Spin state photo-switching of Fe(II) Complexes

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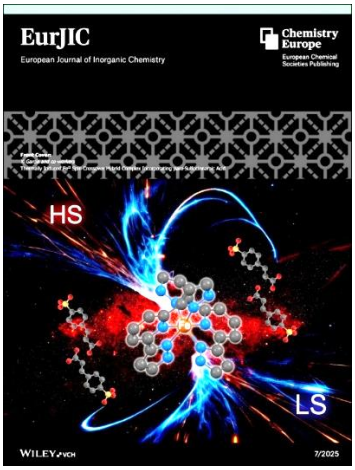
Abstract

Spin crossover (SCO) coordination complexes have attracted great interest during the last thirty years, after their potential use in display devices and electronic computing was proposed. While the SCO phenomenon of these materials can be induced thermally,[1] the possibility to address their spin state by light-irradiation was demonstrated.[2] The so-called Light Induced Excited Spin State Trapping (LIESST) has however shown poorly applicability both in term of ignition temperature and relaxation behaviors. Chemists have therefore developed alternative strategies where an activated complex component can indirectly induce a spin state modification. This refers to the Ligand-Driven Light Induced Spin Change (LD-LISC), the Guest Driven Light Induced Spin Change (GD-LISC), and the recently discovered Anion Driven Light Induced Spin Change (AD-LISC).[3] A photo-responsive non-coordinated anion was inserted in the crystal lattice of a Fe(II) SCO complex, i.e. at a remote location compared to the metallic center, responsible of the spin switching effect. Light induced structural changes occurring in the non-coordinated anion are then expected to induce a spin state change at the metal center.[3] Crystal engineering of Fe(II) SCO complexes is thus needed to secure an effective propagation of long-range effects induced by the anion within the crystal lattice.[4,5]



Recent Publications

1. X. Li, N. E. I. Belmouri, M. Sy, M. Wolff, A. Rotaru, S. van Terwingen, D. Maskowicz, M. Sawczak, R. Jendrzejewski, K. Boukheddaden, Y. Garcia, J. Am. Chem. Soc. 147 (2025) 46608–46620.
2. B. Wang, J. Kfoury, Z. Gong, J. Oláh, L. Zou, S. Xue, Y. Guo, Y. Garcia, J. Am. Chem. Soc. 148 (2026) 4414–4425
3. (a) V. Kumar, A. Rotaru, Y. Garcia, J. Mater. Chem. C 10 (2022) 14128 - 14134. Inside **Front Cover**. (b) V. Kumar, A. C. Ghosh, Y. Draoui, M. Wang, K. Van Hecke, A. Rotaru, Y. Garcia, Eur. J. Inorg. Chem. 28 (2025) e202400753.
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5. M. Wang, Y. Draoui, K. Robeyns, J. Yadav, Z. Han, M. Wolff, D. Maskowicz, A. Rotaru, D. Pinkowicz, M. Sawczak, R. Jendrzejewski, Y. Garcia, Cryst. Growth Des (2026, 10.1021/acs.cgd.5c01701).

Biography

Prof. Yann Garcia develops a new generation of sensors that do not need any thermal activation for various applications in material science and food chemistry using coordination compounds. He obtained his doctorate in Jan. 1999 with the highest distinction at ICMCB-CNRS, and worked as a postdoc in Germany (Universität Mainz) before being appointed at UCLouvain. His team has published more than 300 papers with several cover pages of top chemistry journals, 13 book chapters in Inorganic Chemistry, a Wiley-VCH book on the applications of Mössbauer spectroscopy in chemistry and two patents. h-index = 61 (17561 citations, GScholar, March 2026). He is associate editor of the *Mössb. Eff. Ref. Data J.* (Chinese Academy of Sciences) and *Chem. Synth.* (OAE Pub, China). Since 2007, he chairs the French Speaking Mössbauer Society (gfsm.fr) and is vice chair of the International Mössbauer community (IBAME.org) since 2021. He is the actual president of the FNRS-EDT CHIM doctoral school in supramolecular and functional chemistry. He co-chaired with UMP the Inter. Conf. on Advanced Materials, Nanosciences and Applications (ICAMANA 2019 and 2022) and two training schools on Nanochemistry. He recently organized EDT CHIM 2026 as well as GFSM 2025 about 'Nanochemistry, Hybrid Materials & Molecular Chemistry' where a number of Moroccan scientists contributed, including a chemistry Nobel prize winner.

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