Luminescent lanthanide complexes for functional imaging.

Complexes de lanthanide luminescents pour l'imagerie fonctionnelle

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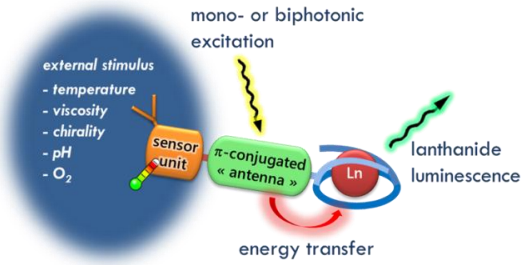
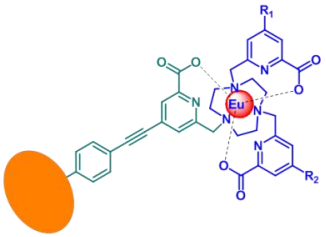
Fluorescence microscopy, enabling to image the intracellular medium, is well suited to probe a local environment without disrupting it. To that aim, our team developed luminescent lanthanide complexes exploiting the peculiar luminescence properties of rare earths (sharp bands covering the whole visible and near infrared spectrum). In particular, previous works were devoted to the design and the study of highly luminescent species sensitized by two-photon excitation, enabling high-resolution tridimensional imaging of cellular medium.[1] It has first required the design of a series of π-conjugated antennas and a clear understanding of the whole sensitization pathway till an efficient excitation of lanthanide ions. Recently, this approach was rewarded by the discovery of a new complex which shows a high sensitivity to the neighboring medium (in particular, oxygen concentration). It enabled an intracellular mapping of the probe luminescence lifetime demonstrating a possible functional imaging.[2]

This first results paved the way to the development of a new class of compounds that could also be sensitive to other biological parameters, such as: temperature, pH, chirality or viscosity. These developments could be rather straightforward with regard to our experience in designing antennas with adjusted spectroscopic properties. Beyond new luminescent bioprobes for imaging, we also expect that such compounds, among the brightest complexes ever reported,[3] could offer applications as precursor for functional materials.

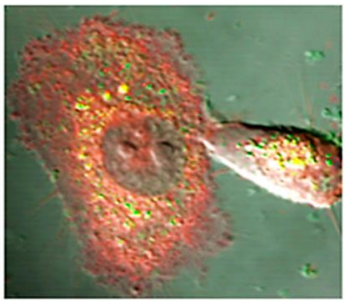
Design of new functional probes



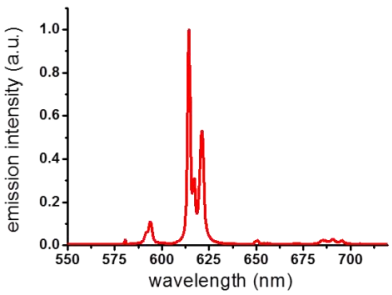
Organic and coordination chemistry



Functional imaging



Photophysical characterization



Candidate profile:

This project will target the development of new lanthanide based probes allowing functional multicolor imaging.[4] The student will have to perform the synthesis of new complexes and will be trained to advanced photophysical characterization. He/she will be involved in external collaboration required for eventual implementation (physic measurements and biological imaging). It thus requires a motivated student with a good knowledge in organic synthesis and a real interest for multidisciplinary subject (chemistry, physics, biology…).

References:

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2. A. T. Bui, A. Grichine, A. Duperray, P. Lidon, F. Riobé, C. Andraud, O. Maury, *J. Am. Chem. Soc.*, **2017,** *139*, 7693-7696.
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4. V. Placide, A. T. Bui, A. Grichine, A. Duperray, D. Pitrat, C. Andraud, O. Maury, *Dalt. Trans.*, **2015**, *44*, 4918-4924.