

Dedicated
to
The Almighty God and My Beloved Family

DECLARATION

I hereby declare that the thesis entitled “**Functional Site Mimics of Few Oxidase Enzymes by Newly Developed Coordination Compounds with (N, N) and (N, O) Donor Ligands**” submitted for the award of Ph.D. The degree is the result of investigations I carried out at the Department of Chemistry, University of North Bengal, under the guidance of Professor Bhaskar Biswas. Further, it has not previously formed the basis for the award of any other degree.

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Date: 22.09.2023



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A STATE GOVERNMENT AIDED UNIVERSITY

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Dr. Bhaskar Biswas, Professor, Dept. of Chemistry

CERTIFICATE

I declare that Mr. CHANCHAL KUMAR PAL has prepared the thesis entitled “Functional Site Mimics of Few Oxidase Enzymes by Newly Developed Coordination Compounds with (N, N) and (N, O) Donor Ligands” for the award of the Ph.D. degree at the University of North Bengal, under my supervision. He has worked at the Department of Chemistry, University of North Bengal.

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"Functional Site Mimics of Few Oxidase Enzymes by Newly Developed Coordination Compounds with (N, N) and (N, O) Donor Ligands" Thesis Submitted to University of North Bengal in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Chemistry By Chanchal Kumar Pal (M.Sc. in Chemistry) Supervised by Prof. Bhaskar Biswas Department of Chemistry University of North Bengal Darjeeling - 734013 West Bengal, India September 2023 Dedicated to The Almighty God and My Beloved Family

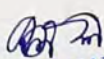
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PREFACE

I began my journey for the research work related to my doctoral degree thesis entitled **“Functional Site Mimics of Few Oxidase Enzymes by Newly Developed Coordination Compounds with (N, N) and (N, O) Donor Ligands”** in the year 2018 under the supervision of Dr. Bhaskar Biswas of the department of Chemistry at Surendranath College, Calcutta University, West Bengal, India. Later, I shifted to the University of North Bengal as Dr. Biswas joined the Department of Chemistry, University of North Bengal. My Ph.D. registration from the University of North Bengal, India, is on 28.05.2019 vide letter no. Ph. D /Chem. (1317) / 169/ R-2020 dated 22.01.2020.

Schiff base-metal complexes have various applications for their versatile physico-chemical properties across multiple research fields, from innovative electronics to efficient catalysts to metallo-therapeutics.

The present investigation deals with synthetic polydentate ligands and their metal complexes, highlighting their structural, photo-physical, spectroscopic and bio-functional characteristics. The physicochemical characterizations of the compounds have been performed with a suite of spectroscopic and analytical methods and single-crystal X-ray diffraction studies. The structural features and bio-oxidative coupling reactions have been further correlated with detailed theoretical calculations employing the Density Functional Theory (DFT). Finally, the future scope of the present investigation has been delineated with scientific and industrial significance.

Acknowledgment

Firstly, I thank Almighty God for showering blessings throughout my life, giving me strength and providing opportunities more than I deserve.

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I want to express my sincere thanks to Prof. Biswajit Sinha, Head of the Department of Chemistry, University of North Bengal, for providing the necessary advice, facilities and administrative support for carrying out my research. I sincerely appreciate the help rendered by all other faculty members and the non-teaching staff of this department during the research period. I am also truly grateful to Dr. Angshuman Roy Choudhury of the Department of Chemical Sciences, Indian Institute of Science Education and Research (IISER) Mohali, for his timely help and support for Single Crystal X-ray diffraction studies.

I am also thankful to our collaborators of national and international reputation for their valuable experimental and theoretical assistance in pursuing my Ph. D research work. I am grateful to all my lab mates, Dr. Prafulla Kumar Mudi, Mr. Rajani Kanta Mahato, Ms. Shreya Mahato, Mr. Nilaj Bandopadhyay, Mr. Suvojit Roy, Mr. Subham Mukherjee, Mr. Sangharaj Diyali, Mr. Subhajit Saha, Mr. Subhankar Kundu, Mr. Nilankar Diyali, Ms. Meena Chettri and all other scholars of the department for supporting me at various stages of my research work.

