Synthesis, spectroscopic characterizations and X-ray structural studies of new one-dimensional Co(II) Cu(II) and Zn(II) coordination polymers containing benzoato and 4,4′-bipyridine ligands

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Abstract: Three new 1D coordination polymers formulated as \{[Co(\text{benz})(4,4′-bpy)\text{H}_{1.5}(\text{H}_2\text{O})]\}NO_3\text{H}_2\text{O}]_n \text{(I)}, \{[\text{Cu}(\text{benz})(4,4′-bpy)\text{H}_{1.5}(\text{H}_2\text{O})]\}NO_3\text{H}_2\text{O}]_n \text{(II)} and \{[\text{Zn}(\text{benz})(4,4′-bpy)(\text{H}_2\text{O})]\}NO_3\text{H}_2\text{O}]_n \text{(III)} (where \text{benzH} = \text{benzoic acid and 4,4′-bpy} = 4,4′-\text{bipyridine}), have been prepared by reactions of metal(II) nitrate, 4,4′-bpy and benzH in the mole ratio of 1:1:1. All compounds were characterized by means of infrared spectroscopy, UV-Vis spectroscopy, powder and single crystal X-ray diffraction. Compounds I and II are isomorphous and in the monoclinic space group \text{P2}_1/c. Both compounds feature a 1D ladder chain in which the metal(II) centres adopt a trigonal bipyramidal geometry constructing from two \text{N} atoms of two different 4,4′-bpy molecules, two \text{O} atoms of a benz molecule and one \text{O} atom from coordinated water molecules. Compound III is a 1D zigzag chain, where each Zn(II) ions are connected by 4,4′-bpy bridging ligand along the crystallographic \text{b} axis with the Zn⋯Zn separation of 11.21 Å.

Keywords: 1D Coordination polymers; Benzoato; 4,4′-Bipyridine; Ladder chain; Zigzag chain