

CORROLES

Thesis by

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## ABSTRACT

Corroles, porphyrin analogues, are the center of a rapidly growing field of research. By virtue of a missing meso-carbon, corroles retain the aromaticity of porphyrins, but become tribasic ligands in place of the dibasic porphyrin. This thesis is a study of synthetic methods for corroles, as well as their photophysical properties and potential applications.

New synthetic methodologies for the free-base molecules have been used to obtain corroles with pentafluorophenyl meso substituents in both water-soluble and non-water-soluble forms. Closed-shell metallocorrole complexes have been synthesized by introducing Ga(III) and Sn(IV) ions into the macrocycle. Likewise, an open shell transition metal corrole utilizing Mn(III) has been made. Problems arising from making a third type of closed shell metallocorrole by introduction of In(III) are also discussed. Among other characterizations of these complexes, Gouterman's four-orbital model for porphyrins is reinterpreted under the reduced symmetry of the corrole macrocycle to explain the absorption and singlet emission spectra of the molecules. Evidence of a triplet excited state is also presented.

The application of corrole complexes to other aspects of chemistry is then examined in two different areas. The interactions of the water-soluble corroles with human serum albumin were investigated to assess their usefulness as diagnostic agents and drugs for cancer research. These highly colored compounds have also been introduced as the dye component of dye-sensitized solar cells, and various aspects of the cells, including overall efficiency, have been tested.



This thesis concludes with a summary of results obtained from collaborations on the interactions of corroles in cellular systems and synthetic attempts toward new types of water-soluble corroles, including an imidazole substituted chromium corrole and a sulfonated manganese nitrido corrole.

## TABLE OF CONTENTS

Acknowledgements .....	iii
Abstract .....	viii
Table of Contents .....	x
List of Tables, Schemes, and Figures .....	xii
Molecule Abbreviations .....	xv
Chapter I: Introduction .....	1
Chapter II: Syntheses .....	5
General Synthetic Procedures .....	5
pK <sub>a</sub> of <b>2</b> .....	12
Materials .....	18
Detailed Syntheses .....	20
<sup>1</sup> H NMR Data .....	27
Mass Spectral Data .....	28
Chapter III: Electronic Structures and Absorption Spectra .....	35
Gouterman Four-Orbital Model .....	35
Corrole Four-Orbital Model .....	35
Conclusions .....	44
Chapter IV: Photophysics .....	46
Singlet Emission and the Four-Orbital Model .....	46
Singlet Lifetimes .....	54
Singlet Quantum Yields .....	54
Triplet States .....	58
Conclusions .....	61
Chapter V: Interactions with HSA .....	62
Introduction .....	62
Experimental Procedures .....	66
Results and Discussion .....	67

Concluding Remarks .....	83
<b>2-Sn</b> /HSA Interactions .....	84
<b>2-Sn</b> /HSA Conclusions .....	87
Chapter VI: Solar Cells.....	89
Introduction.....	89
<b>2-Ga</b> versus Ruthenium Dyes .....	90
<b>2</b> , <b>2-Ga</b> , and <b>2-Sn</b> Dyes versus N3 .....	93
Conclusions.....	100
Appendix A: Anti-Cancer Drugs.....	101
Appendix B: Work with Mayra Sheikh .....	104
Bibliography .....	112

## LIST OF TABLES, SCHEMES, AND FIGURES

## Chapter 1

Figure 1.1. Skeletal structures of porphyrin, corrin, and corrole .....	2
---	---

