

Silver(I) Coordination Polymers: From Mechanosynthesis and Structural Features to Bioactivity

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Rok wydania

2026

Czasopismo

Crystal Growth and Design

Strony

1-11

DOI

10.1021/acs.cgd.6c00023

Kolekcja

Naukowa

Język

Angielski

Typ publikacji

Artykuł

Streszczenie

The design of bioactive coordination polymers represents an important research direction in crystal engineering and materials chemistry for combatting antimicrobial resistance. In this study, two new silver(I) coordination polymers (CPs), $[Ag_2(PTA=S)_2(tpa)]_n \cdot nH_2O$ (**1**) and $[Ag_2(PTA=S)_2(Hcda)_2]_n \cdot nH_2O$ (**2**), were assembled from 1,3,5-triaza-7-phosphaadamantane-7-sulfide (PTA=S) and two types of carboxylic acid linkers, namely terephthalic (H_2tpa) or 1,4-cyclohexanedicarboxylic (H_2cda) acids. The syntheses were conducted via mechanochemical approach known as liquid-assisted grinding (LAG) or via solution self-assembly. The compounds were isolated as crystalline solids with distinct 3D (**1**) or 1D (**2**) coordination polymer structures constructed from the 1D $\{Ag_2(\mu_3-PTA=S)_2\}^{2+}$ chain motifs. The crystal structures of **1** and **2** feature the fsx/I and SP 1-periodic net (6,3)(0,2) topologies, respectively. Antimicrobial assays demonstrate the antimicrobial potential of **1** toward HAdV-C5 (human adenovirus type 5) and HSV-1 (herpes simplex virus type 1) with virus titer reduction values of 3log; (99.9%) and 3.5log (99.95%), respectively. Both compounds **1** and **2** also inhibit the growth of Gram-positive (*S. aureus*) and Gram-negative (*E. coli*, *P. aeruginosa*) bacteria and yeast with the MIC values in the range of 20–50 $\mu g\ mL^{-1}$. In addition, **1** and **2** exhibit remarkable antiproliferative activity on A549 (human lung cancer) and LM-MEL-75 (human melanoma) cells (EC_{50} of 1 $\mu M/mL$ and 9.45 $\mu M/mL$, respectively) with lower cytotoxicity of **1** ($EC_{50} > 100\ \mu M/mL$) to normal human dermal fibroblast (NHDF) cells. This study widens the family of bioactive CPs with highly promising antimicrobial and antiproliferative behavior.

Słowa kluczowe

Toxicity, Cells, Ligands, Antimicrobial agents, Silver

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<http://dx.doi.org/10.1021/acs.cgd.6c00023>

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