

Chi Kwong CHANG 張啟光



Education

B.Sc. - Chemistry, Fu Jen Catholic University, Taipei, Taiwan, 1969
Ph.D. - Organic Chemistry, University of California, San Diego, 1973
Postdoctoral - Department of Chemistry, University of California, San Diego, 1974
Department of Chemistry, University of British Columbia, Vancouver, 1975-76

Professional Experience

Michigan State University (MSU), East Lansing, Michigan
Assistant Professor of Chemistry, 1976-79
Associate Professor of Chemistry, 1979-82
Adjunct Professor of Biophysics, Biophysics Department (now defunct), 1980
Professor of Chemistry, 1982 - present
Associate Chairman, Chemistry Department, 1990-1994

Visiting Scientist, Brookhaven National Laboratory, Upton, New York, 1978-1979
National Science Council Visiting Professor, National Taiwan University, Taipei, Taiwan, 1991
Visiting Professor, Hong Kong University of Science & Technology, Hong Kong, 1996-97

Hong Kong University of Science & Technology (HKUST), Kowloon, Hong Kong
Professor of Chemistry, 1998-2007 (part-time); Chemistry Department Head, 1998-2004
Adjunct Professor of Chemistry 2007- 2013

National Taiwan University (NTU), Department of Chemistry, Taipei, Taiwan,
Distinguished Chair Professor 2009-2013

研究領域

紫質及其金屬錯合物(合成、化性、催化、光譜等), 無機生物化學及仿生系統、紫質衍生物
應用在光動力效應治療癌腫瘤

Award and Scholarly Service

Alfred P. Sloan Fellow, 1980-82
Camille and Henry Dreyfus Teacher-Scholar Award, 1981-85
MSU Distinguished Faculty Award, 1991
Distinguished Alumni Award, Fu Jen Catholic University, 2002
Member of the NIH Study Section on Metallobiochemistry (BMT), 1980-83
Chairperson, American Chemical Society - Michigan State University Chapter, 1987-88
Chairperson, American Chemical Society Hong Kong International Chapter, 2005-07
Advisory Board Member, Institute of Chemistry, Academia Sinica (Taiwan), 1985-94
External reviewer for Department of Chemistry, National Taiwan University, 1999 and 2004.
External reviewer for Institute of Chemistry, Academia Sinica (Taiwan), 2009
Editorial Advisory Board Member, Newton Science Magazine (Taiwan), 1987-2008
Editorial Board Member, Journal of Porphyrins and Phthalocyanines, 2000-05
Consultant for: Dow Chemical Co., 1980-83; Standard Oil of Ohio, 1983; General Motors, 1986-90; Chevron, 1992; Parke-Davis, 1994; PDT Inc. 1991-96

Research Interests

Porphyrins and porphyrinoid ligands, biological oxygen binding and activation, models of metalloenzymes, monooxygenation catalysts, photodynamic therapy using porphyrin tumoricidal agents.

Research funding

Former recipient of grants from NSF, USDA, NIH, Research Corporation, ACS Petroleum Research Fund, Dow Chemical, General Motors, Lambda Pharmaceuticals, and Research Grant Council (RGC) of Hong Kong

Publications

ResearcherID B-1675-2010, 248 篇, 引用次數 >11,300, h-index:62

Total number to date: 232, **h-index**=57 (see last page); ranked 754 on the *ISI World's 1000 Most Cited Chemists 1980-1997* <<http://www.ccp14.ac.uk/ccp/web-mirrors/armel/www.cristal.org/1000chimistes.html>>

