



Ain Shams University
Faculty of Science
Chemistry Department

**Synthesis, characterization and biological activities
of some transition metal complexes with novel
Schiff bases**

**Thesis Submitted for the Degree of PhD
In
Chemistry**

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فَوَيْلٌ لِلَّذِينَ
رَبَّكَ زَيَّنَّا

Dedication

*To my God who supporting me in all my life
and providing me the patience and needed
power to achieve this work.*

*To my dear parents and brothers who are
enlighting my life and supporting me all time.*

*To my beloved wife for her patience, kind
support and continuous encouragement
during this work.*

*To all my family for their continuous
encouragement especially my uncle
For believing in me and motivating me
throughout my whole education.*

*For all my friends for their support and
encouragement.*

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Ahmed Shawky Ahmed

Abstract

Abstract

Schiff bases have a pivotal role in the development of coordination chemistry of main group elements, transition metals and lanthanides and gained importance because of their physiological and pharmacological activities. Owing to the easy tunability of their stereo-electronic structures, Schiff bases are privileged ligands because they easily synthesized and form stable complexes with most of the transition metal ions and stabilized them in various oxidation states. Metal complexes of sulfur and nitrogen containing ligands such as Schiff bases has been the subject of current and growing interest in the field of coordination chemistry, because it has been shown that many of these complexes possess wide applications in various areas of science such as anticancer, antitumor, antifungal, antibacterial and antioxidant activities. Di- and polynuclear metal complexes of transition metals (including many Schiff base complexes) have been continuing interest because of their roles as biological models, as catalysts for organic reactions.

Looking to these interesting biological activities associated with Schiff base complexes, in this work, we have been synthesized a novel tetradentate Schiff base

ligands namely; 6,6'-(((1E,1'E)-thiophene-2,5-diylbis(methaneylylidene)) bis(azaneylylidene)) bis(3,4-dimethylaniline)(L¹), 3,3'-(((1E,1'E)-thiophene-2,5-diylbis(methaneylylidene)) bis(azaneylylidene)) bis(naphthalen-2-amine) (L²) derived via condensation of 2,5-thiophene dicarboxaldehyde with 2,3-diaminonaphthalene or 4, 5-dimethyl-1, 2-phenylenediamine and their five binuclear Mn(II), Cu(II), Co(II), Ni(II) and Zn(II) complexes have been synthesized as well. The Schiff base ligands (L¹ and L²) and their five binuclear metal complexes have been fully characterized using different physicochemical techniques e.g. elemental analyses, spectroscopic (FT-IR, ¹H NMR, ¹³C NMR, UV-Vis., EPR, ESI-mass) methods, conductivity and magnetic moments measurements. The low molar conductance measurements of the synthesized complexes indicated that these complexes have non-electrolytic nature.

The antibacterial activities for the synthetic compounds were screened against four different bacteria; *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas putida* and *Bacillus subtilis*. As well, their antifungal activities were screened against three different fungi; *Aspergillus Niger*, *Aspergillus flavus*, and *Rhizoctonia bataicola*. The synthesized complexes exhibited higher

antimicrobial activity than the free ligands relative to the standard drugs like; streptomycin and nystatin. The antioxidant activities of the synthesized compounds were investigated also by studying the radical scavenging activity against different four radicals; superoxide anion, hydroxyl, 2, 2-diphenyl-2-picrylhydrazyl and 2, 2'-azino bis(3-ethylbenzothiazoline -6-sulfonicacid). The synthesized complexes exhibited higher antioxidant activity than the free ligands.

Furthermore, the interaction of the synthetic compounds with CT-DNA has been studied to investigate their anticancer and antitumor activities by the electronic spectroscopy, fluorometric competition studies with ethidium bromide and DNA viscosity measurements. The collective biological activities of the synthesized complexes opened a promising window for designing of new metal-based anticancer drugs in the future.



Contents

List of contents

Chapter 1 GENERAL INTRODUCTION	Page No
1.1. Schiff bases	1
1.2. Schiff base metal complexes	8
1.3. Applications of Schiff bases and their complexes	11
Aim of the work	35
Chapter 2 EXPERIMENTAL	
2.1. Materials	36
2.2. Physicochemical measurements	36
2.3. Syntheses of the Schiff base ligands	38
2.4. Syntheses of Schiff base metal complexes	41
2.5. Biological studies	41
<i>2.5.1. Antimicrobial assays</i>	41
<i>2.5.2. DNA-binding assays</i>	42
2.5.2.1. UV–visible absorption spectroscopy	43
2.5.2.2. EB competitive studies with fluorescence spectroscopy	45
2.5.2.3. Viscosity measurements	46
2.6. Antioxidant assays	47
Chapter 3 RESULTS AND DISCUSSION	
3.1. 6,6'-(((1E,1'E)-thiophene-2,5-diylbis(methanelylidene))bis(azanelylidene))bis(3,4-dimethylaniline) (L¹)	55