## Chapter 2

Scheme 2.1. Synthesis of <b>1</b> .....	8
Scheme 2.2. Synthesis of <b>2</b> .....	9
Scheme 2.3. Metallation reactions of <b>1</b> .....	10
Scheme 2.4. Metallation reactions of <b>2</b> .....	11
Figure 2.1. Skeletal structures of free-bases <b>1</b> and <b>2</b> .....	6
Figure 2.2. Protonation and deprotonation processes for <b>2</b> .....	13
Figure 2.3. UV-vis pH titrations of <b>2</b> .....	15
Figure 2.4. Fluorescence pH titrations of <b>2</b> .....	16
Figure 2.5. X-ray structure of <b>1</b> .....	17
Figure 2.6. Measured and predicted mass spectra of <b>1</b> .....	29
Figure 2.7. Measured and predicted mass spectra of <b>2</b> .....	30
Figure 2.8. Measured and predicted mass spectra of <b>1-Ga</b> and <b>2-Ga</b> .....	31
Figure 2.9. Measured and predicted mass spectra of <b>1-Sn</b> .....	32
Figure 2.10. Measured and predicted mass spectra of <b>2-Sn</b> .....	33
Figure 2.11. Measured and predicted mass spectra of <b>2-Mn</b> .....	34

## Chapter 3

Table 3.1. Absorption peaks and epsilons .....	39
Figure 3.1. Porphyrin HOMOs and LUMOs.....	36
Figure 3.2. Orbital and state diagrams for porphyrins and corroles .....	38
Figure 3.3. Absorption spectra of <b>1</b> and <b>2</b> .....	40
Figure 3.4. Absorption spectra of <b>1-Ga</b> and <b>2-Ga</b> .....	41
Figure 3.5. Absorption spectra of <b>1-Sn</b> and <b>2-Sn</b> .....	42

## Chapter 4

Table 4.1. Emission peaks.....	47
Table 4.2. Quantum yields .....	59
Table 4.3. Triplet lifetimes .....	60
Figure 4.1. Emission spectra of <b>1-Ga</b> and <b>2-Ga</b> .....	48
Figure 4.2. Emission spectra of <b>1-Sn</b> and <b>2-Sn</b> .....	49
Figure 4.3. Emission spectra of <b>1</b> and <b>2</b> .....	51
Figure 4.4. Emission spectra of <b>1</b> , <b>2<sup>-</sup></b> , and <b>2</b> .....	52
Figure 4.5. Emission spectra of <b>2<sup>-</sup></b> , <b>2</b> , and <b>2<sup>+</sup></b> .....	53
Figure 4.6. Idealized structure of <b>2<sup>+</sup></b> .....	55
Figure 4.7. Fluorescence emission decay and fit for <b>1</b> .....	56

## Chapter 5

Table 5.1. Association constants of HSA:porphyrinoid conjugates .....	64
Figure 5.1. HSA/corrole titrations by UV-vis .....	68
Figure 5.2. UV-vis spectral changes at selected wavelengths .....	70
Figure 5.3. HSA/corrole titrations by corrole fluorescence .....	72
Figure 5.4. Fluorescence peak intensity as a function of added HSA .....	73
Figure 5.5. HSA/corrole titrations by visible CD.....	75
Figure 5.6. HSA/corrole titrations by UV-CD .....	76
Figure 5.7. HSA/corrole titrations by HSA fluorescence.....	78
Figure 5.8. Normalized HSA emission as a function of added corrole ....	79
Figure 5.9. Structural models depicting four potential binding sites .....	82
Figure 5.10. HSA/ <b>2-Sn</b> titrations by UV-vis and CD .....	85
Figure 5.11. HSA/ <b>2-Sn</b> titrations by corrole fluorescence.....	86
Figure 5.12. HSA/ <b>2-Sn</b> titrations by HSA fluorescence .....	88

## Chapter 6

Table 6.1. Efficiency parameters for <b>2-Ga</b> vs. ruthenium dyes.....	95
--	----

Table 6.2. Efficiency parameters for corrole dyes vs. N3 .....	97
Figure 6.1. TiO <sub>2</sub> slides coated with <b>2-Ga</b> and N3 .....	91
Figure 6.2. Model diagram of CV curve showing efficiency parameters.	92
Figure 6.3. CV curves for <b>2-Ga</b> vs. ruthenium dyes .....	94
Figure 6.4. CV curves for corrole dyes vs. N3 .....	96
Figure 6.5. Absorption spectra of corrole dyes and N3 on TiO <sub>2</sub> slide .....	98
Figure 6.6. IPCE curves for corrole dyes vs. N3 .....	99

