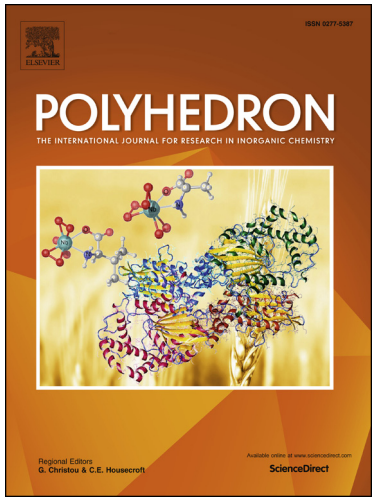

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1, 2, 4-triazole Schiff base directed synthesis of Polynuclear Iron Complexes: investigating the magnetic properties from a dimer to 1D chain to 3D framework

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ABSTRACT

Based on two functionalized Schiff base ligands 4-(1*H*-imidazol-5-ylmethylene-amino)-4H-1,2,4-triazole (imztrz) and 4-(*p*-tolylidene-amino)-*4H*-1,2,4-triazole (toltrz), a series of three triazole based polynuclear Fe complexes has been prepared. Compounds $\{[Fe^{II}(toltrz)_2(C_2O_4)]\cdot 10H_2O\}_n$ (**1**) and $\{[Fe^{II}(5\text{-imztrz})(C_2O_4)]\cdot 2H_2O\}_n$ (**2**) are oxalate bridged Fe^{II} complexes with **1** showing a linear 1D chain structure and **2** exhibiting a zigzag chain based 3D interpenetrating framework. Both structures show rather big voids in the 3D architecture (~ 15% of the crystal volume). Compound $(5\text{-imztrzH})_2[Fe^{III}_2(cit^{4-})_2(H_2O)_2]\cdot 6H_2O$ (**3**) is a binuclear Fe^{III} complex bridging by two citrate ligands to form a face-shared centrosymmetric structure. Magnetic susceptibility measurements indicate that all three compounds show weak antiferromagnetic exchange interaction between the adjacent Fe centers.

1. Introduction

In recent years, interest has grown among chemists to design and synthesize extended 3*d* metal networks based on small chelating anionic ligands such as oxalate and citrate. Particularly, in the field of molecular magnetic materials, [1] oxalato-bridged complexes have been intensively studied because of the versatile ability of the ligand to mediate magnetic coupling between paramagnetic metal centers with a rather large separation (~ 5 Å). [2] Numerous of polynuclear chains and networks have been reported with the oxalate-bridging mode, covering the most common transition metals, like Mn(II), Zn(II), Co(II), Ni(II) and Fe(II), with different co-ligands (pyridine–, triazole– and amine– derivative) involved for the coordination. [3-7] The binuclear iron system was first studied long ago by the pioneers Earnshaw, Lewis and Murray, [8] while there are only few examples with dimeric Fe^{III} citrate complexes reported until now. [9] Success in characterization of polynuclear compounds has been achieved, by the combination of oxalate