LNCMI

LNCMI-Grenoble

Multifunctional molecule-based materials: towards multiferroics

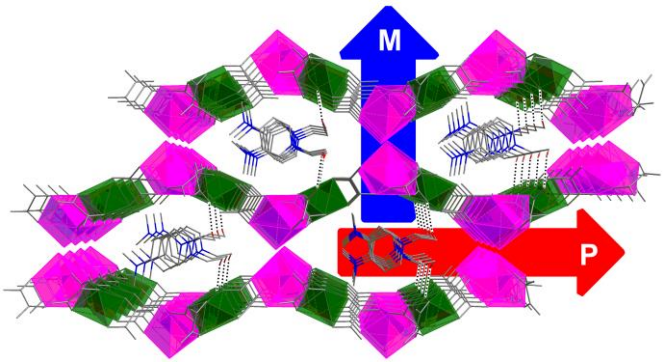
Master 2 Internship subject

Summary *(400 caractères maxi)*

Synthesis and study of materials combining several physical properties is a central topics in molecular magnetism. This subject is synthetically challenging. All the more, the synergy between ferroelectric and ferromagnetic properties is a key issue towards type II multiferroics, which are materials of prime importance for future spintronics applications

Detailed subject *(1200 caractères maxi dont une figure possible)*

Molecular magnetism goes all the way from synthesis of original coordination compounds to the study of their properties by miscellaneous physical methods. It is thus an intrinsically pluridisciplinary and demanding field. Since the early ages, two ligands play a central role in this field: oxalate and cyanide ions. By a proper choice of the building blocks, both allow the synthesis of multifunctional.



Along the years, we have focus our attention on oxalate-based networks. Using an original enantioselective self-assembly technique, we have thus obtained optically active magnets exhibiting magneto-chiral dichroism [1] and magnetisation-induced second harmonic generation [2]. By playing on the counter-ion, when have willingly introduced ferroelectricity in the compound [3]. Owing to their higher Curie temperatures, we intend to extent these possibilities to cyanide-bridged compounds. Moreover, we expect a greater interplay between the ferroelectric and ferromagnetic properties to reach type II multiferroics which are called for future spintronics devices. The work will start from reproducing the synthesis of compounds described in the literature. It will then be extended to other ligands known to favour ferroelectricity.

Publications linked to the theme

[1] C. Train, R. Gheorghe, V. Krstic, L.-M. Chamoreau, N.S. Ovanesyan, G. L. J. A. Rikken, M. Gruselle et M. Verdaguer, Nat. Mater., 2008, 7, 729
[2] C. Train, T. Nuida, R. Gheorghe, M. Gruselle et S.-I. Ohkoshi, J. Am. Chem. Soc. 2009, 131, 16838
[3] E. Pardo, C. Train*, H. Liu, L.-M. Chamoreau, B. Dkhil, K. Boubekeur, F. Lloret, K. Nakatani, H. Tokoro, S. Ohkoshi et M. Verdaguer*, Angew. Chem. Int. Ed. 2012, 51, 8356

Background and skills expected :

Synthesis of ligands and coordination compounds; NMR; IR. Taste for physical measurements

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