

Synthesis and reactivity studies of Lanthanide-Iridium heterobimetallic complexes

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As industrialization progresses, the amount of chemical wastes produced goes higher and higher each year [1]. In order to decrease the impact on the environment of those wastes such as carbon monoxide, carbon dioxide or methane there is a need of efficient catalysts able to perform diverse transformations [2].

In this context the strategy we chose to explore is led by the idea of assembling three different entities. On one side, divalent lanthanide complexes which are powerful single electron source [3]. On the other side well-known transition metals from group 9 and 10 to perform simple transformations such as C-O or C-H bond transformation. To link those two metallic entities, we use a redox-active ligand which is able to give or receive electrons from both metals [4]. This leads to well defined heterobimetallic complexes in which the lanthanide part can transmit one electron to the bridging ligand that can then influence the reactivity occurring on the transition metal center [5].

In this Master internship project, the student will be proposed to work on the precise case of Ytterbium-Iridium compounds linked by a 2,2'-bipyrimidine bridging ligand. Some preliminary results obtained in the team got us several interesting thoughts about how to modulate the electronic density given to the transition metal (see Figure 1). We now need to a bit further to see if more analogue compounds can be isolated and then perform reactivity tests.

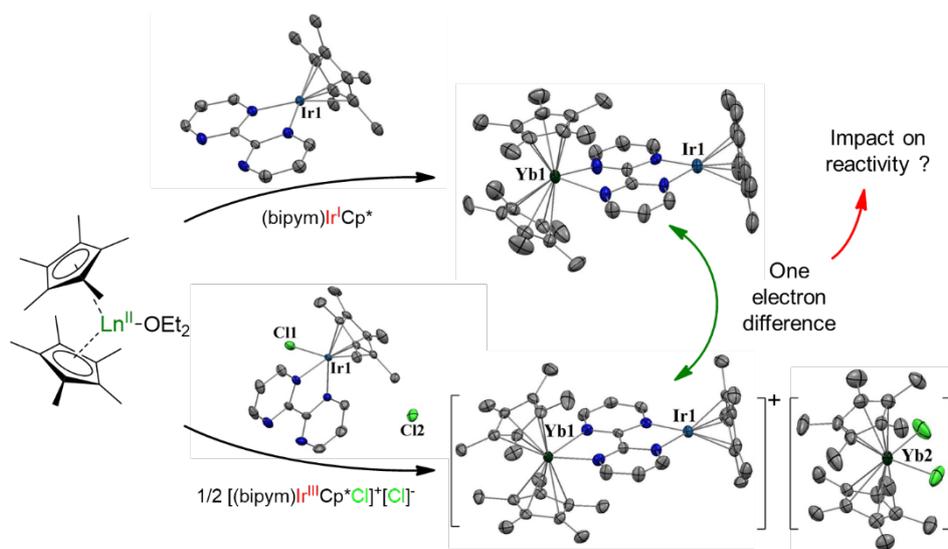


Figure 1: Summary of the synthesis and preliminary results.

The first goal of this project will be first to synthesize the compounds, to characterize them by the means of several spectroscopic tools. This part will permit to the student to (re)discover inert-atmosphere chemistry, paramagnetic NMR spectroscopy, single crystal X-Ray diffraction, UV-Visible and IR spectroscopy or SQUID magnetometry). Then will come the second goal of the internship with the reactivity trials with or without photoactivation of the compounds since the Iridium backbone at stake here has already been found quite reactive under such conditions [6].

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