Mössbauer under electric fields for the study of magnetoelectric materials

Athanassios Boudalis*[1], Jean-Marc Greneche[2], Nader Yaacoub[2], and Sebastien Nogarotto[2]

[1]Institut de Chimie de Strasbourg – université de Strasbourg, Centre National de la Recherche Scientifique : UMR7177 – 1 rue Blaise Pascal BP 296R8 67008 STRASBOURG CEDEX, France
[2]Institut des Molécules et Matériaux du Mans (IMMM) – Le Mans Université, Institut de Chimie du CNRS, Centre National de la Recherche Scientifique, Centre National de la Recherche Scientifique : UMR6283 – UFR Sciences et Techniques - Le Mans Université - Avenue Olivier Messiaen - 72085 LE MANS Cedex 9, France

Résumé

Magnetoelectric coupling refers to the possibility of controlling the magnetic properties of a material through the application of electric fields, or vice-versa. This has been a property of interest from multiferroic to spin-chiral materials, as it creates a new degree of freedom for their manipulation. Of particular interest in this context are either new techniques that probe such properties, but also the "upgrading" of classical techniques to allow for the inclusion of a new "degree of freedom" in the experimental process.
We have previously undertaken the use of electric fields in Electron Paramagnetic Resonance for the study of the magnetoelectric coupling in the molecular spin triangle (Fe3O(O2CPh)6(py)3)ClO4·py (Fig. 1).1,2 Expanding this to Mössbauer spectroscopy would be of particular interest given the nature of this spectroscopy, since its local-probing character could reveal important information on the magnetic states of individual magnetic ions upon application of an electric field.

In this talk, we will refer to our first attempts to tackle this problem, to experimental complications arising therefrom, and also to some preliminary results.

References

(1) Boudalis, A. K.; Robert, J.; Turek, P. First Demonstration of Magnetoelectric Coupling in a Polynuclear Molecular Nanomagnet: Single-Crystal EPR Studies of (Fe3O(O2CPh)6(Py)3)ClO4·py under Static Electric Fields. *Chem. - Eur. J.* **2018**, *24* (56), 14896–14900. https://doi.org/10.1002/chem.20180303
(2) Robert, J.; Parizel, N.; Turek, P.; Boudalis, A. K. Polyanisotropic Magnetoelectric Coupling in an Electrically Controlled Molecular Spin Qubit. *J. Am. Chem. Soc.* **2019**, *141* (50), 19765–19775. https://doi.org/10.1021/jacs.9b09101.

Mots-Clés: magnetoelectric coupling, molecular magnets

*Intervenant