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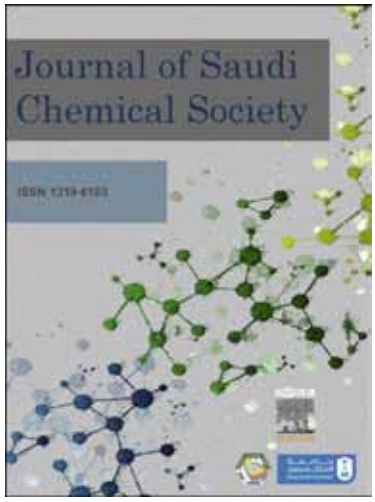

Original article

Bioactivity of some divalent M(II) complexes of Penicillin based Schiff base ligand: Synthesis, Spectroscopic Characterization, and Thermal study

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Bioactivity of some divalent M(II) complexes of Penicillin based Schiff base ligand: Synthesis, Spectroscopic Characterization, and Thermal study

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Abstract

A series of four novel metal complexes of Co(II), Ni(II), Cu(II) and Zn(II) were synthesized from Schiff base derived from amoxicillin (AMX) and picolinaldehyde (PC2). The ligand and metal complexes were fully characterized by physical and spectral techniques such as elemental microanalysis, conductivity, FT-IR, ^{1}H & ^{13}C NMR, UV-vis, mass spectra, EPR, magnetic moment measurement, TGA/DTA, PXRD and antibacterial activity study. The spectroscopic study revealed 1:2 metal ligand ratio and coordination sites in the ligand for metal ions were evaluated by analysis of the spectral results. The surface morphology of the complexes was evaluated by SEM analysis. Molar conductivity implies non-electrolytic nature of the complexes. UV-vis. spectral study nicely supports octahedral geometry for Co(II) and Zn(II) complexes and tetrahedral geometry for Cu(II) complex. The kinetic parameters were extracted from Coats-Redfern equation. The PXRD study revealed nano-crystalline nature of Co(II), Ni(II) & Cu(II) complexes and amorphous nature of Zn(II) complex. The proposed geometry of the complexes was optimized by MM2 calculation supported in Cs-ChemOffice Ultra-11 program. The ligand and metal complexes were screened for antibacterial potency against four human pathogenic clinical strains of bacteria and the data revealed their promising antibacterial activity.

Keywords: *Schiff base metal complexes, Kinetic parameters, Antibacterial activity, Molecular modeling, Penicillin*

1. Introduction

Schiff bases and related complexes cover a wide range of applications in medicinal and pharmaceutical fields and are of great research interest [1]. Due to the formation of stable complexes with transition metal ions and participation of azomethine linkage in the chelation process, Schiff bases are considered as a model compound and play an active role in the development of coordination chemistry [2]. The lone pair electron of N-atom in azomethine group has significant ability to chelate various metal ions, leading to potential biomedical applications, easy removal of toxic metals from the biological systems and also from waste materials [3,4]. Metal ions make bridge between the drug substances and pathogenic organisms and thus the field of metal drug interaction chemistry is growing rapidly in the medical and chemical sciences [5]. Chemically Schiff base is an imine group containing compound whose clinical profile attribute it a versatile pharmacophore in the biomedical field [6]. The applications in electronics as a very good sensor, catalytic activity in various reaction pathways in chemical science [7,8] and as dyes and paints in industries further increase the importance of this class of compound [9,10]. Recent progress in the field of coordination chemistry including Schiff base metal complexes offers a big platform for the advancement