

## PhD Candidate Profile

**Name:**

Fabiane Soares Lira

**Research Group:**

ALiCE- Associate Laboratory in Chemical Engineering

LSRE- Laboratory of Separation and Reaction Engineering and

LCM – Laboratory of Catalysis and Materials

**Research Centre:**

N/A

**Department/School(s):**

Department of Chemical Engineering

**College:**

University of Porto

**Supervisor(s):**

Dr. Vítor Jorge Pais Vilar

**Co-Supervisor(s):**

Dra. Tânia Filomena Castro Valente Silva

**Funding body:**

N/A

**Area (field) of study:**

Photocatalysis/ Nitrogen Photofixation

**Thesis Title:**

A step forward in photocatalytic nitrogen fixation: Towards a more sustainable future

**Abstract:**

Ammonia ( $\text{NH}_3$ ) is a fertilizer and emerging fuel. Industrial-scale nitrogen ( $\text{N}_2$ )-fixation via the Haber-Bosch process dominates today's artificial fertilizer production. Owing to the  $\text{N}_2$ 's triple bond exceptional stability, Haber-Bosch is an energy-intensive chemical process that consumes 2-3% of global natural gas, emitting more than 300 million tons of  $\text{CO}_2$ . In light of an increasing  $\text{NH}_3$  demand coupled with an urgency to reduce fossil fuel consumption and  $\text{CO}_2$  emissions, the development of  $\text{N}_2$ -fixation alternative/eco-friendly technologies is essential.

Accordingly, this project focuses on the intensification of  $\text{N}_2$  reduction into  $\text{NH}_3$  via gas-phase heterogeneous photocatalysis, using green  $\text{H}_2$  under near-mild conditions. To overcome this process's barriers, it will be developed: (i) novel hierarchically structured photocatalysts with

## PhD Candidate Profile

high selectivity and photocatalytic activity and larger light spectrum absorbance; (ii) nano-enhanced photocatalytic membranes; and (iii) a continuous-flow disruptive tube-in-tube photocatalytic membrane reactor, irradiated by high energetic efficiency UV/Vis Lamps, presenting low mass- and photon-transfer limitations.

### Collaborations:

Internship - University of Bayreuth - RG Marschall Group

### Publications:

N/A

### Presentations:

N/A