Magnetic Properties and Crystal Structure of a $Cu^{II}Gd^{III}$ Heterodinuclear Schiff Base Complex

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The crystal structure and the magnetic properties of a heterodinuclear complex, $[LCu(Me_2CO)Gd(NO_3)_3]_2$ (L=N,N'-bis(2-hydroxy-3-methoxybenzylidene)-1,3-diaminopropane) are reported: $[(C_{19}H_{20}N_2O_4)Cu(C_3H_6O)Gd(NO_3)_3]_2$, triclinic, space group $P1$, with $a = 12.118.3(9)$, $b = 13.562(3)$, $c = 9.391(3)$ Å, $\alpha = 93.03(3)$, $\beta = 107.65(2)$, $\gamma = 73.07(2)^\circ$, $V = 1406.0(7)$ Å^3, $Z = 1$. The crystal structure consists of two independent binuclear $Cu^{II}Gd^{III}$ complexes and two non-coordinating acetone molecules in the asymmetric unit. The central region of the complexs is occupied by Cu^{II} and Gd^{III} ions which are bridged by two phenolato oxygen atoms of the ligand. The Cu^{II} ion is in a square-planar geometry and coordinated by four donor atoms of the ligand (N_2O_2). The Gd^{III} ion is deca-coordinated. In addition to the two phenolate oxygen atoms, its coordination sphere contains two oxygen atoms of the OMe side arms of L and six oxygen atoms from the three bidentate nitrate ions. The average Cu···Gd separation is 3.375(2) Å. The χT versus T plots, χ being the molar magnetic susceptibility per $Cu^{II}Gd^{III}$ unit and T the temperature, has been measured in the 4 – 347 K range. The values of the intrachain interaction parameters have been deduced from the magnetic data: $J = 7.4$ cm^{-1}, $g_{Cu} = 2.12$, $g_{Gd} = 2.06$. This indicates a weak ferromagnetic spin exchange interaction between Cu^{II} and Gd^{III} ions. The nature of the magnetic super-exchange interaction of the title compound is compared with similar $Cu^{II}Gd^{III}$ heterodinuclear complexes.

Key words: Heterodinuclear Complex, Copper, Gadolinium, Crystal Structure, Magnetic Properties