

**Name:**

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**Research Group (if relevant):**

Agro-Environmental Technologies Laboratory

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**Department/School(s) (if relevant):**

Chemistry Department

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**Supervisor(s):**

Doutor Marco Paulo Gomes de Sousa Lucas; Principal Investigator

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**Funding body:**

FCT – Fundação para a Ciência e a Tecnologia

**Area (field) of study:**

Environmental Chemistry; Environmental Engineering; Chemical Engineering

**Thesis Title:**

Treatment of Agro-industrial Wastewaters using Advanced Oxidation Processes

**Abstract:**

The agro-industries can generate a huge amount of wastewaters, characterized by seasonal variability and high organic load that cannot go directly to MWTP. These wastewaters present BOD<sub>5</sub>/CQO ratios below 0.4 due to the presence of compounds that are recalcitrant to conventional biological treatment. In addition, they can also present high microbiological load inhibiting their reutilization in agriculture or industry. There is a consensual understanding that these wastewaters must pass through an Advanced Oxidation Process (AOP) before they can go to MWTP.

Some of AOP's are based on UV irradiation sources. Solar energy and high or low pressure mercury vapour lamps are the most often used sources, however they present several disadvantages like power instability. Recently, new powerful UV-LED's appeared as a safe, non-hazardous, longer life time and energy efficient alternative. These UV-LED's proved to be suitable in the photocatalytic degradation of dyes.

## PhD Candidate Profile

The main purpose of this PhD thesis is to go deep into the application of UV-driven AOPs (e.g. UV-LEDs) in the treatment of agro-industrial wastewaters obtaining total removal of organic matter and inactivation of pathogenic microorganisms, allowing the reuse of the treated water or a safe disposal in MWTP.

### Collaborations:

Plataforma Solar de Almería, Spain

Loughborough University, UK

### Publications:

Rafael R. Solís, F. J. Rivas, **Leonor C. Ferreira**, A. Pirra, José A. Peres. Integrated aerobic biological–chemical treatment of winery wastewater diluted with urban wastewater. LED-based photocatalysis in the presence of monoperoxysulfate. *Journal of Environmental Science Health Part A* 53 (2018) 124-131.

**Leonor C. Ferreira**, Marco S. Lucas, José R. Fernandes, Pedro B. Tavares. Photocatalytic oxidation of Reactive Black 5 with UV-A LEDs. *Journal of Environmental Chemical Engineering* 4 (2016) 109 – 114.

Jorge Rodríguez-Chueca, **Leonor C. Ferreira**, José R. Fernandes, Pedro B. Tavares, Marco S. Lucas, José A. Peres. Photocatalytic discolouration of Reactive Black 5 by UV-A LEDs and solar radiation. *Journal of Environmental Chemical Engineering* 3 (2015) 2948 – 2956.

### Presentations:

**Leonor C. Ferreira**, Maria Castro-Alfárez, Samira Nahim-Granados, Maria I. Polo-López, Marco Lucas, Gianluca Li Puma, Pilar Fernández-Ibáñez. Investigation of parameters affecting the inactivation of *E. coli* and *E. faecalis* in water by sulphate radicals: sunlight, temperature and organic matter. XXIII Encontro Galego-Portugués de Química, Ferrol, Spain, 15-17 November 2017 (Poster presentation).

Juliana Milheiro, **Leonor C. Ferreira**, Luis-Filipe Ribeiro, Fernanda Cosme, Fernando M. Nunes. Validation of a dSPE-HPLC methodology for the determination of biogenic amines in wine. 10<sup>o</sup> Encontro Nacional de Cromatografia, Bragança, Portugal, 4-6 December 2017 (Oral presentation).

**Leonor C. Ferreira**, José R. Fernandes, Marco S. Lucas, José A. Peres, Pedro B. Tavares. Tratamento de efluentes do processamento industrial de *Sambucus nigra* da região do Távora-Varosa por fotocatalise. 1<sup>a</sup> Jornadas do Projecto INTERACT – Linha BEST, Vila Real, Portugal 16 November 2016 (Oral presentation).

**Leonor C. Ferreira**, José R. Fernandes, Jorge Rodríguez-Chueca, Marco S. Lucas, José A. Peres, Pedro B. Tavares. Photodegradation of anthocyanins by UV-LEDs/TiO<sub>2</sub>. XXII Encontro Luso-Galego de Química, Bragança, Portugal, 9-11 November 2016 (Oral presentation).

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**Leonor C. Ferreira**, José R. Fernandes, Jorge Rodríguez-Chueca, Marco S. Lucas, José A. Peres, Pedro B. Tavares. Mineralization of phenolic compounds using UV-LEDs/TiO<sub>2</sub>. XXI Encontro Galego-Portugués de Química, Pontevedra, Spain, 18-20 November 2015 (Oral presentation).

**Leonor C. Ferreira**, Jorge Rodríguez-Chueca, José R. Fernandes, Marco S. Lucas, José A. Peres, Pedro B. Tavares. Development of UV-LED systems for Photocatalytic reactors. XX Encontro Luso-Galego de Química, Porto, Portugal, 26-28 November 2014 (Poster presentation).

Pedro B. Tavares, **Leonor C. Ferreira**, José R. Fernandes, José A. Peres, Marco S. Lucas. A continuous flow stirred-tank reactor (CSTR) based on UV-LED/TiO<sub>2</sub> for the photocatalytic decolourization of RB5. 8th European Meeting on Solar Chemistry and Photocatalysis: Environmental Applications, Thessalonik, Greece, 25-28 June 2014 (Poster presentation).

**Leonor C. Ferreira**, Marco S. Lucas, José R. Fernandes, Pedro B. Tavares. Degradação fotocatalítica do corante têxtil Reactive Black 5 por UV-LEDs/TiO<sub>2</sub> num reator em contínuo do tipo perfeitamente agitado. VII Jornadas de Bioquímica da UTAD, Vila Real, Portugal, 2-3 April 2014 (Oral presentation).

**Leonor C. Ferreira**, Marco S. Lucas, José R. Fernandes, Pedro B. Tavares. Lab-scale Photocatalytic Prototype Based on UV-LED/TiO<sub>2</sub>. 9º Encontro Nacional de Catálise e Materiais Porosos, Porto, Portugal, 6-7 May 2013 (Poster presentation).