
TABLE OF CONTENTS

| | | |
|------------|--|-----------|
| 1 | SUMMARY | 3 |
| 2 | ZUSAMMENFASSUNG | 5 |
| 3 | EXPLOITING PROTEIN SYMMETRY TO DESIGN LIGHT-CONTROLLABLE ENZYME INHIBITORS | 7 |
| 3.1 | Introduction | 9 |
| 3.2 | Results and Discussion | 11 |
| 3.2.1 | Synthesis | 11 |
| 3.2.2 | Photochromism | 12 |
| 3.2.3 | Biological Test Results..... | 13 |
| 3.2.4 | Molecular Modeling..... | 14 |
| 3.3 | Conclusion | 16 |
| 3.4 | Supporting Information..... | 17 |
| 3.4.1 | Synthesis and Characterization of New Compounds | 17 |
| 3.4.2 | Photochromism of DTE-phosphates and DTE-phosphonates | 24 |
| 3.4.3 | Cloning, Heterologous Expression in <i>E. coli</i> , and Purification of <i>mtPriA</i> | 26 |
| 3.4.4 | Steady-state Enzyme Kinetics of <i>mtPriA</i> | 26 |
| 3.4.5 | Molecular Modeling..... | 29 |
| 3.5 | References | 31 |
| 4 | TOWARDS PHOTOSWITCHABLE KINASE INHIBITORS | 35 |
| 4.1 | Introduction | 37 |
| 4.2 | Results and Discussion..... | 39 |
| 4.2.1 | Molecular Docking..... | 39 |
| 4.2.2 | Synthesis | 40 |
| 4.2.3 | Photochromism | 41 |
| 4.2.4 | Biological Test Results..... | 43 |
| 4.3 | Conclusion | 47 |
| 4.4 | Experimental Materials and Methods | 48 |
| 4.4.1 | Synthesis and Characterization of New Compounds | 48 |
| 4.4.2 | Molecular Docking..... | 51 |
| 4.4.3 | Photochemical Investigations..... | 52 |
| 4.4.4 | Enzymatic Reisomerization with ERK2 | 52 |
| 4.5 | References | 53 |

| | | |
|------------|---|------------|
| 5 | SYNTHESIS OF PHOTOCROMIC DITHIENYLMALEIMIDE AMINO ACIDS..... | 57 |
| 5.1 | Introduction..... | 59 |
| 5.2 | Results and Discussion..... | 61 |
| 5.2.1 | Synthesis | 61 |
| 5.2.2 | Peptide Coupling | 64 |
| 5.2.3 | Photochromism..... | 65 |
| 5.3 | Conclusion | 67 |
| 5.4 | Experimental Section | 68 |
| 5.4.1 | General | 68 |
| 5.4.2 | New Compounds..... | 69 |
| 5.4.3 | Solid Phase Peptide Synthesis | 74 |
| 5.4.4 | Photochemical Investigations | 75 |
| 5.5 | References | 76 |
| 6 | NEW PHOTOCROMIC DITHIENYL MALEIC HYDRAZIDES | 79 |
| 6.1 | Introduction..... | 81 |
| 6.2 | Initial Results and Discussion..... | 82 |
| 6.3 | Conclusion | 86 |
| 6.4 | Experimental Section | 86 |
| 6.5 | References | 87 |
| 7 | APPENDIX | 89 |
| 7.1 | Supplementary NMR spectra for Chapter 1 | 91 |
| 7.2 | Supporting Information for Chapter 2 | 101 |
| 7.2.1 | Supplementary Figures..... | 101 |
| 7.2.2 | Supplementary NMR spectra..... | 103 |
| 7.3 | Supporting Information for Chapter 3 | 108 |
| 7.3.1 | Supplementary Synthetic Data | 108 |
| 7.3.2 | Supplementary Figures..... | 114 |
| 7.3.3 | Supplementary NMR spectra..... | 115 |
| 7.4 | List of Abbreviations | 127 |
| 7.5 | Curriculum Vitae..... | 131 |
| 7.6 | Publications and Conference Contributions | 132 |
| 7.7 | Danksagung..... | 133 |