## Appendix A

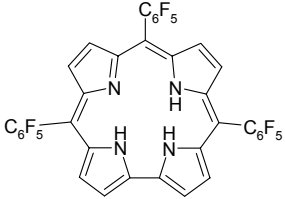
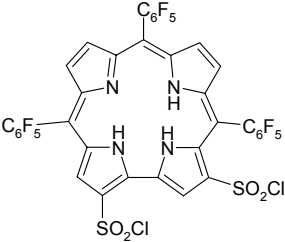
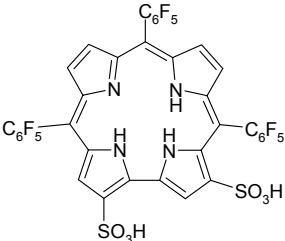
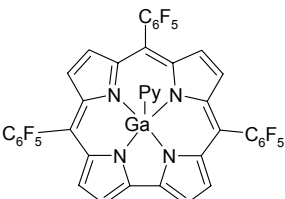
Figure A.1. Micrographs of corrole delivery to cells .....	102
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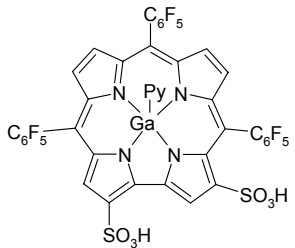
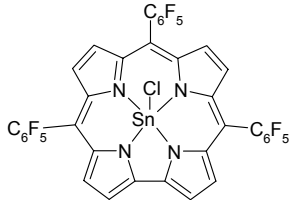
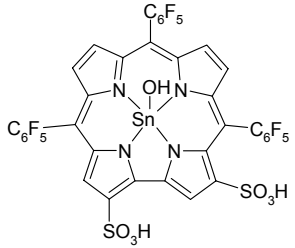
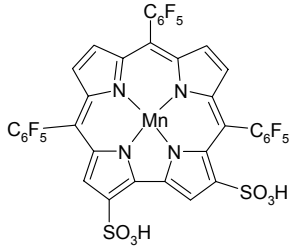
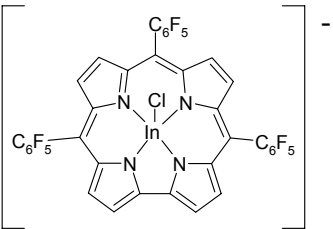
## Appendix B

Figure B.1. Skeletal structure of <b>4</b> .....	106
Figure B.2. Mass spectra of imidazole substituted corrole .....	107
Figure B.3. Possible structures of bismethylimidazole corrole.....	109
Figure B.4. Mass spectrum of water-soluble chromium corrole.....	110

## MOLECULE ABBREVIATIONS

Below is a list of the compounds synthesized in this work, along with their structures and the abbreviations used in the text.

Abbreviation	Structure	Name
<b>1</b>		5,10,15-tris(pentafluorophenyl)corrole
<b>Cl-2</b>		2,17-bis(chlorosulfonato)-5,10,15-tris(pentafluorophenyl)corrole
<b>2</b>		2,17-bis(sulfonato)-5,10,15-tris(pentafluorophenyl)corrole
<b>1-Ga</b>		5,10,15-tris(pentafluorophenyl)corrolato-gallium(III) monopyridine

Abbreviation	Structure	Name
<b>2-Ga</b>		2,17-bis(sulfonato)-5,10,15-tris(pentafluorophenyl)corrolato-gallium(III) monopyridine
<b>1-Sn</b>		5,10,15-tris(pentafluorophenyl)corrolato-tin(IV) chloride
<b>2-Sn</b>		2,17-bis(sulfonato)-5,10,15-tris(pentafluorophenyl)corrolato-tin(IV) hydroxide
<b>2-Mn</b>		2,17-bis(sulfonato)-5,10,15-tris(pentafluorophenyl)corrolato-manganese(III)
<b>1-In</b>		5,10,15-tris(pentafluorophenyl)corrolato-indium(III) chloride anion