

Discrete unusual mixed-bridged trinuclear $\text{Co}^{\text{III}}_2\text{Co}^{\text{II}}$ and pentanuclear Ni^{II} coordination complexes supported by a phenolate-based ligand: theoretical and experimental magneto-structural study

Autorzy

- Richa
Muni Rathnam
Akhilesh Kumar
Indresh Verma
Julia Kłak
Joan Cano
Antonio J. Mota
Amit Rajput
Himanshu Arora

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Two new complexes $[\text{Co}^{\text{III}}_2\text{Co}^{\text{II}}(\mu\text{-OL})_2(\mu\text{-OOCCH}_3)_2(\mu\text{-N}_3)_2(\text{N}_3)_2]\cdot\text{Et}_2\text{O}$ (**1**·Et₂O) and $[\text{Ni}^{\text{II}}_5(\mu\text{-OL})_4(\mu\text{-OOCCH}_3)_2(\text{OOCCH}_3)_2(\mu\text{-N}_3)_2]\cdot\text{CH}_3\text{CN}$ (**2**) (HOL = 2-((2-(pyridin-2-yl)ethylamino)methyl)phenol) have been synthesized and characterized by elemental analysis, IR, and UV/Vis spectroscopy. Structural analysis revealed that **1** is a discrete trinuclear and **2** is a discrete pentanuclear coordination complex. In complex **1**, terminal metal (Co^{III}) is in a distorted octahedral MN_4O_2 environment where coordination is satisfied by two nitrogen atoms and one oxygen atom of the ligand, and an oxygen atom from the acetate group and two nitrogen atoms from azide (one each from the bridging and terminal ones). The central metal (Co^{II}) is also in a distorted octahedral MN_2O_4 environment where coordination is satisfied by two oxygen atoms from the phenoxo bridge, two oxygen atoms from the acetate bridge and two nitrogen atoms from the azide bridge. In complex **2**, each Ni is in a distorted octahedral $\text{MN}_2\text{O}_4/\text{MN}_3\text{O}_3$ environment where coordination is satisfied by different donor atoms (amine, pyridine, acetate, phenolate and azide). Direct current (DC) variable-temperature magnetic susceptibility measurements on polycrystalline samples of **1**·Et₂O and **2** were carried out in the temperature range of 1.8–300 K. The magnetic behaviour of **1**·Et₂O indicates the presence of magnetic anisotropy of the cobalt(II) ion. The magnetic data of **2** reveal the coexistence of antiferromagnetic and ferromagnetic interactions within the Ni₅ unit. Theoretical calculations made from the crystal structures reveal a very good agreement with the experimental findings.

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