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Copper(II) complexes with substituted imidazole and chlorido ligands: X-ray, UV-Vis, magnetic and EPR studies and chemotherapeutic potential.

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Crystal structures, UV–Vis and EPR spectra and magnetic properties of four copper(II) complexes with chloride anions and alkyl derivatives of imidazole: 4-methylimidazole, 2-ethylimidazole, 2-isopropylimidazole and 2-ethyl-4-methylimidazole are described. A comparison of structures of these compounds in the solid state and methanolic solution is performed. In the solid state three of the complexes are mononuclear and one complex with 2-ethylimidazole is binuclear with bridging chlorido ions. The geometries of the complex ions in crystals depend on the position and size of the alkyl substituents in the imidazole ligands. UV–Vis spectra of the methanolic solutions of the complexes show LMCT bands characteristic for the presence of Cu–N(imidazole) and Cu–Cl coordination bonds. The visible part of the UV–Vis spectrum indicates that in solution the complexes adopt similar geometries. Powdered compounds exhibit anisotropic X-band EPR spectra: axial for complexes with 4-methylimidazole and 2-ethyl-4-methylimidazole and rhombic for the complex with 2-isopropylimidazole. A very weak spin-spin interaction between Cu(II) ions in the binuclear complex with 2-ethylimidazole has mainly dipole-dipole character leading to HF EPR spectrum which corresponds to S=1 with small ZFS. In frozen methanol solutions the EPR spectra of all studied complexes prove similar axial symmetry of the coordination polyhedra, that corresponds to tetragonally elongated octahedral geometry. The results of cytotoxicity tests of the complexes against U937 lymphoma show comparable, moderate antineoplastic activity of the tested compounds.

Słowa kluczowe

Copper(II) complexes, imdazole, chloride, crystal structur4e, magnetic properties, UV-Vis, EPR, cytotoxuc activity

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