesment will also be performed and the main TPs identified throughout the treatment process.

Collaborations:

Dra Elaine Regina Lopes Tiburtius

Professor of the Graduate Program in Applied Chemistry of Universidade Estadual de Ponta Grossa and collaborator of the Graduate Program in Sanitary and Environmental Engineering. Ponta Grossa, Brazil.

Dr Marco Flôres Ferrão

Associate Professor at the Federal University of Rio Grande do Sul (UFRGS) and Permanent Member of the Graduate Programs in Chemistry (PPGQ-UFRGS) and Production Engineering (PPGEP-UFRGS). INCT bioanalytical researcher of CNPq since 2008. Leader of CNPq Research Group on Chemistry and Analytical Instrumentation based at UFRGS. Porto Alegre, Brazil.

Dr Vitor Vilar

Principal Researcher in LSRE-LCM, under the Investigator FCT 2013 (IF/00273/2013) and CEEC Individual 2017 FCT (CEECIND/01317/2017) programmes. He is currently one of the editors of the Environmental Science and Pollution Research (ESPR) Journal (Springer). Porto, Portugal.



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Publications:

- BECKER, RAQUEL WIELENS ; IBÁÑEZ, MARIA ; LUMBAQUE, ELISABETH CUERVO ; WILDE, MARCELO LUÍS ; DA ROSA, TAINÁ FLORES ; HERNÁNDEZ, FÉLIX ; SIRTORI, CARLA . Investigation of pharmaceuticals and their metabolites in Brazilian hospital wastewater by LC-QTOF MS screening combined with a preliminary exposure and in silico risk assessment. SCIENCE OF THE TOTAL ENVIRONMENT, 2019.
- CUERVO LUMBAQUE, ELISABETH; SALMORIA ARAÚJO, DÉBORA ; MOREIRA KLEIN, THÁGOR ; LOPES TIBURTIUS, ELAINE R. ; ARGÜELLO, JACQUELINE ; SIRTORI, CARLA . Solar photo-Fenton-like process at neutral pH: Fe(III)-EDDS complex formation and optimization of experimental conditions for degradation of pharmaceuticals. CATALYSIS TODAY, v. 328, p. 259-266, 2019.
- CUERVO LUMBAQUE, ELISABETH; WIELENS BECKER, RAQUEL ; SALMORIA ARAÚJO, DÉBORA ; DALLEGRAVE, ALEXSANDRO ; OST FRACARI, TIAGO ; LAVAYEN, VLADIMIR ; SIRTORI, CARLA . Degradation of pharmaceuticals in different water matrices by a solar homo/heterogeneous photo-Fenton process over modified alginate spheres. Environmental Science and Pollution Research, v. 26, p. 6532-6544, 2019.
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- LUMBAQUE, ELISABETH C.; DA SILVA, BRUNA A. ; BÖCK, FERNANDA C. ; HELFER, GILSON A. ; FERRÃO, MARCO F. ; SIRTORI, CARLA . Total dissolved iron and hydrogen peroxide determination using the PhotoMetrixPRO application: a portable colorimetric analysis tool for controlling important conditions in the solar photo-Fenton process. JOURNAL OF HAZARDOUS MATERIALS, v. 378, p. 120740, 2019.
- LUMBAQUE, E. CUERVO; CARDOSO, R.M. ; DALLEGRAVE, A. ; DOS SANTOS, L.O. ; IBÁÑEZ, M. ; HERNÁNDEZ, F. ; SIRTORI, C. . Pharmaceutical removal from different water matrixes by Fenton process at near-neutral pH: Doehlert design and transformation products identification by UHPLC-QTOF MS using a purpose-built database. JOURNAL OF ENVIRONMENTAL CHEMICAL ENGINEERING, v. 6, p. 3951-3961, 2018.
- CUERVO LUMBAQUE, ELISABETH; GOMES, MONIKE FELIPE ; DA SILVA CARVALHO, VANESSA ; DE FREITAS, ADRIANE MARTINS ; TIBURTIUS, ELAINE REGINA LOPES . Degradation and ecotoxicity of dye Reactive Black 5 after reductive-oxidative process. Environmental Science and Pollution Research, v. 24, p. 6126/7-6134, 2016.
- ACOSTA NIÑO, GEMA EUNICE ; COY BARRERA, CARLOS ANDRÉS ; BOURDÓN GARCÍA, ALEJANDRO ; CUERVO LUMBAQUE, ELISABETH . Electrocoagulation as treatment for metals remotion in industry wastewater. Revista Facultad de Ciencias Basicas, v. 9, p. 306-317, 2013.



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Presentations:

- LUMBAQUE, ELISABETH C.; SIRTORI, C. ; Tiburtius E . Use of EDDS in solar photo-Fenton-like process to improve the efficiency of pharmaceutical degradation in real hospital wastewater at neutral pH. 2019.
- LUMBAQUE, E. C.; SCHWEIGERT, C; OLIVEIRA, L; RODEMBUSCH, F; DOS SANTOS J; LAVAYEN, V. ; SIRTORI, C. . Degradation of pharmaceuticals through solar light-driven heterogeneous photocatalysis from petrochemical waste. 2019.
- LUMBAQUE, E. CUERVO; LOPEZ, F. A. ; DUARTE, E. S. A. ; RODRIGUES, M. B. ; TIBURTIUS, ELAINE REGINA LOPES ; SIRTORI, C. . Effect of solar photo-advanced Fenton on degradation of pharmaceuticals in real hospital wastewater. 2019.
- LUMBAQUE, ELISABETH C.; SIRTORI, C. ; Tiburtius E . Proposed reaction pathways for pharmaceuticals degradation by solar photo-advanced Fenton process. 2019.
- KOSERA, V. S. ; LUMBAQUE, ELISABETH C. ; DALLEGRAVE, A ; Felipe M ; PAULA, V. C. ; Martins de Freitas A ; SIRTORI, C. ; Tiburtius E . Degradation of Triclosan by TiO₂/UV: Transformation products and toxicity. 2019.
- LUMBAQUE, E. C.; MARTINS, R. ; DALLEGRAVE, A ; FRACARI, T. ; LAVAYEN, V. ; SIRTORI, C. . Pharmaceuticals Degradation using Solar Heterogeneous Photo-fenton Process over Modified Alginate Spheres: Preliminary Evaluation. 2017.
- LUMBAQUE, E. C.; SANTOS, L. O. ; MARTINS, R. ; DELLGRAVE, A. ; SIRTORI, C. . Pharmaceutical Removal from Hospital Wastewater by Homogeneous Fenton Process at Near Neutral pH. 2017.
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- VARONA, M ; LUMBAQUE, E. C. ; TABORDA, B. S. A. Validation of an analytical method for the determination of ethyl acetate, tetrahydrofuran, benzene, toluene and xylene in air extraction by gas chromatography coupled to mass spectrometry (GC / MS). 2012.