Two novel cadmium(II) coordination polymers constructing from benzene-1,3-dicarboxylato ligands: Synthesis, characterization, crystal structure and fluorescent sensing properties

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Abstract: Two Cd²⁺ multidimensional coordination polymers namely \([\text{Cd} \text{Na}_2(1,3\text{-bdc})_2(\text{H}_2\text{O})_2(\text{DMF})]_n (I) \) and \(\{\text{Cd}(1,3\text{-bdc})_2(\text{DMF})\} \cdot \text{DMF} \cdot 2\text{H}_2\text{O}\}_n (II)\) (where 1,3-bdcH₂ = benzene-1,3-dicarboxylic acid) have been successfully synthesized by using direct preparation with the same condition of \(\text{Cd(NO}_3)_2 \cdot 4\text{H}_2\text{O}, 1,3\text{-bdcH}_2\) and \(\text{NaOH}\) reactants and spectroscopically characterized. The X-ray structure of both compounds have been determined by means of single-crystal X-ray diffraction technique. Compound I is a three-dimensional Cd²⁺–Na⁺ heterobimetallic coordination polymer. The Cd²⁺ atom exhibits a seven-coordinate geometry, while the Na⁺ atoms can be considered to be pentacoordinate. The metal ions and their symmetry-related equivalents are connected via chelating–bridging carboxylate groups of 1,3-bdc ligands to generate a three-dimensional framework. While, compound II presents two-dimensional square grid network, constructing from the connection of trinuclear Cd²⁺ SBU s by 1,3-bdc linkers in crystallographic ab plane. Each Cd²⁺ ion in trinuclear SBU s is six-coordinate geometry. The optical sensing properties for small organic solvent molecules of compound I have been investigated. Interestingly, compound I presents fluorescent quenching signal and selective for acetone.

Keywords: Cd²⁺ coordination polymers; Cd²⁺–Na⁺ heterobimetallic; Benzene-1,3-dicarboxylic acid; Multidimensional structure; Fluorescent properties