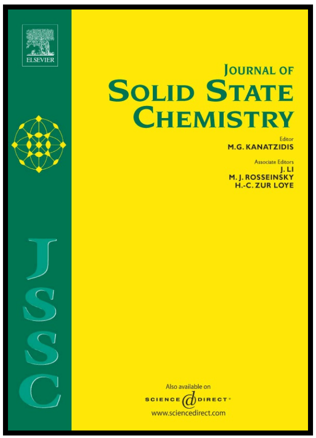

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PII: S0022-4596(18)30176-2
DOI: https://doi.org/10.1016/j.jssc.2018.04.036
Reference: YJSSC20204

To appear in: *Journal of Solid State Chemistry*

Received date: 31 January 2018
Revised date: 26 April 2018
Accepted date: 28 April 2018

Cite this article as: Liming Fan, Lingling Gao, Guohua Ren, Jie Zhang, Liangqin Huo, Xiaoqing Wang, Xiaoyan Niu and Tuoping Hu, Three coordination polymers based on 5-(1H-tetrazol-5-yl)isophthalic acid: Syntheses, structure, magnetic properties, *Journal of Solid State Chemistry,* https://doi.org/10.1016/j.jssc.2018.04.036

Three coordination polymers based on 5-(1H-tetrazol-5-yl)isophthalic acid: syntheses, structure, magnetic properties

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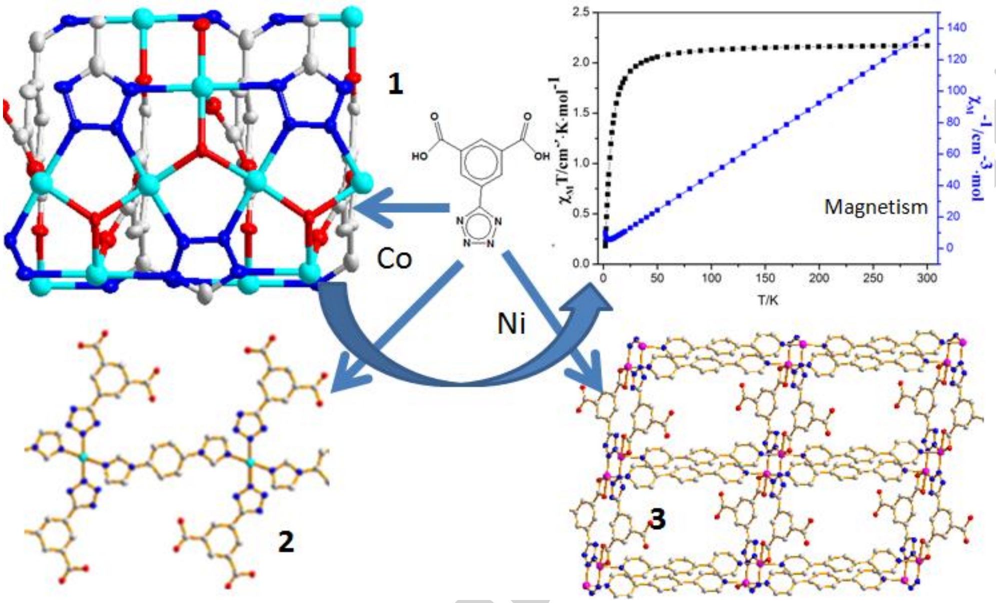
Abstract:

Three novel coordination polymers (CPs), formulated as $[Co_2(TZI)(OH)(H_2O)_2]_n$ (**1**), $\{[Co(H_2TZI)_2(BIB)(H_2O)_2]\cdot(H_2O)_2\}_n$ (**2**), and $[Ni(HTZI)(BPB)(H_2O)]_n$ (**3**) (H_3TZI =5-(1H-tetrazol-5-yl)isophthalic acid, BIB = 1,4-bi(1-imidazolyl)benzene, and BPB =1,4-bi(1-pyridyl)benzene), have been synthesized under hydrothermal methods, using 5-(1H-tetrazol-5-yl)isophthalic acid ligand (H_3TZI) and two different N-donating ancillary ligands. Their structures have been determined by single-crystal X-ray diffraction analysis, elemental analysis (EA), IR spectra (IR), powder X-ray diffraction (PXRD), and thermogravimetric analysis (TGA). X-ray single-crystal diffraction analyses reveal that complex **1** possesses a 2D bilayer structure, complex **2** displays a 3D supermolecular structure with a $Co(H_2TZI)_2$ SBU by H-bond interactions between neighbouring 1D chains, and complex **3** presents a 2D framework with a dinuclear $[Ni_2N_4]^{2+}$ SBU. Furthermore, the magnetic properties of **1**-**3** have been investigated, the results show there are antiferromagnetic interactions between the Co ions in **1** and **2**, and the ferromagnetic interactions between Ni ions in **3**.

Graphical abstract



Synopsis:

Based on 5-(1H-tetrazol-5-yl)isophthalic acid ligand (H_3TZI), three novel coordination polymers (CPs) have been synthesized under hydrothermal methods. Furthermore, the magnetic properties of of title complexes were also investigated.

Keywords: Multidentate carboxylate ligand; N-donating auxilary; Magnetic property.

1. Introduction

The rational construction of metal-organic coordination polymers (CPs) has been of great interest in the field of crystal engineering over the last two decades, not only for their interesting properties relevant to potential applications such as heterogeneous catalysis, gas separation/adsorption, sensing and magnetism, but also for their diverse and easily tailored structures and topologies [1-8]. Among them, the magnetic properties of CPs, which can be fine-tuned by suitable modification of their chemical composition by varying the metal salt and the ligands, have been drawn considerable interest. Here, the coordination modes of the organic linkers and the magnetic exchange pathways can efficiently affect the magnetic properties of CPs. But it is difficult and a great challenge to construct CPs with interesting properties and topologies. The reasons are the structural assembly process of CPs has something to do with the organic ligands, the nature of the central metal ions, solvents, the metal-to-ligand ratio, pH and reaction temperature, and so on [9]. Of these, organic linkers play a vital role in the syntheses of CPs. In general, the use of aromatic multidentate organic ligands containing tetrazolate and carboxyl groups is an interesting synthetic strategy, on the one hand, multicarboxylic groups not only connect several metal ions to increase the nuclear density of the compounds and to expand the spatial dimensions of the CPs [10] but also can transmit magnetic interactions between the paramagnetic ions [11]. On the other hand, the carboxyl groups can also form strong hydrogen bonds to stabilize coordination polymers or to assemble low-dimensional coordination networks into high-dimensional CPs. Furthermore, four electrondonating nitrogen atoms of its