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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وقل رب زدني علما

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.

2018

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Ahmed Shawky Ahmed

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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)(L^1), 3,3'-(((1E,1'E)-thiophene-2,5-diylbis(methaneylylidene)) bis(azaneylyli- dene)) bis(naphthalen-2-amine) (L^2) derived via condensation of 2,5-thiophene dicarboxaldehyde with 2,3-diamino-naphthalene 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 synthesizedas well. The Schiff base ligands (L^1 and L^2) 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 synthezied 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 synthezied 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 synthezied complexes opened a promising window for designing of new metal-based anticancer drugs in the future.

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