Circularly Polarized Luminescence and Magneto-Chiral Dichroism in Ytterbium Nanomagnets Involving Helicene Ligands

Fabrice Pointillart,[1] Kais Dhbaibi,[1] Matteo Atzori,[2] Haiet Douib,[1] François Riobé,[3] Bruno Baguenard,[4] Olivier Cador,[1] Boris Le Guennic,[1] Cyrille Train,[2] Jeanne Crassous[1]

[1] Univ Rennes, CNRS, ISCR (Institut des Sciences Chimiques de Rennes) – UMR 6226, F-35000 Rennes, France, email: fabrice.pointillart@univ-rennes1.fr
[2] Univ. Grenoble Alpes, INSA Toulouse, Univ. Toulouse Paul Sabatier, EMFL, CNRS, Grenoble
[3] Univ Lyon, Ens de Lyon, CNRS UMR 5182, Université Claude Bernard Lyon 1, Lyon, France
[4] Univ Lyon, Université Claude Bernard Lyon 1, CNRS, UMR 5306, Institut Lumière Matière, 69622 Lyon, France

The design of non-centrosymmetric molecular magnets is of paramount importance since the absence of an inversion centre leads to efficient coupling of electric fields to the molecular magnetic moment,[1] and to magnetochirality,[2] a non-reciprocal effect that can be harnessed by unpolarised light. Such molecular magnets may combine magnetism with other physical properties displayed independently or in synergy leading to an attractive and unusual example of multifunctional materials merging chiroptical, luminescence, and magnetic properties.[3] Lanthanide ions are able to retain their magnetization in a given direction, thus generating a special class of Single-Molecule Magnet (SMM) thanks to their specific magnetic and optical properties.[4] In this context, we developed two new families of enantiopure Ytterbium complexes based on the inherently chiral helicene ligand[5]. Slow magnetic relaxation, Circularly Polarized Luminescence (CPL) and Magneto-Chiral Dichroism (MChD)[6] were investigated for both mononuclear and one-dimensional compounds (Figure 1). In this communication, the enhancement of the SMM performances and MChD effect in the polymeric structure will be argued thank to the support of ab initio calculations providing a deeper understanding of the underlying factors that govern the physical properties in these multifunctional nanomagnets.

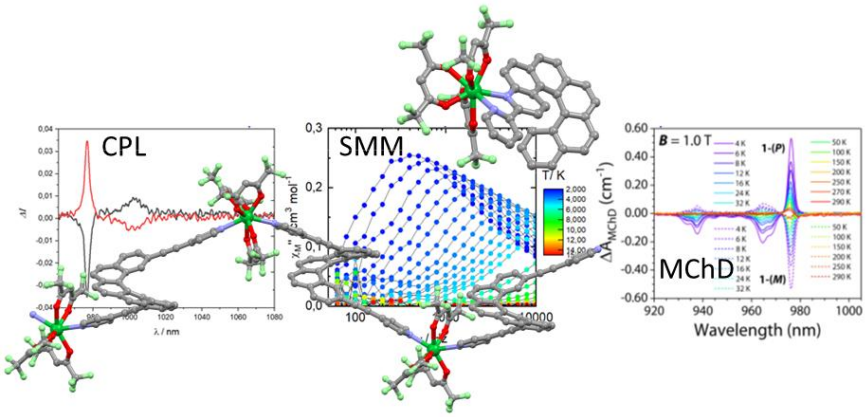

Fig. 1. Development of new multifunctional molecules based on Ytterbium helicene complexes.

References

[1] F. Pop, *et al*., *Chem. Rev*. **119**, 8435 (2019).
[2] G. L. J. A. Rikken, *et al*.; *Nature*. **390**, 493 (1997).
[3] Pointillart, F *et al*., *Inorg. Chem. Front*. **8**, 963 (2021).
[4] D. N. Woodruff *et al*., *Chem. Rev*. **113**, 5110 (2013).
[5] K. Dhbaibi et al., *Chem. Rev*. **119**, 8846 (2019).
[6] M. Atzori *et al*., *J. Am. Chem. Soc*. **143**, 2671 (2021).