

Abstract

Chapter I contains a brief overview on the ionic liquids (ILs), specially functionalized ionic liquids (FILs) along with the properties of the ionic liquids consisting of different cations and anions, their applications and the advantages of using ILs over conventional organic solvents. Chemistry of Schiff bases and their transition metal complexes as well as their applications in different fields were also briefly discussed. This chapter also contains a brief literature survey on related works as well as the object and application of the research works embodied in this dissertation.

Chapter II briefly describes the spectroscopic and analytical techniques employed for the physico-chemical characterization of the synthesized compounds. This chapter also contains sources of the different chemicals used and describes the syntheses and physicochemical characterization of some amine functionalized ionic liquids required for the syntheses of various ionic liquid-supported Schiff bases used as ligands in subsequent chapters of this thesis.

In chapter III Mn(II) and Co(II) complexes synthesized from the ionic liquid-supported Schiff base, 1-{2-(2-hydroxybenzylideneamino)ethyl}-3-methylimidazolium bromide have been presented. Their structural characterization by various analytical and spectroscopic methods was described. Their antibacterial activities were tested by *in vitro* disc diffusion method against *Escherichia coli* and *Bacillus subtilis* to assess their minimum inhibition concentrations.

Chapter IV describes syntheses of the ionic liquid supported Schiff base, 1-{2-[(2-hydroxybenzylidene)amino]ethyl}-3-methylimidazolium hexafluorophosphate and its Mn(II), Co(II) and Cu(II) complexes. Their physico-chemical characterizations by various spectroscopic (ESI-MS, ¹H-NMR, ¹³C-NMR, FT-IR and UV-Visible) and analytical (elemental analysis and magnetic susceptibility measurements) techniques were presented. Antibacterial activities against gram positive and negative bacteria by *in vitro* disc diffusion methods have been discussed.

In chapter V, the syntheses of an air and moisture stable ionic liquid-supported Schiff base, 1-{2-(2-hydroxy-5-nitrobenzylideneamino)ethyl}-3-ethylimidazolium tetrafluoroborate and its Co(II), Ni(II) and Cu(II) complexes have been described. These compounds were characterized by different spectroscopic

(powder X-ray diffraction, ESI-MS, UV-Visible, FT-IR, ^1H -NMR and ^{13}C -NMR) methods and analytical (elemental analysis, molar conductance and magnetic susceptibility measurements) techniques. The antibacterial studies of the synthesized compounds were explored and the metal complexes exhibited significant activities against the selected gram negative bacteria (*Escherichia coli*, *Pseudomonas aeruginosa*, *Proteus vulgaris* and *Enterobacter aerogenes*) and gram positive bacteria (*Staphylococcus aureus* and *Bacillus cereus*).

In Chapter VI the syntheses of the Co(II), Ni(II) and Cu(II) complexes of the Schiff base, 1-{2-[(2-hydroxy-5-bromobenzylidene)amino]ethyl}-3-ethylimidazolium tetrafluoroborate have been described. These complexes were characterized by various analytical and spectroscopic methods. The antibacterial activities (*in vitro*) of the Schiff base and its complexes have been performed by disc diffusion method. The complexes showed reasonable antibacterial activities against the selected four gram negative bacteria (*E. coli*, *P. aeruginosa*, *P. vulgaris* and *E. aerogenes*) and two gram positive bacteria (*S. aureus* and *B. cereus*).

Chapter VII describes the syntheses and physico-chemical characterization of the Schiff base, 1-{2-(2-hydroxy-5-bromobenzylideneamino)ethyl}-3-ethylimidazolium tetrafluoroborate and its Fe(III) and Cr(III) complexes. Their physico-chemical characterization by various analytical and spectroscopic methods such as elemental analysis, UV-Visible, FT-IR, ^1H NMR, ESI MS, TGA/DTG, molar conductance and magnetic susceptibility measurements have been illustrated. Antibacterial activities of these compounds against *Escherichia coli* and *Staphylococcus aureus* were also performed.

Chapter VIII describes the synthesis, physico-chemical characterization and potential biological applications of some transition metal complexes of the ionic liquid-supported Schiff base, 1-{2-(2-hydroxy-5-chloro-benzylideneamino)ethyl}-3-methylimidazolium tetrafluoroborate. The geometrical structures of the complexes were established by different spectroscopic and analytical data. Their potential biological applications against gram positive (*Staphylococcus aureus* and *Bacillus cereus*) and gram negative (*Escherichia coli* and *Klebsiella pneumoniae*) bacteria were explored and discussed accordingly.

Finally in chapter IX the concluding remarks on the research works embodied in this thesis were made.