Luminescent lanthanide complexes for functional imaging.

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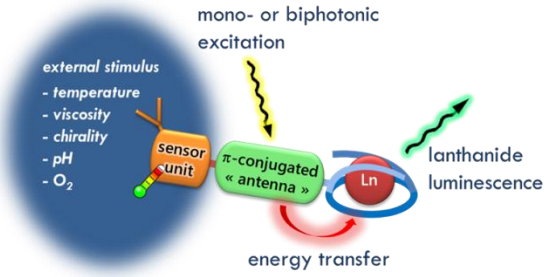
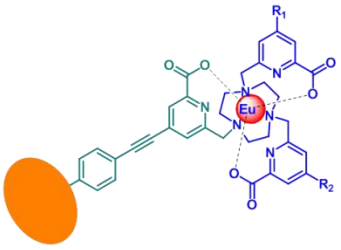
Fluorescence microscopy, enabling to image the intracellular medium, can furthermore be a powerful tool to probe a local environment without disrupting it. To that aim, our team is particularly interested in the development of luminescent lanthanide complexes exploiting the peculiar luminescence properties of rare earths (sharp bands covering the whole visible and near infrared spectrum). In particular, our 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 antennæ, 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 sensitivity to the viscosity of its close neighboring through the rotational motion of its antenna. Then, it enabled us to map the intracellular viscosity using a two-photon microscope.[2]

This premiere 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 oxygen concentration. These developments could be rather straightforward with regard to our knowledge of the design of antenna with adjusted spectroscopic properties. Beyond new luminescent bioprobes for imaging, we also expect that such compounds could offer possible applications as precursor for functional materials.

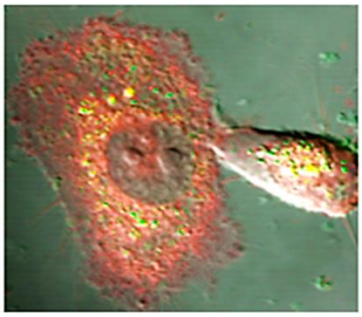
Design of new functional probes



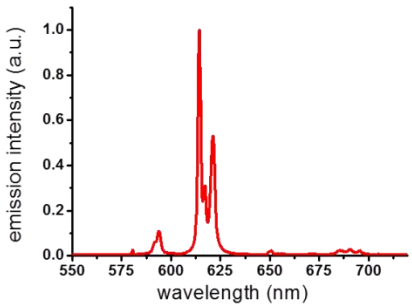
Organic and coordination chemistry



Functional imaging



Photophysical characterization



This project will target the development of new lanthanide based probes allowing functional multicolor imaging.[3] 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 this multidisciplinary subject (chemistry, physics, biology…).

References:

1. A. T. Bui, M. Beyler, Y.-Y. Liao, A. Grichine, A. Duperray, J.-C. Mulatier, B. L. Guennic, C. Andraud, O. Maury and R. Tripier, *Inorganic Chemistry*, **2016**, *55*, 7020-7025; A. T. Bui, A. Grichine, S. Brasselet, A. Duperray, C. Andraud and O. Maury, *Chemistry – A European Journal*, **2015**, *21*, 17757-17761.
2. *Submitted*.
3. V. Placide, A. T. Bui, A. Grichine, A. Duperray, D. Pitrat, C. Andraud and O. Maury, *Dalton Transactions*, **2015**, *44*, 4918-4924.