



## Research paper

# Structural investigation of discrete solvent protonated vanadium and other transition metal complexes of *N'*-[(*E*)-(3-ethoxy-2-hydroxyphenyl)methylidene]benzohydrazide, synthetic, spectroscopic and cytotoxicity studies

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## ABSTRACT

A new ligand 3-ethoxysalicylaldehyde benzoic hydrazone (H<sub>2</sub>ESB) and its copper(II), nickel(II), cobalt(II), zinc (II), and dioxidovanadium(V) complexes have been synthesized and characterized by elemental analysis, IR, UV–Vis and EPR studies. Copper(II) complex (**2**) contains 2,2'-bipyridine as a coligand. Aroyl hydrazone and its copper and vanadium complexes were characterised by single crystal XRD. The vanadium compound crystallized in triclinic space group *P*1 and copper compound in orthorhombic space group *P*2<sub>1</sub>2<sub>1</sub>2<sub>1</sub>. The solvent molecule DMF protonates to form ammonium ion in vanadium complex which neutralises the charge on the vanadium ion. Both complexes copper and vanadium show distorted square pyramidal geometry. From EPR results, spin Hamiltonian and bonding parameters were calculated. The *g* values in copper complexes indicate the presence of the unpaired electron in the *d*<sub>x<sup>2</sup>-y<sup>2</sup> orbital. *In vitro* cytotoxicity studies of aroylhydrazone and its complexes showed that copper, cobalt and vanadium complexes are more cytotoxic than hydrazone and other complexes against Dalton's lymphoma ascites cells (DLA).</sub>

## 1. Introduction

Coordination compounds have been perceived for more than a century and the scientific concern and enthusiasm in these compounds have escalated considerably over the years. Coordination compounds with their magnetic, electronic and optical properties and complex structures have an important role in our routine life. Although it is a widely probed field, its importance is on the rise.

Metal complexes of hydrazones are reported to have extensive activities in biological, catalytic [1,2] and photoluminescence [3] fields. Biological activity of hydrazones is enhanced by linking a hydrazide with pharmacologically active carbonyl compounds during condensation reactions. Many hydrazone derivatives possess important biological activities such as antimicrobial [4], antioxidant [5], anticancer [6,7], antitubercular [8] and DNA binding [9]. One important feature of hydrazone is that it shows structural diversity with monoanionic, dianionic or tetraanionic forms [10,11]. Some vanadium complexes of

nicotinoyl hydrazone possess favourable anti-cancer activity against cervical cancers [7]. Oxidovanadium complexes of Schiff base ligands are effective catalysts in the oxidation of cyclic and bicyclic olefins [12] and in the oxidation of cyclooctene and styrene [13]. Recently our group has published work on inclusion/pseudo-inclusion complexes based salen type ligands [14] and bifurcated hydrogen bonds in making inclusion/pseudo-inclusion complexes of salophen type ligands [15]. Here each protonated solvent molecule forms both inter and intramolecular hydrogen bonds with adjacent vanadium molecules.

Herein we report the synthesis and spectral studies of a new ligand *N'*-[(*E*)-(3-ethoxy-2-hydroxyphenyl)methylidene]benzohydrazide and its six complexes. We used 3-ethoxysalicylaldehyde and benzoic hydrazone to synthesize aroylhydrazone. Aroylhydrazone and its complexes are characterized by different physicochemical methods. The synthesized ligand and its complexes were used for cytotoxicity studies.

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