ABSTRACT

Synthesis of water soluble metal complexes of β-cyclodextrin based ligands is an emergent field of research in coordination chemistry. The vast interest in this field has stemmed from their fascinating features (like water solubility, less toxicity, variation of coordination properties, green synthetic aspect, *etc.*). These properties lead to their wide range of applications as enzyme mimicking, drug delivery, catalysis, *etc.* Using this type of metal complexes as catalysts and drugs makes the catalytic reaction environmentally benign and bio-friendly.

Chapter I is an introductory one that describes β-cyclodextrin based ligands, their applications in various fields and the advantages of using metal complexes of β-cyclodextrin based ligands. This chapter also contains a brief literature review on related works as well as the objective and application of the research works.

Chapter II contains the sources of the different chemicals and materials used in this research work. This chapter also contains details of the physico-chemical and spectroscopic techniques, *viz.,* Elemental analysis, Magnetic susceptibility measurement, IR, UV-Visible, NMR- spectroscopies, ESI-MS, *etc.*, used for the physic-chemical characterization of the synthesized complexes. This chapter also describes briefly the procedure to study different applications of the compounds.

Chapter III contains the synthesis, physico-chemical characterization of the water soluble Zn(II) complexes of two β-cyclodextrin based Schiff bases, *viz.*, mono-6-deoxy-6-(4-(5-chloro-2-hydroxybenzylideneamino)-3,4-diaminotolune)-β-cyclodextrin and mono-6-deoxy-6-(4-(5-nitro-2-hydroxybenzylideneamino)-3,4-diaminotolune)-β cyclodextrin. Immune cell cytotoxic properties, antioxidant and free radicals scavenging activities of these complexes were studied.

Chapter IV includes the synthesis and physico-chemical characterization of newly synthesized Co(II) and Cu(II) complexes of a β-cyclodextrin based azo functionalized Schiff base. It was found that the β-cyclodextin based azo containing Schiff base ligand acts as tetradentate ligand for both the metal ions. But both the Co(II) and Cu(II) complexes acquire octahedral geometry with two coordinated water molecules. The synthesized compounds were used to study DNA interaction and DNA cleavage activities.

Chapter V includes the synthesis, physico-chemical characterization and biological activity of S, N containing S-modified β-cyclodextin based ligand and its fairly water soluble Fe(III) complex. Various analytical and spectroscopic data suggested that the Fe-complex has high spin octahedral geometry. The synthesized compounds were used to study antibacterial activity against gram positive (*Staphylococcus aureus*, *Bacillus subtilis*) and gram negative (*Escherichia coli, Klebsiella pneumoniae*) bacteria.

Chapter VI includes the synthesis, Physico-chemical characterization and catalytic activity of a Pd(II) complex of β-cyclodextin based polydentate ligand in aqueous phase. The complex showed good catalytic activity for Suzuki reaction in aqueous media with its recyclabilty up to 4^{th} run.

Finally chapter VII concluded the works embodied in this dissertation.