

Comments

Contradicting Reports on Magnetic Properties of Layered Molecule-Based Material $N(n\text{-C}_3\text{H}_7)_4[\text{Fe}^{\text{II}}\text{Fe}^{\text{III}}(\text{C}_2\text{O}_4)_3]$

Day and his co-workers have contributed significantly in understanding the magnetic properties of molecule-based materials $A[\text{M}^{\text{II}}\text{Fe}^{\text{III}}(\text{ox})_3]$ (A = organic cation, M^{II} = transition metal ion, ox = oxalato ligand).¹⁻³ Some of these compounds give rise to a rarely observed negative magnetization phenomenon.^{1,4} However, their detailed published reports on the magnetic properties of $N(n\text{-C}_3\text{H}_7)_4[\text{Fe}^{\text{II}}\text{Fe}^{\text{III}}(\text{ox})_3]$ in three different journals¹⁻³ are contradicting. These contradictions are compared below.

(1) In 1996, Mathoniere et al.¹ reported that $A[\text{Fe}^{\text{II}}\text{Fe}^{\text{III}}(\text{ox})_3]$ materials with $A = N(n\text{-C}_4\text{H}_9)_4^+$ exhibited negative magnetization below 30 K, whereas those with $N(n\text{-C}_3\text{H}_7)_4^+$ and $P(\text{C}_6\text{H}_5)_4^+$ did not.

(2) In 1998, Nuttal and Day² reported that $N(n\text{-C}_3\text{H}_7)_4[\text{Fe}^{\text{II}}\text{Fe}^{\text{III}}(\text{ox})_3]$ showed negative magnetization

phenomena under the same conditions of ref 1, and on this basis, this compound was classified as Néel's N-type ferrimagnet, whereas $P(\text{C}_6\text{H}_5)_4[\text{Fe}^{\text{II}}\text{Fe}^{\text{III}}(\text{ox})_3]$ was classified as Néel's Q-type ferrimagnet, as the latter did not show negative magnetization under similar conditions.

(3) In 1999, Nuttal and Day³ discussed two different chemical methods of obtaining the $A[\text{M}^{\text{II}}\text{Fe}^{\text{III}}(\text{ox})_3]$ materials and the influence of stacking faults during the crystallization process, leading to interlayer disorder in these materials. Here, the authors conjectured that materials with interlayer disorder prevent the negative magnetization phenomena from occurring and this is why $N(n\text{-C}_3\text{H}_7)_4[\text{Fe}^{\text{II}}\text{Fe}^{\text{III}}(\text{ox})_3]$ compound did not exhibit a negative magnetization phenomenon.

Thus, these reports¹⁻³ contain some contradicting results about the magnetic properties of $N(n\text{-C}_3\text{H}_7)_4[\text{Fe}^{\text{II}}\text{Fe}^{\text{III}}(\text{ox})_3]$ material. The authors should explain the reasons behind this contradicting scientific information.

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