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LIST OF TABLES

Table	Page No.
Table 2.1. Crystallographic data and structure refinement parameters for tetra-iron (III) cluster.....	39
Table 2.2. Bond distances and bond angles for tetra-iron(III) cluster.....	40
Table 2.3. Comparison of structural aspects between crystal structures of reported tetra-iron(III) cluster, $[\text{Fe}_4\text{O}_2(\text{O}_2\text{CMe})_6(\text{phen})_2(\text{N}_3)_2]$ and our synthesized iron(III) cluster, $[\text{Fe}_4\text{O}_2(\text{OAc})_6(\text{phen})_2(\text{H}_2\text{O})]$	42
Table 2.4. Bond valence sum calculation for tetra-iron(III) cluster.....	43
Table 2.5. Kinetic parameters for the oxidation of DTBC catalysed by tetra-iron (III) cluster.....	47
Table 2.6. Electrochemical data of the tetra-iron (III) complex in ACN.....	49
Table 2.7. Kinetic parameters for the hydrolysis of phosphoester linkage in PNPP catalysed by tetra iron (III) cluster in aqueous methanol.....	50
Table 3.1. Crystallographic data and structure refinement parameters for Zn(II)-Schiff base complex.....	68
Table 3.2. Selected bond distances (Å) and bond angles (°) for Zn (II) complex.....	69
Table 3.3. Comparison of structural aspects between crystal structures of reported zinc (II) complex $[\text{Zn}(\text{HL}^1)(\text{H}_2\text{O})]$ and our synthesized Zn(II)-Schiff base complex, $[\text{Zn}(\text{HL})(\text{H}_2\text{O})].(\text{H}_2\text{O})$ (1).....	70
Table 3.4. Percentage surface area interaction of Zn (II)-Schiff base complex.....	72
Table 3.5. Kinetic parameters for transesterification activity by Zn (II)-Schiff base complex in aqueous methanol medium.....	74
Table 3.6. Cartesian coordinates of the optimized structure of I in MeOH.....	78
Table 3.7. Cartesian coordinates of the optimized structure of II in MeOH.....	80
Table 3.8. Cartesian coordinates of the optimized structure of III in MeOH.....	82
Table 3.9. Cartesian coordinates of the optimized structure of IV in MeOH.....	85
Table 3.10. Cartesian coordinates of the optimized structure of V in MeOH.....	88
Table 4.1. Crystallographic data of $[\text{Pb}(\text{Phen})(\text{NO}_3)(\text{OAC})(\text{H}_2\text{O})]_n$ (3).....	101
Table 4.2. Bond lengths (Å) for 3	102
Table 4.3. Bond Angles For Pb (II) polymer (3).....	103

