



HAL
open science

Redox Multi-Switch in Trinuclear Co(II) complexes

N Bridonneau, S Delaporte, A Colin, François Lambert, R Guillot, E. Riviere,
Laurent Maron, G Wang, Thayalan Rajeshkumar, Nathalie Guihéry, et al.

► **To cite this version:**

N Bridonneau, S Delaporte, A Colin, François Lambert, R Guillot, et al.. Redox Multi-Switch in Trinuclear Co(II) complexes. ICMM2025 International Conference on Molecular Magnetism, Oct 2025, Bordeaux, France. <hal-05595351>

HAL Id: hal-05595351

<https://hal.science/hal-05595351v1>

Submitted on 17 Apr 2026

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons CC BY-NC-ND 4.0 - Attribution - Non-commercial use - No Derivative Works - International License

#00045

Redox Multi-Switch in Trinuclear Co(II) complexes

N. Bridonneau^{1,*}, S. Delaporte¹, A. Colin¹, F. Lambert¹, R. Guillot¹, E. Rivière¹, L. Maron², G. Wang², T. Rajeshkumar², N. Guihéry³, N. Suaud³, T. Mallah¹.

¹*ICMMO Université Paris Saclay / CNRS - Orsay (France)*, ²*Université de Toulouse INSA / CNRS - Toulouse (France)*, ³*LCPQ Université de Toulouse CNRS - Toulouse (France)*

*Corresponding author(s).

Email: nathalie.bridonneau@universite-paris-saclay.fr (N.Bridonneau)

Main text

Switchable molecules exhibiting reversible changes in their physical properties are highly promising for diverse applications, such as data storage and sensors. Over the last few years, we have developed a family of Ni- and Co-based trimetallic complexes whose magnetic and optical properties can be switched depending on the redox state of the hexahydroxytriphenylene (HHTP) bridging ligand.¹⁻³ This ligand bears three redox-active sites that can undergo reversible oxidation processes from the catecholate (cat) species into semiquinone (sq), and to quinone (q). This study shows the possibility of obtaining different complexes capable of displaying multi-step electronic switching. The magnetic behavior of the molecules is significantly influenced by the redox state of the bridging ligand, particularly by the presence and localization of the radicals, which also affects the coordination sphere of the metal ions. The resulting structural and electronic changes have a profound impact on the spectroscopic properties of the complexes, as shown by the modulations in the UV-vis and near IR spectra. In the particular case of the Co-based trimetallic complexes, careful modifications of the Co coordination sphere enabled to tune the crystal field and to induce valence tautomerism (VT) transitions both in solution and in the solid state. These systems also exhibit electrochromic properties through six reversible one-electron processes.⁴ The precise nature of the multiple redox processes was elucidated thanks to spectro-electrochemical studies and TD-DFT calculations.

References

- [1] Y. Wang, F. Lambert, E. Rivière, R. Guillot, C. Herrero, A. Tissot, Z. Halime and T. Mallah, *Chemical Communications*, 2019, 55, 12336
- [2] N. Suaud, A. Colin, M. Bouammali, T. Mallah, N. Guihéry, *Chemistry a European Journal*, 2024, 30, e202302256

[3] A. Colin, Y. Wang, F. Lambert, N. Bridonneau, N. Suaud, R. Guillot, E. Rivière, Z. Halime, N. Guihéry, S.-i. Ohkoshi, T. Mallah, *Magnetochemistry*, 2024, 10(12), 102

[4] S. Delaporte, F. Lambert, R. Guillot, N. Suaud, N. Guihéry, G. Wang, T. Rajeshkumar, L. Maron, N. Bridonneau, T. Mallah, *submitted*

Valence tautomerism in trinuclear Co(II) complexes