3.1.1. Infrared Spectroscopy	55
3.1.2. NMR spectra	63
3.1.3. ESI-mass spectra	67
3.1.4. Magnetic moment and Electronic spectra	73
3.1.5. ESR spectra	80
3.1.6. Bioactivity evaluation	85
3.1.6.1. In vitro antimicrobial activities	85
3.1.6.2. Antioxidant Activities	88
3.1.6.2.1. DPPH radical scavenging activity	89
3.1.6.2.2. Hydroxyl radical scavenging activity	91
3.1.6.2.3. Superoxide anion scavenging activity	93
3.1.6.2.4. ABTS radical scavenging activity	94
3.1.6.3. DNA interaction studies	96
3.1.6.3.1. Absorption spectroscopic studies	96
3.1.6.3.2. EB-DNA Quenching Studies	104
3.1.6.3.3. Viscosity measurements	111
3.2. 3,3'-(((1E,1'E)-thiophene-2,5 diylbis(methane glylidene)))bis(azaneylylidene)) bis(naphthalene-2-amine) Schiff base (L²) and its metal(II) Complexes	113
3.2.1. Infrared Spectroscopy	113
3.2.2. NMR spectra	121
3.2.3. ESI-mass spectra	125
3.2.4. Magnetic moment and Electronic spectra	131
3.2.5. ESR spectra	134
3.2.6. Bioactivity evaluation	139
3.2.6.1. In vitro antimicrobial activities	139

3.2.6.2. In vitro free radical scavenging activity	141
3.2.6.2.1. DPPH radical scavenging activity	143
3.2.6.2.2. Hydroxyl radical scavenging activity	145
3.2.6.3. DNA interaction studies	147
3.2.6.3.1. Absorption spectroscopic studies	147
3.2.6.3.2. Ethidium bromide displacement studies	155
3.2.6.3.3. Viscosity measurements	162
3.3. CONCLUSION	164
REFERENCES	165

List of figures

Figure	description	Page No
Fig (1.1)	Some Classes of Schiff base ligands.	4
Fig (1.2)	Macrocyclic Ligands.	7
Fig (1.3)	Schematic diagram for antibacterial activity and DNA interaction of the investigated complexes.	22
Fig (1.4)	Structure of transition metal(II)-N,N'-bis (naphthaldehyde) diimines.	26
Fig (2.1)	The optimal structure of the Schiff base ligand L ¹ .	39
Fig (2.2)	The optimal structure of the Schiff base ligand L ² .	40
Fig (3.1)	FT-IR spectrum of Schiff base Ligand L ¹ .	57
Fig (3.2)	FT-IR spectrum of Mn(II) complex (1).	58

Fig (3.3)	FT-IR spectrum of Co(II) complex (2).	59
Fig (3.4)	FT-IR spectrum of Ni(II) complex (3).	60
Fig (3.5)	FT-IR spectrum of Cu(II) complex (4).	61
Fig (3.6)	FT-IR spectrum of Zn(II) complex (5).	62
Fig (3.7)	^1H NMR of L^1 Schiff base ligand.	64
Fig (3.8)	^1H NMR of ZnL^1 Complex.	65
Fig (3.9)	^{13}C NMR of L^1 Schiff base ligand.	66
Fig (3.10)	Full scan mass spectrum of ligand L^1 .	68
Fig (3.11)	Full scan mass spectrum of MnL^1 complex.	69
Fig (3.12)	Full scan mass spectrum of CoL^1 complex.	70
Fig (3.13)	Full scan mass spectrum of NiL^1 complex.	71
Fig (3.14)	Full scan mass spectrum of CuL^1 complex.	72
Fig (3.15)	Full scan mass spectrum of ZnL^1 complex.	73
Fig (3.16)	UV-Vis spectrum of Schiff base ligand L^1 in DMSO.	77
Fig (3.17)	UV-Vis spectrum of Mn(II) complex (1) in DMSO.	77
Fig (3.18)	UV-Vis spectrum of Co(II) complex (2) in DMSO.	78
Fig (3.19)	UV-Vis spectrum of Ni(II) complex (3) in DMSO.	78
Fig (3.20)	UV-Vis spectrum of Cu(II) complex (4) in DMSO.	79
Fig (3.21)	UV-Vis spectrum of Zn(II) complex (5) in DMSO.	79
Fig (3.22)	ESR spectrum of Cu(II) complex (4) at room temperature.	81
Fig (3.23)	The optimal structure of the Mn(II) complex.	83
Fig (3.24)	The optimal structure of the Co(II) complex.	83
Fig (3.25)	The optimal structure of the Ni(II) complex.	84
Fig (3.26)	The optimal structure of the Cu(II) complex.	84