SORBONNE UNIVERSITÉ

CHINA SCHOLARSHIP COUNCIL

Appel à projets
Campagne 2022
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Title of the research project :

Luminescent optically active coordination complexes with organometallic ligand.

Thesis supervisor (HDR) :

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Code *(ex. UMR xxxx)* : UMR CNRS 8232

Doctorate School

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SORBONNE UNIVERSITÉ

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Subject description (2 pages max):

Chirality is a very important property and occurs in different field of science from chemistry to biology and physics as well.[1]For instance, in chemistry mainly asymmetric organic synthesis, researchers have demonstrated the skills to control the configuration at the tetrahedral carbons, and thus chiral transfer has become a well-established strategy in this area. In contrast however, this is less understood in asymmetric coordination chemistry where control of chirality at the metal center remains a difficult task.[2] Several attempts have been carried out with some success to use chiral auxiliaries in order to transfer the chiral information to the metal center.[3-5]

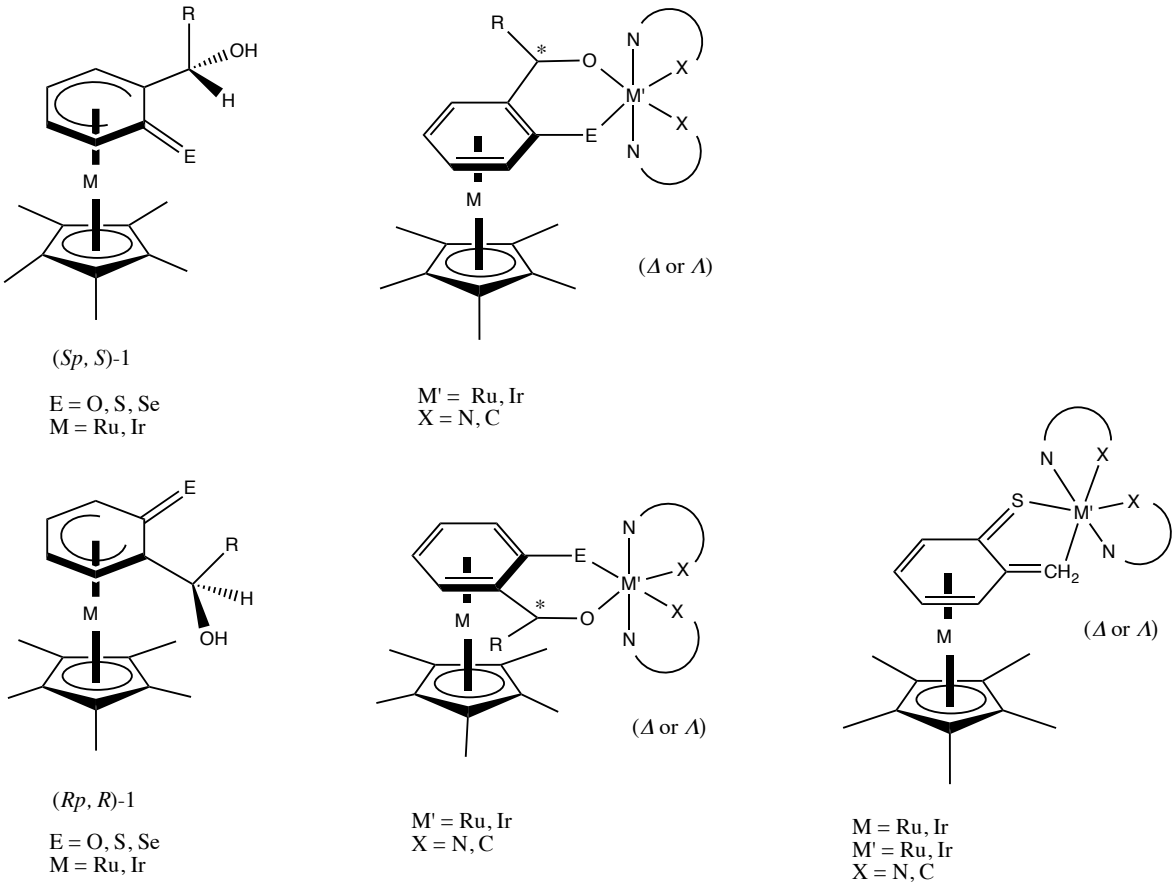

Figure. Optically active organometalloligands and their chiral coordination assemblies to be prepared in this research project.

In this project we present a new method for obtaining luminescent optically active coordination complexes. Indeed, in the laboratory we have developed the synthesis of chiral organometallic ligands (*Sp, S*) -1 and (*Rp, R*) -1 combining centered and planar chirality.[4] These complexes are precursors of π-metallated oxo, thio- and seleno-ligands which can react with metal based luminophores containing bipyridyl ligands (N^N) such as (bpy, phen, …etc) or cylometalated ligands (C^N) such as (ppy, F2ppy… etc) to form optically active heterobimetallic complexes with chirality transfer (see Figure) to the metal center with octahedral configuration. Thus we expect starting with the enantiopure organometallic ligand, a predetermined configuration whether Δ or Λ will occur at the metal center of the octahedral luminophore.

This new approach allows us to obtain enantiopure coordination assemblies with potentially important luminescent properties depending on the nature of the inorganic chromophore. For instance those displaying iridium chromophores should emit in blue-green region, while those containing ruthenium complexes should emit in the near infrared area.[6-7] The aim of this project is the synthesis of optically active organometallic ligands and their use as chiral assembling ligands to prepare coordination assemblies with chirality transfer. Moreover their photophysical properties will be also investigated and studied.

References

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2- H. Amouri, M. Gruselle, *Chirality in Transition Metal Chemistry,* Wiley, Chichester, **2008.**
3- a) E. Meggers, *Eur. J. Inorg. Chem.,* **2011,** 2911. b) L. Zhang, E. Meggers *Acc. Chem. Res.* **2017**, *50*, 320. c) X. Huang, E. Meggers, *Acc. Chem. Res.* **2019**, *52*, 833.
4- J. Dubarle-Offner, M. R. Axet, L. M. Chamoreau, and H. Amouri *Organometallics* **2012**, *31*, 4429.
5- A. Groué, J.-P. Tranchier, M. N. Rager, G. Gontard, M. Jean, N. Vanthuyne, H. R. Pearce, A. L. Cooksy, and H. Amouri. *Inorg. Chem.* **2019**, 58, 2930
6- A. Damas, M. Pia Gullo, M. N. Rager, A. Jutand, A. Barbieri, H. Amouri *Chem. Comm.* **2013**, 49, 3796.
7- J. Moussa, A. Loch, L.-M. Chamoreau, A. Degli Esposti, E. Bandini, A. Barbieri, and H. Amouri *Inorg Chem.* **2017**, 56, 2050.

Profile of the Applicant (skills/diploma…)

The research involved in this thesis required skills in organic and organometallic synthesis and supramolecular chemistry. Characterization will be done using NMR, IR-FT, MS, ESI, and X-ray crystallography. UV-visible and fluorescence spectroscopy will be frequently used. Motivated candidates with master degree and good background with the above skills are encouraged to apply.

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