Synthesis, Crystal Structure, and Spectroscopic and Magnetic Properties of a Dinuclear Iron(III) Complex Asymmetrically Bridged by a Phenoxo and a Methoxo Group

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A new dinuclear iron(III) derivative $Fe_2L(OCH_3)Cl_2$ (L = 1,3-bis[N-(5-chloro-2-hydroxybenzylidene)-2-aminoethyl]-2-(5-chloro-2-hydroxyphenyl)imidazolidine) has been synthesized, it crystal structure determined and magnetically characterized. The two iron(III) ions are asymmetrically bridged by a phenoxo and a methoxo group and separated by 3.150(2) Å. The magnetic susceptibility of the complex was measured over the range 5 – 349.3 K and the observed data were successfully simulated by the equation based on the spin-Hamiltonian operator $H = -J\vec{S}_1 \cdot \vec{S}_2$, indicating very weak antiferromagnetic coupling between the iron ions with $J = -11.3$ cm^{-1}. The magnetic and structural parameters of the compound and the nature of the magnetic super-exchange interaction are discussed and compared with data of similar dinuclear iron(III) complexes.

Key words: Dinuclear Iron(III) Complex, Super-Exchange Interactions, Antiferromagnetic Coupling, Schiff Base, Imidazolidine