

SPIN STATE SWITCHING IN NON-CENTROSYMMETRIC CRYSTALS

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Chirality is important in magnetism[1] particularly in the development of new non-linear optical (NLO) materials[2] and in spintronic devices with spin polarized electrons.[3] Although the majority of spin crossover (SCO) materials are centrosymmetric, there is growing interest in those which crystallize in non-centrosymmetric enantiomorphic space groups.[4] In some cases this occurs by spontaneous chiral resolution,[5] but in the main, enantiopure SCO samples have been targeted by the use of chiral ligands[6] or chiral anions.[7] Use of an achiral chelating ligand confers chirality at the metal center by twisting around the ion in a clockwise (Δ) or anti-clockwise (λ) fashion and this chelate type is well known in SCO systems including the R-sal₂323 ligand series which promotes thermal spin state switching in Mn^{III}, Figure 1.[5] We discuss here the factors which may be used for enantio-enrichment of SCO crystals, the properties which emerge in spin state ordered systems and potential applications of non-centrosymmetric spin switchable crystals.

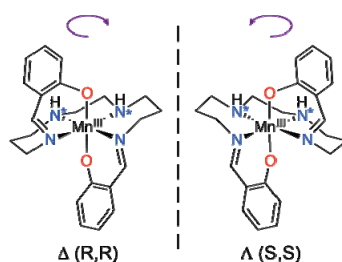


Figure 1. General structure of [Mn^{III}(sal₂323)]⁺ complexes showing the Δ and λ enantiomers. The amine nitrogens of the backbone (*) are chiral centers where the configuration is R,R (Δ) or S,S (λ).

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- [1] M. Atzori, G. L. J. A. Rikken, C. Train, *Chem. Eur. J.* **2020**, *26*, 9784-9791.
- [2] A. Iazzolino, A. Ould Hamouda, A. Naïm, O. Stefánczyk, P. Rosa, E. Freysz, *Appl. Phys. Lett.* **2017**, *110*, 161908.
- [3] R. Naaman, D. H. Waldeck, *J. Phys. Chem. Lett.* **2012**, *3*, 2178-2187.
- [4] O. I. Kucheriv, V. V. Oliynyk, V. V. Zagorodnii, V. L. Launets, I. O. Fritsky, I. A. Gural'skiy, in *Modern Magnetic and Spintronic Materials*, Springer Netherlands, Dordrecht, **2020**, 119-143.
- [5] I. A. Kühne, A. Ozarowski, A. Sultan, K. Esien, A. B. Carter, P. Wix, A. Casey, M. Heerah-Booluck, T. D. Keene, H. Müller-Bunz, S. Felton, S. Hill, G. G. Morgan, *Inorg. Chem.* **2022**, *61*, 3458-3471.