PREFACE

The present thesis deals with different aspects of the chemistry of oxovanadium(IV) complexes, their interaction with DNA and protein and photo-induced DNA and protein cleavage activity and photocytotoxicity.

Chapter I presents a general introduction on various modes of interactions of organic compounds and transition metal complexes capable of targeting DNA leading to DNA strand scission, emphasizing particularly the photo-induced DNA cleavage activities for their potential application in PDT. The mechanistic pathways associated with the DNA cleavage are discussed. A comparison has been made on the advantages of photoactive metal complexes over organic conjugates. Objective of the present investigation is also dealt in this Chapter.

Chapter II of the thesis deals with the synthesis, characterization, DNA binding and photo-induced DNA cleavage activity of ternary oxovanadium(IV) complexes of N-salicylidene-S-methylthiocarbazate (salmdtc) and phenanthroline bases to explore the photo-induced DNA cleavage activity in UV-A light of 365 nm.

Chapter III presents the synthesis, characterization, DNA binding and photo-induced DNA cleavage activity of ternary oxovanadium(IV) complexes containing N-salicylidene-L-methionate (salmet) and N-salicylidene-L-tryptophanate (saltrp) Schiff bases and phenanthroline bases. The objective of this work is to investigate the photo-induced DNA cleavage activity in near-IR light and to see the effect of pendant thiomethyl and indole moieties in the DNA cleavage reactions.

Chapter IV deals with the synthesis, characterization, DNA binding, red-light induced DNA cleavage activity and photocytotoxicity of ternary oxovanadium(IV) complexes having N-salicylidene-L-arginine (sal-argH) and N-salicylidene-L-lysine (sal-lysH) Schiff bases and phenanthroline bases. The important results include the visible light-induced DNA cleavage activity and photocytotoxicity of the complexes in human cervical HeLa cancer cells.
Chapter V describes the synthesis, characterization, DNA binding and photo-induced DNA and protein cleavage activity and photocytotoxicity of oxovanadium(IV) complexes containing bis(2-benzimidazolylmethyl)amine and phenanthroline bases. The significant results include DNA cleavage activity in near-IR light and photocytotoxicity of the dppz complex in non-small cell lung carcinoma/human lung adenocarcinoma A549 cells in visible light. Further, we have studied the protein cleavage activity of the complexes in UV-A light of 365 nm by using bovine serum albumin (BSA) and lysozyme.

Finally, Chapter VI presents the binary oxovanadium(IV) complexes of phenanthroline bases. We have studied their synthesis, characterization, DNA binding and photo-induced DNA and protein cleavage activity and photocytotoxicity. Photocytotoxicity of dppz complex has been studied in human cervical HeLa cancer cells in visible light. Photo-induced protein cleavage activity of the complexes has been studied in UV-A light of 365 nm by using BSA and lysozyme.

The references have been compiled at the end of each chapter and indicated as superscript numbers in the text. The complexes presented in this thesis are represented by bold-faced numbers. Crystallographic data of the complexes, characterized structurally by single crystal X-ray crystallography, are given in CIF format in the enclosed CD (Appendix-I). Due acknowledgements have been made wherever the work described is based on the findings of other investigators. Any omission that might have happened due to oversight or mistake is regretted.

INDEX WORDS: Oxovanadium(IV) complexes · Crystal structure · DNA binding · NIR-light induced DNA cleavage · Protein cleavage · Photocytotoxicity

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