

Aliphatic dicarboxylate directed assembly of silver(I) 1,3,5-triaza-7-phosphaadamantane coordination networks : topological versatility and antimicrobial activity.

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Streszczenie

The present work describes the facile synthesis, full characterization, and architectural diversity of three new bioactive silver-organic networks, namely 1D $[\text{Ag}_2(\mu\text{-PTA})_2(\mu\text{-suc})]_n \cdot 2n\text{H}_2\text{O}$ (**1**), 2D $[\text{Ag}_2(\mu\text{-PTA})_2(\mu_4\text{-adip})]_n \cdot 2n\text{H}_2\text{O}$ (**2**), and 3D $[\text{Ag}_2(\mu_4\text{-PTA})(\mu_4\text{-mal})]_n$ (**3**) coordination polymers, generated via a mixed-ligand strategy using PTA (1,3,5-triaza-7-phosphaadamantane) as a main building block and flexible aliphatic dicarboxylic acids (succinic (H_2suc), adipic (H_2adip), or malonic (H_2mal) acids) as an ancillary ligand source. The compounds **1–3** were isolated as moderately air and light stable crystalline solids and were fully characterized by IR and ^1H and $^{31}\text{P}\{^1\text{H}\}$ NMR spectroscopy, elemental analysis, ESI($\pm$)-MS spectrometry, and single-crystal X-ray crystallography. The type of aliphatic dicarboxylate plays a key role in defining the dimensionality and structural and topological features of the resulting networks, which are also driven by the PTA blocks that adopt unconventional N,P- or N_3P -coordination modes. The topological analysis of simplified underlying nets revealed that **1** possesses uninodal 3-connected chains with the SP 1-periodic net (4,4)(0,2) topology, **2** features a uninodal 4-connected layer with the skl topology, and **3** reveals a uninodal 4-connected metal–organic framework with the dia topology. The presence of the crystallization water molecules in polymers **1** and **2** gives rise to the extension of their metal–organic structures into 3D (**1**) or 2D (**2**) H-bonded networks that disclose rather rare topologies. All of the obtained silver(I) coordination polymers feature solubility in water ($S_{25\text{ }^\circ\text{C}} \approx 3\text{--}5\text{ mg mL}^{-1}$) and show significant antibacterial and antifungal activity against the selected strains of Gram-negative (*Escherichia coli*, *Pseudomonas aeruginosa*) and Gram-positive (*Staphylococcus aureus*) bacteria and yeast (*Candida albicans*).

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