

Research Article

Five-Coordinate Zinc(II) Complex: Synthesis, Characterization, Molecular Structure, and Antibacterial Activities of Bis-[(*E*)-2-hydroxy-*N'*-{1-(4-methoxyphenyl)ethylidene}benzohydrazido] dimethylsulfoxidezinc(II) Complex

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The titled Zn(II) complex was synthesized by reacting the compound (*E*)-2-hydroxy-*N'*-{1-(4-methoxyphenyl)ethylidene}benzohydrazide with zinc(II) acetate dihydrate in alkaline DMSO and ethanol solution under reflux condition for 28 hours. The resulting solid was filtered and recrystallized from the mixture of ethanol and DMSO. The hydrazone Schiff base and its Zn(II) complex were characterized using ¹H, ¹³C NMR, FTIR, UV-Vis spectroscopy, and single crystal X-ray diffraction analysis. Meanwhile, their antibacterial activities were examined using disc diffusion method. The spectral studies showed that the hydrazone Schiff base underwent keto-enol tautomerization, forming a bidentate ligand (N,O) towards Zn(II) ion. Surprisingly, on top of the two hydrazone Schiff base molecules which coordinated to the Zn metal center, an additional DMSO molecule was found attached to the Zn metal center in the crystal data, resulting in a 5-coordinate distorted trigonal bipyramidal Zn(II) complex. Both hydrazone Schiff base and its Zn(II) complexes were found to exhibit low antibacterial activity even when the concentrations were increased to 800 ppm.

1. Introduction

Hydrazone Schiff base plays an important role in inorganic chemistry, as it can easily form stable complexes with most transition metal ions due to its ability to form keto-enol tautomerism (Figure 1) [1–4]. In coordination chemistry, the hydrazone Schiff base ligand normally presents in enol conformation in order to bind with the metal center through the nitrogen atom from imine moiety [5–7] and oxygen from hydroxyl group [8, 9].

Complexation with Zn(II) metal center usually results in complexes with 4-coordination number and a tetrahedral geometry. This is due to the fact that Zn is a late transition metal with full *d* valence electrons, which means that a stable

18-electron complex can be formed through 4-coordination number with its ligands. Due to this reason, 5-coordinate Zn complex is considered unusual and expected to be unstable. Nevertheless, 5-coordinate Zn complexes were previously reported [10–14]. Similar to 4-coordinate Zn complexes, the common oxidation state for Zn ion in 5-coordinate Zn complexes is +2; however, the one reported by Song et al. is in 0 oxidation state [13]. In this paper, the synthesis (Scheme 1) and spectroscopic and crystallographic data of a 5-coordinate trigonal bipyramid bis-[(*E*)-2-hydroxy-*N'*-{1-(4-methoxyphenyl)ethylidene}benzohydrazido] dimethylsulfoxidezinc(II) complex are reported. In addition, the antibacterial activities of both hydrazone Schiff base **L1** and Zn(II) complex have also been examined.