



CBH Graduate School
Université Grenoble Alpes

Offre de Thèse

UMR- équipe : Département de Chimie Moléculaire – UMR 5250 et Laboratoire Chimie et Biologie des métaux, UMR 5249

Directeurs de thèse : Jennifer K. Molloy, Olivier Sénéque

Début de thèse : 1^{er} octobre 2025

Date de fin de candidatures : 15 avril 2025

Titre: Peptide functionalized responsive lanthanide complexes as bioprobes for CEST imaging (PRECEST)

Description de projet : Chemical Exchange Saturation Transfer (CEST) imaging is a non-invasive technique using magnetic resonance imaging, allowing visualization of any exchangeable protons that exchange with the bulk water signal, generating a contrast. The probing of biological tissue redox status by molecular imaging may lead to detection of oxidative stress, a contributor in several serious illnesses. The lanthanides possess fascinating properties for molecular imaging; long lived luminescence, defined line-like emission bands and are also some of the most paramagnetic elements in the periodic table, perfect for magnetic resonance applications. However, the lanthanides predominantly exist in their +III oxidation state, so they are rarely explored as redox-active probes. Redox active ligands are a fascinating alternative as they concentrate the redox activity in a ligand radical which can then communicate a response via the lanthanide ion. Our team works on redox active ligands capable of communicating their response to the metal ion. The objective of this project is the incorporation of peptide sequences into redox active ligands which will allow systematic study of the interactions between exchangeable protons and their behaviour to be tuned, thus leading to a greater understand of their CEST activity. This project will thus focus on the design and synthesis of new macrocyclic ligands containing peptides with exchangeable protons. The synthesis of macrocyclic ligands containing both radicals and peptide sequences will be performed in a second step to study the potential switch behaviour for redox probes. In depth studies will be performed to study the redox behaviour by electrochemistry and EPR and CEST response will be studied using NMR.

Profil : The PhD fellow will be required to perform the synthesis of Ln^{III} complexes: peptide conjugates (organic and peptide synthesis), their spectroscopic, physicochemical and electrochemical characterization and CEST spectra using NMR.

Modalités : Les candidatures doivent être envoyés à : jennifer.molloy@univ-grenoble-alpes.fr et olivier.seneque@cnrs.fr