LIST OF FIGURES

Figure	Page No.
Fig.1.1. Different types of ligand	3
Fig.1.2. Versatile application of Schiff base metal complexes.....	5
Fig.1.3. Different isomers of bipyridine.....	20
Fig.1.4. Most portable binding motifs of bipyridine.....	20
Fig. 1.5. Binding mode of phenanthroline with metals.....	21
Fig. 2.1. IR spectrum of tetra-iron (III) cluster.....	37
Fig. 2.2. UV-VIS Spectrum of tetra-iron (III) cluster.....	38
Fig. 2.3. X-ray structure of cationic tetra-iron(III) cluster (1) with 30% ellipsoid probability H atoms are removed for clarity	38
Fig. 2.4. ¹ H NMR spectrum of oxidized product (3,5-DTBQ) isolated from the catechol oxidation by the tetra-iron(III) cluster.....	45
Fig. 2.5. Rise of DTBQ band at 400 nm in UV-VIS spectrum upon addition of 1 (10 ⁻⁴ M) to 100 equivalents of DTBC in acetonitrile. The spectra were recorded after every 5 min.....	46
Fig. 2.6. Rate vs concentration of DTBC for catecholase activity of tetra-iron(III) cluster in acetonitrile	47
Fig. 2.7. Left : Cyclic voltammogram of the tetra-iron(III) cluster in anhydrous acetonitrile media; Right: Cyclic voltammogram of the mixture of tetra-iron(III) cluster and DTBC under a molecular oxygen atmosphere in anhydrous acetonitrile media.....	48
Fig. 2.8. Increase of 4-nitrophenolate band at 412 nm after addition of tetra-iron (III) cluster to 100 equivalents of PNPP in aq. Methanolic solution. (The spectra were recorded every 12 min). Inset: Time vs. Absorbance plot at defined wavelength.....	49
Fig. 2.9. Initial rate determination for phosphoester cleavage activity by tetra-iron(III) cluster towards PNPP using plot of time vs log[A _∞ /(A _∞ -A _t)] of the same solution.....	50
Figure 2.10. ESI-Mass spectrum of the tetra-iron(III) cluster in presence of 10 times PNPP in aqueous-methanolic.....	52
Fig. 3.1. Absorbance spectra of Schiff base (black) and Zn(II)-Schiff base complex in MeOH	64
Fig. 3.2. Fluorescence spectra of Schiff base (brown; λ _{ex} 254 nm) and Zn (II)-Schiff base	

complex (green; λ_{ex} 244, 297 nm) in MeOH at 298 K	65
Fig. 3.3. ESI-MS spectrum of Zn(II)-Schiff base complex in MeOH.....	65
Fig. 3.4. Images of frontier molecular orbital of Zn(II) complex in IEFPCM/MeOH solvent System.....	66
Fig. 3.5. ORTEP diagram of Zn(II) -Schiff base complex with 30% ellipsoid probability.....	67
Fig. 3.6. Optimised structure of Zn(II) complex in vacuum obtained using B3LYP/6-311G theoretical model.....	70
Fig. 3.7. XRD and optimized structures superimposed image of Zn(II)-Schiff base complex.....	71
Fig. 3.8. Intermolecular H-bonding interaction mediated 3D architecture of Zn(II)-Schiff base.....	71
Fig. 3.9. Hirshfeld surface area of Zn(II)-Schiff base complex.....	72
Fig. 3.10. Fingerprint plot of Zn(II)-Schiff base complex.....	73
Fig. 3.11. Increase of 4-nitrophenolate band at 418 nm after addition of zinc(II)-Schiff base complex to 100 equivalents of PNPP in aq. Methanolic solution. (The spectra were recorded after every 06 min). Inset: Absorbance vs. Time plot at defined wavelength.....	74
Fig. 3.12. Initial rate determination for phosphoester cleavage activity by Zn (II)-Schiff base complex towards PNPP using plot of time vs $\log[A_{\alpha}/(A_{\alpha}-A_t)]$ of the same solution.....	75
Fig. 3.13. ESI -MS of the reaction mixture of 2 in the presence of pNPP in MeOH.....	76
Fig. 4.1. ORTEP diagram of asymmetric unit in $[\text{Pb}(\text{Phen})(\text{NO}_3)(\text{OAc})(\text{H}_2\text{O})]_n$ (3) (30% ellipsoid probability) with atom numbering scheme.....	99
Fig. 4.2. Formation of 1D polymer $[\text{Pb}(\text{Phen})(\text{NO}_3)(\text{OAc})(\text{H}_2\text{O})]_n$ (3) along the crystallographic b axis.....	100
Fig. 4.3. Acetate and nitrate mediated 1D H-bonded network of Pb(II) polymer along the crystallographic b axis. C-H \cdots O interactions are seen in green dotted interaction in this wireframe model.....	103
Fig. 4.4. Solid state absorbance spectrum of compound 3 (a) and solid-state fluorescence spectrum (λ_{ex} = 267 nm) for compound 3 (b).....	105

LIST OF APPENDICES

Appendix	Page No.
<hr/>	
I: List of Publications.....	110
II: Seminar, Symposium Attended.....	110
