

**Project: New industrial value chains from organic wastes**

**Areas:** Biotechnology/Molecular Biology/ Microbiology

**Supervisor:** Lúgia O. Martins **Co-supervisor:** M Paula Robalo

The goal is the development of multi-enzymatic strategies to produce high-value compounds (e.g. imines or aromatic polymers) from underutilized dye-containing wastewater effluents contributing for the creation of a circular economy and for a smart and efficient use of resources.

Synthetic dyes are xenobiotic compounds that are being increasingly used in several industries, with special emphasis in the paper, textile and leather industries. Over 100,000 commercial dyes exist today and more than  $7 \times 10^5$  tons of dyestuff is produced annually, of which  $1-1.5 \times 10^5$  tons is released into the wastewaters. Among these, azo dyes, characterised by the presence of one or more azo groups (-N=N) represent the largest group of synthetic colourants used in industry and are serious environmental pollutants. We have been involved during the last years in the development of novel strategies for the degradation of synthetic dyes through the use of bacterial oxidoreductive enzymes.<sup>1</sup> In particular, **azoreductases** are particularly effective in the reduction of the azo linkage, using NADH and/or NADPH as an electron donor, and producing aromatic amines. These aromatic amines can be converted into high-added value products by using microbial oxidoreductive enzymes such as **CotA-laccase** or **DyP-peroxidases**.<sup>2,3</sup>

The cooperative and complementar action of multi-enzymatic systems for efficient and selective reactions involved in the degradation and valorization of dye-containing effluents will be investigated. These studies will contribute to design new green catalytic processes.

1.S. Mendes, M. P. Robalo and L. O. Martins, in *Microbial Degradation of Synthetic Dyes in Waste Waters*, ed. S. N. Singh, Springer, 2015, pp. 27-55.

2.A. C. Sousa, M. F. M. M. Piedade, L. O. Martins and M. P. Robalo, *Green Chem.*, 2016, **18**, 6063-6070.

3.A. C. Sousa, M. C. Oliveira, L. O. Martins and M. P. Robalo, *Adv Synth Catal*, 2018, **360**, 575-583.

**Contact:**

Lúgia O. Martins

Microbial and Enzyme Technology Lab

ITQB NOVA, Oeiras

Tel: 214469534,

E-mail: [lmartins@itqb.unl.pt](mailto:lmartins@itqb.unl.pt)

<http://met.itqb.unl.pt/>

1. S. Mendes, M. P. Robalo and L. O. Martins, in *Microbial Degradation of Synthetic Dyes in Waste Waters*, ed. S. N. Singh, Springer, 2015, pp. 27-55.
2. A. C. Sousa, M. F. M. M. Piedade, L. O. Martins and M. P. Robalo, *Green Chem.*, 2016, **18**, 6063-6070.
3. A. C. Sousa, M. C. Oliveira, L. O. Martins and M. P. Robalo, *Adv Synth Catal*, 2018, **360**, 575-583.