Copper(i) iodide complexes derived from *N*-alkyl-1,3,5-triaza-7-phosphaadamantanes; synthesis, crystal structures, photoluminescence, and identification of the unprecedented $\{Cu_3I_5\}^{2-}$ cluster.

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Streszczenie

The new luminescent mononuclear $[CuI(PTA\text{-}Me)_3](I)_3$ (**1**) and $[CuI(PTA\text{-}Et)_3](I)_3$ (**2**) and trinuclear $[Cu_3I_2(\mu\text{-}I)(\mu_3\text{-}I)_2(PTA\text{-}Pr)_2]$ (**3**) copper(I) complexes have been easily prepared, in aqueous medium and at ambient conditions, from copper(II) nitrate and *N*-methyl-, *N*-ethyl-, and *N*-propyl-1,3,5-triaza-7-phosphaadamantane iodides [PTA-R]I (R = Me, Et, *n*Pr), respectively. They have been fully characterized by IR, ^{1}H and ^{31}P NMR spectroscopies, FAB-MS$^+$, and elemental and single-crystal X-ray diffraction analyses, the latter featuring a novel type of tricopper iodide $\{Cu_3I_2(\mu\text{-}I)(\mu_3\text{-}I)_2\}^{2-}$ cluster. Compounds **1**, **2**, and **3** exhibit distinct photoluminescence in the solid state, DMSO solution, and frozen glass, thus extending to copper centers the application (previously limited to only Au complexes) of 1,3,5-triaza-7-phosphaadamantane (PTA) or any of its derivatives toward the preparation of luminescent organometallic materials. In addition, complex **3** widens the cluster chemistry of PTA, providing the first example of a metal halide cluster bearing a cage-like PTA core.

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