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Co₁₂Fe₇ magnetic molecular cluster - on the way to control multifunctional discrete molecular materials architecture

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Since their discovery Prussian Blue Analogs (PBAs) have become a driving force for many fruitful discoveries on the route to control the quantum nanoworld [1]. For example study of Co^{II}-Fe^{III}(CN)₆ PBAs resulted in the burst of interest because of its nonmagnetic to magnetic photo-induced transition. Along with the miniaturization tendencies and in connection with Single-Molecule Magnets (SMMs) development, many fascinating discrete molecular materials were discovered i.e. Fe₄Co₂ light induced single molecule magnet [2] or Fe₄Co₄ [3a], Fe₂Co₂ [3b], and FeCo [3c] complexes possessing the metallic core geometry that can be considered as 'slices' of PBAs. We contribute to this unique group of molecules with an unprecedented [Co(1,10-tdapO₂)₂]₆[Co(1,10-tdapO₂)(MeCN)]₆[Fe(CN)₆] (Co₁₂Fe₇) cluster, whose metallic core resembles a part of a unit cell of Co^{II}-Fe^{III}(CN)₆ PBA (Figure 1). This compound contains recently reported redox active [1,2,5]thiadiazolo[3,4-f][1,10]phenanthroline 1,1-dioxide (1,10-tdapO₂) ligand, which makes it a perfect subject for studying the photo-induced energy transfer between metals and ligands within a discrete molecule. Synthesis, structural analysis, and magnetic properties, concluded with foresights for the development of other congeners will be presented.

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