

Design and synthesis of heterometallic [Cu^{II}-Dy^{III}] compounds: single molecule magnet (SMM) properties

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Molecular nano magnets are a wide area, which includes antiferromagnetic wheels, single molecule magnets (SMMs) to sing chain magnets (SCMs). The paramagnetic molecules which exhibits a magnetic behavior of intrinsic molecular origin in the absence of a magnetic field are termed as single molecule magnets(SMMs).They have potential application in high density information storage devices to solid states Q-bits in quantum computing, magnetic refrigerant, and in spintronics [1]. Heterometallic complexes are important as magnetic materials which offer the possibility of testing fundamental questions in physics such as slow relaxation of magnetization, quantum tunneling etc. [2]. In this work, new heterometallic Cu^{II}-Dy^{III} complexes containing Schiff base ligand H₅L= N,N'-bis(2,3-dihydroxysalicylene) (2-aminoethyl)-ethane are designed and synthesized. These heterometallic complexes are synthesized form a Schiff base ligand H₅L= N,N'-bis(2,3-dihydroxysalicylene) (2-aminoethyl)-ethane, which is obtained by the condensation of 2, 3-dihydroxybenzaldehyde with diethylenetriamine in the ratio 2:1(Figure 1).

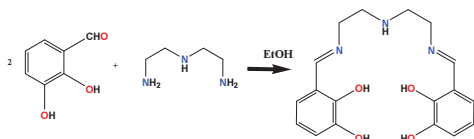


Figure 1: Scheme for ligand H₄L

The heterometallic Cu^{II}-Dy^{III} metal complexes, [Cu^{II}Dy^{III}(HL)(NO₃)₂] (1) and [{Cu(HL)}₂Dy]-2DMF (2) obtained as single crystalline material by reacting Schiff base ligand with Cu(OAc)₂·H₂O, Dy(NO₃)₃·xH₂O in different solvents (Figure 2).

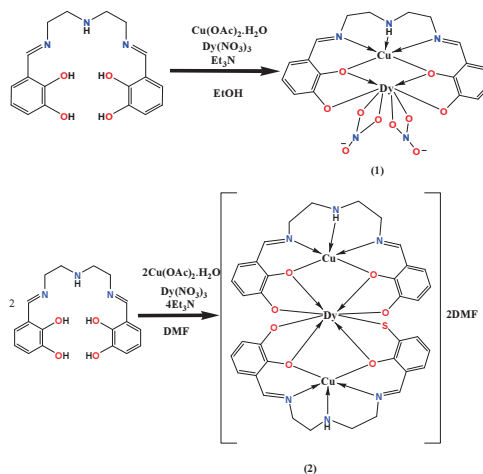


Figure 2: Synthesis of complex (1) and (2)

The ligand and its complexes were characterized by various spectral techniques viz., FT-IR, ¹H-NMR, ESI/MS, UV-Visible, X-ray crystallography etc. Mass spectrometric ion signals related to complexes were detected both in positive and negative in mode *via* electrospray ionization mass spectrometry ascertain the stoichiometry which supports the single X-ray analysis. The magnetic studies shows that the complex (2) behave as single molecular magnet and can manipulate information using the orientation of their molecular spin.

References

1. R. Sessoli, D. Gatteschi, A. Caneschi, M. A. Novak, *Nature*, 365(1993) 141.
2. D. Gatteschi, A. Caneschi, L.Pardi,R. Sessoli, *Science*,284(1999)133.