

Silver Coordination Polymers Driven by Adamantoid Blocks for Advanced Antiviral and Antibacterial Biomaterials

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Streszczenie

The development of sustainable biomaterials and surfaces to prevent the accumulation and proliferation of viruses and bacteria is highly demanded in healthcare areas. This study describes the assembly and full characterization of two new bioactive silver(I) coordination polymers (CPs) formulated as $[\text{Ag}(\text{aca})(\mu\text{-PTA})]_n \cdot 5n\text{H}_2\text{O}$ (**1**) and $[\text{Ag}_2(\mu\text{-ada})(\mu_3\text{-PTA})_2]_n \cdot 4n\text{H}_2\text{O}$ (**2**). These products were generated by exploiting a heteroleptic approach based on the use of two different adamantoid building blocks, namely 1,3,5-triaza-7-phosphaadamantane (PTA) and 1-adamantanecarboxylic (Haca) or 1,3-adamantanedicarboxylic (H_2ada) acids, resulting in the assembly of 1D (**1**) and 3D (**2**). Antiviral, antibacterial, and antifungal properties of the obtained compounds were investigated in detail, followed by their incorporation as bioactive dopants (1 wt %) into hybrid biopolymers based on acid-hydrolyzed starch polymer (AHSP). The resulting materials, formulated as **1**@AHSP and **2**@AHSP, also featured (i) an exceptional antiviral activity against herpes simplex virus type 1 and human adenovirus (HAd-5) and (ii) a remarkable antibacterial activity against Gram-negative bacteria. Docking experiments, interaction with human serum albumin, mass spectrometry, and antioxidation studies provided insights into the mechanism of antimicrobial action. By reporting these new silver CPs driven by adamantoid building blocks and the derived starch-based materials, this study endows a facile approach to access biopolymers and interfaces capable of preventing and reducing the proliferation of a broad spectrum of different microorganisms, including bacteria, fungi, and viruses.

Język

Angielski

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