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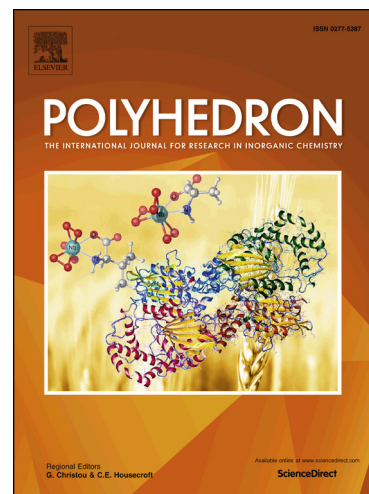
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Coordination polymers of transition metal diphosphonates: synthesis, crystal structure and magnetic behaviour

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Abstract

Five new transition metal coordination polymers: $[\text{Cu}_2\text{L}(4,4'\text{-bipy})(\text{H}_2\text{O})_{0.5}]$ (**1**), $[\text{Cu}(\text{H}_2\text{L})\text{H}_2\text{O}]$ (**2**), $[\text{Cd}_2(\text{H}_2\text{L})_2\text{H}_2\text{O}]$ (**3**), $[\text{Co}_2\text{L}(\text{H}_2\text{O})_2]\cdot 0.184\text{H}_2\text{O}$ (**4**), $[\text{Fe}_3\text{L}_2(\text{OH})(\text{H}_2\text{O})_3]\cdot 2\text{H}_2\text{O}$ (**5**) ($\text{H}_4\text{L} = 4\text{-CH}_3\text{-C}_6\text{H}_4\text{CH}_2\text{N}(\text{CH}_2\text{PO}_3\text{H}_2)_2$), were obtained through hydrothermal reactions. The complexes have been characterized by IR, elemental analysis, TGA and XRD. Crystal structure analysis reveals that all of **2-5** contain 2D inorganic layer structures, constructed by the coordination interactions between metal ions and phosphonate oxygen atoms. 4,4'-bipy molecules in **1** act as a bridging ligand to connect the adjacent 2D layers into a 3D framework. Moreover, magnetic properties of the complexes have been quantitatively investigated by the classical spin approximation and PHI software program, revealing that **2**, **4** and **5** exhibit antiferromagnetism, while **1** shows ferromagnetism.

Keywords: Crystal structure; Diphosphonate; Magnetic studies; PHI

1. Introduction

Metal-organic coordination polymers have attracted growing interest in recent years owing to their intriguing architectures and potential applications in catalysis [1, 2], gas storage [3, 4], magnetism [5-7] and so on [8, 9]. Compared with the coordination polymers derived from carboxylic acids, metal organic phosphonates exhibit higher thermal and chemical stability due to their strong interactions between $[\text{CPO}_3]$ units and metal ions [10, 11]. The known crystallographic structures of the metal phosphonates show that the diphosphonic acid ligands can coordinate with metal ions

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