Dinuclear copper(II) complexes with Schiff bases derived from 2-hydroxy-5-methylisophthalaldehyde and histamine or 2-(2-aminoethyl)pyridine and their application as magnetic and fluorescent materials in thin film deposition.

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Streszczenie

Two Cu(II) complexes, 1 and 2, with tridentate Schiff bases derived from 2-hydroxy-5-methylisophthalaldehyde and histamine HL1 or 2-(2-aminoethyl)pyridine HL2, respectively, were obtained and characterized by X-ray crystallography, spectroscopic (UV-vis, fluorescence, IR, and EPR), magnetic, and thermal methods. Despite the fact that the chelate formed by the NNO ligand donors (C26-C25H2-C24H2-N23=C23H-C22-C19Ph(O1)-C2(Ph)-C3H=N3-C4H2-C5H2-C6 fragment) are identical, as well as the synthesis of Cu(II) complexes (Cu:L = 2:1 molar ratio) was performed in the same manner, the structures of the complexes differ significantly. The complex 1, {[Cu2(L1)Cl2]2[CuCl4]}·2MeCN·2H2O, consists of [Cu2(L1)Cl2]+ units in which Cu(II) ions are bridged by the HL1 ligand oxygen and each of these Cu(II) ions is connected with Cu(II) ions of the next dimeric unit via two bridging Cl− ions to form a chain structure. In the dinuclear [Cu2(L2)Cl3]□0.5MeCN complex 2, each Cu(II) is asymmetrically bridged by the ligand oxygen and chloride anions, whereas the remaining chloride anions are apically bound to Cu(II) cations. In contrast to the complex 1, the square-pyramidal geometry of the both Cu(II) centers is strongly distorted. The magnetic study revealed that antiferromagnetic interactions in the complex 2 are much stronger than in the complex 1, which was corresponded with magneto-structural examination. Thin layers of the studied Cu(II) complexes were deposited on Si(111) by the spin coating method and studied by scanning electron microscopy (SEM/EDS), atomic force microscopy (AFM), and fluorescence spectroscopy. The Cu(II) complexes and their thin layers exhibited fluorescence between 489–509 nm and 460–464 nm for the compounds and the layers, respectively. Additionally, DFT calculations were performed to explain the structures and electronic spectral properties of the ligands.

Słowa kluczowe

Schiff bases, dicopper complexes, magnetic properties, DFT, EPR, fluorescience, thin layer

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