

MS37-P12 Reticular Synthesis and Structural Trends of Novel Cd(II) Coordination Polymers Based on N-donor Bridging Ligand

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The rational design and syntheses of coordination polymers have attracted great attention from chemists not only because of their intriguing structural diversities and aesthetical topologies but also due to their interesting properties and potential applications as functional materials in gas storage/separation, heterogeneous catalysis, magnetism, photochemistry [1-4], since the bulk properties of these materials are closely related to their structures, it is important to understand the factors such as coordination geometries of metal ions and the resulting secondary inorganic building blocks, spatial arrangements of organic building blocks, interpenetration, anions and solvents, which control their topologies. Taking the above discussion into account, in this study, we have systematically investigated construction, structural and property feature comparison of some new coordination polymers composed of a long and rigid N-donor, bipyridine, linker ligand (L) towards CdX₂ (X = CH₃COO⁻, I⁻, ...). The X-ray crystallography results display considerable structural differences in Cd (II) geometry. It includes one-dimensional ladder like polymeric chains with seven coordination numbers for Cd (II) metal center in the present of acetate anion, meanwhile, the tetrahedral geometry with zigzag chains have been seen with Iodide one.

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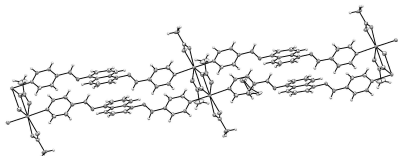


Figure 1. One dimensional structure of [Cd(L)(OAc)₂]

Keywords: Coordination polymer, Bridging Ligand, Cadmium salts, X-ray Crystallography

MS37-P13 A Flexible Interpenetrated pcu Coordination Network Formed by Mixed Ligands

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Abstract: Metal-organic materials (MOMs), also known as porous coordination polymers (PCPs) or metal-organic frameworks (MOFs), are receiving attention thanks to their amenability to design and properties [1, 3]. The pore size and chemistry of MOMs makes them excellent candidates for applications in storage, separation, sensing, and catalysis [2]. Flexible MOMs can exhibit behavior such as swelling, stepwise uptake, gate-opening and breathing which can be induced by stimuli such as solvent, pressure, heat and light [4, 5]

Here, we report a two, three-fold interpenetrated pcu network with general formula [Zn₄(L₁)₄(L₂)₂]:DMF (L₁=1,4-bis(4-carboxyphenyl)benzene; L₂=1,4-bis(4-pyridyl)benzene), or L₂=3,6-Di(4-pyridinyl)-1,2,4,5-tetrazine) based on axially coordinated zinc "paddle-wheels", that exhibits dynamic structural transformations induced by guest incorporation and removal. X-ray structures highlight the highly flexible nature of the framework and reveal that phase transformations involve the movement or rotation of the biphenylene dicarboxylate ligands. The coordination geometry of a zinc paddle-wheel unit is considerably changed without bond breakage.

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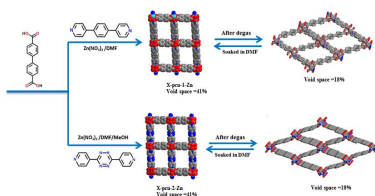


Figure: (a) and (b) An illustration of the interpenetrated pcu nets formed by Zn (II) and reversible phase transformations induced by guests.

Figure 1. (a) and (b) An illustration of the interpenetrated pcu nets formed by Zn (II) and reversible phase transformations induced by guests.

Keywords: Flexible, Interpenetrated, pcu

MS38 Nanomaterials & graphene

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MS38-P1 Synthesis of Ag@SiO₂ nanorattles for controlled Ag⁺ release

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Medical progress and an ageing world population have led to an increasing use of foreign materials inside the human body. Consequently also the number of infections related to these implants has grown significantly.¹ Antimicrobial coatings that prevent the formation of infectious biofilms on the surface of the implants could make an important contribution to overcome that issue. Silver is known for its good antimicrobial and biocompatible properties and could thus play an important role in the fight against implant infections, especially if they are caused by antibiotic resistant bacteria.²

This project investigates Ag@SiO₂ nanorattles as antimicrobial agent for implant coatings. These nanoparticles are characterized by a void between a silica shell and a Ag nanoparticle as cargo.³ The silica shell protects the Ag cores from aggregation and prolongs the release of the antimicrobial active Ag⁺ ions. Moreover it provides reactive sites to functionalize the nanocontainers in order to attach them covalently to implant surfaces or to incorporate them into polymer materials.

We have developed two different synthetic routes to Ag@SiO₂ nanorattles of different sizes. The microemulsion method⁴ gives access to nanorattles with a diameter of ca. 25 nm (Fig. 1, top) that were evaluated for their Ag⁺ release properties, antimicrobial potential and for their impact on cells of the immune system.⁵

The second synthetic approach is based on the coating of Ag nanoparticles with silica under classical Stöber conditions followed by a surface protected etching protocol⁶. This results in Ag@SiO₂ nanorattles with a diameter of ca. 80 nm (Fig. 1, bottom). Cytotoxicity tests showed a good biocompatibility. Their antimicrobial efficiency is currently under investigation.

Silver-containing silica nanorattles thus fulfill several requirements for the development of novel antibacterial nanocoatings on biomaterial surfaces.

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