

Synthesis, Characterization and Spectrophotometric Studies of Seven Novel Antibacterial Hydrophilic Iron(II) Schiff Base Amino Acid Complexes

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ABSTRACT. A series of new Iron(II) Schiff base amino acid complexes derived from the condensation of amino acid and sodium 2-hydroxybenzaldehyde-5-sulfonate have been synthesized. The complexes were characterized by elemental, electronic, IR spectral analyses and conductance measurements. The stability and solubility of the prepared complexes were determined. Two spectral methods used to determine the stoichiometry of the prepared complexes which exhibited divalent tridentate coordination and formed chelates of octahedral structures. The antibacterial activity of the prepared complexes has been tested against *Bacillus cereus*, *Pseudomonas aeruginosa* and *Micrococcus* bacteria. The effect of HCl on investigated complexes studied spectrophotometrically.

Key words: Schiff base complex, Amino acid, Bio-inorganic chemistry, Spectrophotometric study

INTRODUCTION

Salicylaldehyde-amino acid Schiff base complexes are used as non-enzymatic models for the metal - pyridoxal (vitamin B6) amino acid Schiff base systems which are the key intermediates in many metabolic reactions of amino acids catalyzed by enzymes which require pyridoxal as a cofactor (transamination, decarboxylation, elimination, racemization, etc.).¹ Over the past few years, there have been many reports on Schiff base applications in homogeneous and heterogeneous catalysis,² e.g., epoxidation of alkenes,³ cyclopropanation reaction,⁴ asymmetric hydrosilylation of ketones,⁵ selective oxidation of alcohols to corresponding carbonyl compounds,⁶ controlled ring-opening polymerization,⁷ hydrogenation of benzene under mild conditions,⁸ hydrogenation of ketones,⁹ Suzuki cross-coupling reaction under ambient condition¹⁰ and enantioselective oxidation of methyl aryl sulfides.¹¹ In the area of bio-inorganic chemistry, transition metal complexes of Schiff bases have attracted a lot of interest due to their potent biological activities such as antifungal, antibacterial, anticancer and herbicidal applications.¹²⁻¹⁴ These studies have shown that complexation of metals to Schiff base ligands improves the antimicrobial and anticancer activities of the ligands.¹³ Some research groups found that the Schiff base metal complexes derived from salicylaldehyde can specially cleave the DNA.¹⁵⁻¹⁷ Water soluble complexes of sulfonato - substituted Schiff base ligands used as catalytic antioxidants.¹⁸ Comparatively very little effort has been expended

to prepare Iron(II) Schiff base amino acid complexes¹⁹⁻²¹ despite their importance as complexes containing a metal in unstable, low oxidation state, as well as involving unstable ligands, the Schiff base amino acid, that forms through coordination to Fe(II) metal ion. Therefore, in this work we prepared seven novel Fe(II) Schiff base amino acid complexes and characterized their structures by various possible physical methods to obtain more information about their structures.

EXPERIMENTAL

Reagents and Instrumentation

All the used amino acids and $(\text{NH}_4)_2\text{Fe}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ in the present study are of analytical grade purchased from Sigma Aldrich, sodium 2-hydroxybenzaldehyde-5-sulfonate was prepared according to literature.²² Conductivity measurements were made at 25 °C on Jenway Conductivity meter 4320 using bidistilled water as solvent. The electronic spectra of the complexes were monitored using matched 1 cm silica cells on Perkin Elmer Lambda 35 spectrophotometer and IR spectra of the metal chelates recorded over the 400–4000 cm^{-1} range on a Shimadzu FTIR-8101 Fourier transform infrared spectrophotometer using KBr discs. Elemental analyses were carried out at the Micro analytical Center, Assiut University, Egypt.

Synthesis of Schiff Base Metal Complexes

2 mmol (0.448 g) of sodium 2-hydroxybenzaldehyde-5-sulfonate in de-ionized water (20 ml) was added dropwise