



# Synthesis, spectroscopic characterization and antimicrobial activity of mono-, bi- and tri-nuclear metal complexes of a new Schiff base ligand

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Received 27 May 2010, Revised 25 June 2010, Accepted 25 June 2010, Available online 6 July 2010.

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<https://doi.org/10.1016/j.molstruc.2010.06.034>

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## Abstract

Condensation of *o*-acetoacetylphenol and 1,2-diaminopropane in 1:1 molar ratio under condition of high dilution yielded the mono-condensed dibasic Schiff base ligand with a N<sub>2</sub>O<sub>2</sub> donors. The mono-condensed ligand has been used for further condensation with 2-hydroxy-5-nitrobenzaldehyde to obtain the new asymmetrical dicompartamental Schiff base ligand, H<sub>3</sub>L, with N<sub>2</sub>O<sub>3</sub> donors. The structure of the ligand was elucidated by analytical and spectroscopic tools (IR, <sup>1</sup>H and <sup>13</sup>C NMR spectra) which indicated that the coordinating sites are oxygen atoms of the phenolic OH groups, nitrogen atoms of the azomethine groups and the oxygen atom of the ketonic group. Reactions of the ligand with metal salts yielded mono- and homo-bi-nuclear complexes formulated as [M(HL)], where M=Co(II), Ni(II) and Cu(II), [Fe(H<sub>2</sub>L)Cl<sub>2</sub>(H<sub>2</sub>O)]·2½H<sub>2</sub>O, [Fe<sub>2</sub>(HL)(ox)Cl<sub>3</sub>(H<sub>2</sub>O)<sub>2</sub>]·5H<sub>2</sub>O, [UO<sub>2</sub>(H<sub>2</sub>L)(OAc)(H<sub>2</sub>O)<sub>2</sub>], [VO(H<sub>3</sub>L)(SO<sub>4</sub>)(H<sub>2</sub>O)]·H<sub>2</sub>O, [M<sub>2</sub>(L)Cl(H<sub>2</sub>O)<sub>2</sub>]·½H<sub>2</sub>O, where M=Co(II) and Ni(II) and [Cu(H<sub>2</sub>L)Cl]. The mononuclear Ni(II) complex, [Ni(HL)], was used to synthesize homo- and hetero-bi- and tri-nuclear complexes with the molecular formulae [Ni<sub>2</sub>(L)Cl(H<sub>2</sub>O)<sub>2</sub>], [Ni<sub>2</sub>(L)<sub>2</sub>FeCl(H<sub>2</sub>O)]·H<sub>2</sub>O and [Ni<sub>2</sub>(HL)<sub>2</sub>CoCl<sub>2</sub>]. The structures of the complexes were characterized by various techniques such as elemental and thermal analyses, IR, <sup>1</sup>H and <sup>13</sup>C NMR, mass and electronic spectra as well as conductivity and magnetic moment measurements. Square-planar and octahedral geometries are suggested for the Cu(II), Co(II) and Ni(II) complexes, octahedral geometry for the Fe(III) and VO<sup>2+</sup> complexes while uranium(VI) ion is octa-coordinated in its

complex. The Schiff base and its metal complexes were evaluated for antimicrobial activity against Gram positive bacteria (*Staphylococcus aureus*), Gram negative bacteria (*Escherichia coli*) and fungi (*Candida albicans* and *Aspergillus flavus*). The ligand and some of its complexes were found to be biologically active.

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## Keywords

Schiff base ligands; Mononuclear complexes; Binuclear complexes; Trinuclear complexes; Heteronuclear complexes; Antimicrobial activity

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