



Coordination Chemistry Laboratory of the CNRS, Toulouse, France

<https://www.lcc-toulouse.fr/en/>

Team ALAMBIC

<https://hureaulab.wixsite.com/equipeflcc>

Funded by the french National
Research Agency (ANR)

Supervisor: Dr. Emilie MATHIEU

+33 5 61 33 31 20 / emilie.mathieu@lcc-toulouse.fr

PhD Position

Deadline for application: January 2024

Design of bio-inspired lanthano-peptide catalysts

Keywords: peptide synthesis, lanthanide, luminescence, bio-inorganic chemistry

Project: Lanthanides (Ln) recently joined the family of elements essential to living organisms with the discovery of methylotrophic bacteria relying on Ln(III) for their metabolism [1]. The first Ln-enzyme, a methanol dehydrogenase, and the first Ln-trafficking protein have been identified. In addition to these native Ln-binding proteins, synthetic peptides have been designed using different types of scaffolds, such as lanthanide binding tags [2], lanthanide fingers [3], three stranded coiled coils [4], or short cyclic peptides containing unnatural amino acids [5]. However, the lanthano-peptides developed have never been used in catalysis.

Within the [ALAMBIC](#) team, one of the ongoing research projects is the design of lanthano-peptide catalysts. The objectives of the project are to synthesise peptides with a well-defined structure, high affinity for Ln(III) and to implement positive interactions in the active site for substrate binding. The project will include peptide design and synthesis, characterisations using advanced analytical techniques (paramagnetic NMR, time-resolved luminescence) and molecular modelling, as well as evaluation of Ln-peptide catalysts on model reactions.

Environment: The successful candidate will work in an exciting, dynamic and international environment at the Coordination Chemistry Laboratory of the CNRS in Toulouse, France. The technical and scientific environment in the laboratory and in the host team is of high quality and fully adequate for the realisation of the project. The successful candidate will be trained in advanced spectroscopic techniques such as (paramagnetic) NMR, steady-state and time-resolved emission spectroscopies, and circular dichroism.

Profile: We are looking for a highly motivated student with a background in molecular chemistry and excellent grades. Applicants should have a strong interest in multidisciplinary projects in the field of bio-inorganic chemistry. Experience in organic or peptide synthesis and in spectroscopy would be an added value. In addition, ability to write a scientific report, and strong teamwork skills are required.

Application: Please, send your resume and academic records as well as two references to emilie.mathieu@lcc-toulouse.fr.

References

- [1] a. Daumann, L. J. *Angew. Chem. Int. Ed.* **2019**, *58* (37), 12795-12802; b. Cotruvo, J. A. *ACS Cent. Sci.* **2019**, *5* (9), 1496-1506
- [2] Nitz, M. *Angew. Chem. Int. Ed.* **2004**, *43* (28), 3682-3685
- [3] am Ende, C. W. *Chem. Bio. Chem.* **2010**, *11* (12), 1738-1747
- [4] Slope, L. N. *Angew. Chem. Int. Ed.* **2021**, *60* (46), 24473-24477
- [5] Niedzwiecka, A. *Inorg. Chem.* **2012**, *51* (9), 5458-5464