Design of silver(I)-PTA coordination polymers through controlled N, P-coordination of 1,3,5-triaza-7-phosphaadamantane (PTA) with arylcarboxylates.

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Streszczenie

Self-assembly reactions of silver(I) nitrate with 1,3,5-triaza-7-phosphaadamantane (PTA) as a main ligand and linker, and various benzenecarboxylic acids [benzoic (Hba), 4-cyanobenzoic (Hcba), 2-aminobenzoic (Haba), or terephthalic (H_2tpa) acid] as ancillary ligand sources, provide the first general synthetic entry toward the controlled N,P-coordination mode of PTA, giving rise to the new series of coordination polymers $[Ag(ba)(\mu\text{-PTA})]_n$ (**1**), $[Ag(\mu\text{-cba})(\mu\text{-PTA})]_n \cdot 5n H_2O$ (**2**), $[Ag(\mu\text{-aba})(\mu\text{-PTA})]_n \cdot 3n H_2O$ (**3**), and $[Ag_2(\mu_4\text{-tpa})(\mu\text{-PTA})_2]_n \cdot 2n H_2O$ (**4**). They have been isolated as air- and light-stable crystalline solids, characterized by IR and NMR spectroscopies, and elemental and single crystal X-ray diffraction analyses, which feature the generation of infinite PTA-driven 1D or 2D metal−organic networks composed of various Ag-benzenecarboxylate nodes and PTA linkers. A crucial synthetic and architectural defining role is played by the ancillary benzenecarboxylate ligand, a slight modification of which allows design of topologically distinct coordination networks that vary from 1D zigzag (in **1**), ladder-like (in **2**), and tubular-like (in **3**) chains to 2D gridlike undulating nets (in **4**). Weak agostic interactions are observed between the CH groups of the ancillary ligands (in **1**) or the methylene groups of PTA (in **2** and **4**) and the silver(I) center. The metal−organic chains of **2** and **3** also act as host matrices for intercalated guest water molecules, which are associated by multiple H-bonds into infinite 2D $\{(H_2O)_{11}\}_n$ wavelike layers (in **2**) or discrete $(H_2O)_3$ clusters (in **3**), resulting also in further extension of silver−organic hosts to 3D supramolecular frameworks. Compounds **1**−**4** widen the very limited family of PTA-driven coordination polymers, representing also the first heteroligand coordination compounds that simultaneously bear PTA and carboxylate ligands.