

Synthesis, structural characterization and bioactivity of a new tetranuclear Zinc(II)-dihydrazone coordination compound

Autorzy

Rahman Bikas
Fatemeh Soltani
Neda Heydari
Behvar Asghari
Emilia Ganczar

Tadeusz Lis

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Streszczenie

A new dihydrazone ligand (H_4L) was synthesized and used to prepare a tetranuclear zinc(II) coordination compound, $[Zn_4(HL)_2(\mu-OAc)_2(CH_3OH)_{1.6}(H_2O)_{0.4}] \cdot 2.4(CH_3OH)$ (**1**). H_4L and **1** were extensively characterized by using various analytical and spectroscopic techniques and the structure of **1** was determined by single crystal X-ray (SC-XRD) analysis. SC-XRD analysis revealed that dihydrazone ligand is coordinated to the metal ions as hexadentate ligand and the Zn(II) ions are five coordinated and have distorted trigonal bipyramidal geometry. The tested compounds exhibit emissions in the range of 350–600 nm. The bioactivities of the ligand and its Zn(II) coordination compound were evaluated *in-vitro* for α -glucosidase inhibition and antioxidant activity (DPPH radical scavenging). Compound **1** exhibited significantly improved activity compared to the free ligand, with IC_{50} values of 271.6 μM (α -glucosidase) and 251.5 μM (DPPH), versus 381.9 μM and 370.4 μM for the ligand, respectively. Although these values are higher than those reported for standard drugs such as acarbose and ascorbic acid, the results clearly demonstrate that coordination of ligand to Zn(II) ion has a significant effect on the enhancement of both enzymatic inhibition and radical scavenging. This study reports, for the first time, a tetranuclear Zn(II)-dihydrazone coordination compound that combines photoluminescent properties with dual bioactivity, providing new insights into the design of multifunctional metal–organic systems with potential biomedical relevance.

Słowa kluczowe

Dihydrazone ligand, Zn(II) cluster, Structural studies, Spectroscopic studies, α -glucosidase inhibitor, Antioxidant activity

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