1. Chang, C. K. (1969). ACROLEIN POLYMERIZATION. *Fu Jen Chemistry*, 15-23.
2. Diekmann, H., Chang, C. K., & Traylor, T. G. (1971). CYCLOPHANE PORPHYRIN. *Journal of the American Chemical Society*, 93(16), 4068-4070. doi: 10.1021/ja00745a053
3. Chang, C. K., & Traylor, T. G. (1973a). NEIGHBORING GROUP EFFECT IN HEME-CARBON MONOXIDE BONDING. *Journal of the American Chemical Society*, 95(25), 8475-8477. doi: 10.1021/ja00806a061
4. Chang, C. K., & Traylor, T. G. (1973b). PROXIMAL BASE INFLUENCE ON BINDING OF OXYGEN AND CARBON-MONOXIDE TO HEME. *Journal of the American Chemical Society*, 95(25), 8477-8479. doi: 10.1021/ja00806a062
5. Chang, C. K., & Traylor, T. G. (1973c). SOLUTION BEHAVIOR OF A SYNTHETIC MYOGLOBIN ACTIVE-SITE. *Journal of the American Chemical Society*, 95(17), 5810-5811. doi: 10.1021/ja00798a088
6. Chang, C. K., & Traylor, T. G. (1973d). SYNTHESIS OF MYOGLOBIN ACTIVE-SITE. *Proceedings of the National Academy of Sciences of the United States of America*, 70(9), 2647-2650. doi: 10.1073/pnas.70.9.2647
7. Brinigar, W. S., & Chang, C. K. (1974). SIMPLE DIOXYGEN HEME COMPLEXES FORMED IN N,N-DIMETHYLFORMAMIDE. *Journal of the American Chemical Society*, 96(17), 5595-5597. doi: 10.1021/ja00824a060
8. Brinigar, W. S., Chang, C. K., Geibel, J., & Traylor, T. G. (1974). SOLVENT EFFECTS ON REVERSIBLE FORMATION AND OXIDATIVE STABILITY OF HEME-OXYGEN COMPLEXES. *Journal of the American Chemical Society*, 96(17), 5597-5599. doi: 10.1021/ja00824a061
9. Chang, C. K., & Dolphin, D. (1975). FERROUS PORPHYRIN MERCAPTIDE COMPLEXES - MODELS FOR REDUCED CYTOCHROME-P-450. *Journal of the American Chemical Society*, 97(20), 5948-5950. doi: 10.1021/ja00853a069
10. Chang, C. K., & Traylor, T. G. (1975a). KINETICS OF OXYGEN AND CARBON-MONOXIDE BINDING TO SYNTHETIC ANALOGS OF MYOGLOBIN AND HEMOGLOBIN ACTIVE-SITES. *Proceedings of the National Academy of Sciences of the United States of America*, 72(3), 1166-1170. doi: 10.1073/pnas.72.3.1166
11. Chang, C. K., & Traylor, T. G. (1975b). REVERSIBLE OXYGENATION OF PROTOHEME-IMIDAZOLE COMPLEX IN AQUEOUS-SOLUTION (1,2). *Biochemical and Biophysical Research Communications*, 62(3), 729-735. doi: 10.1016/0006-291x(75)90460-x

12. Geibel, J., Chang, C. K., & Traylor, T. G. (1975). COORDINATION OF MYOGLOBIN ACTIVE-SITE MODELS IN AQUEOUS-SOLUTION AS STUDIED BY KINETIC METHODS. *Journal of the American Chemical Society*, 97(20), 5924-5926. doi: 10.1021/ja00853a053
13. Chang, C. K. (1976a). PROJECTION OF STEREOSCOPIC IMAGES BY ORDINARY SLIDE PROJECTOR. *Journal of Chemical Education*, 53(9), 601-601. doi: 10.1021/ed053p601
14. Chang, C. K. (1976b). SIMPLE ANALOG DEVICE FOR DIRECT DETERMINATION OF 1ST-ORDER SYSTEM RATE CONSTANTS. *Applied Spectroscopy*, 30(3), 364-366. doi: 10.1366/000370276774457209
15. Chang, C. K., & Dolphin, D. (1976a). CARBON-MONOXIDE BINDING TO PENTACOORDINATE MERCAPTIDE-HEME COMPLEXES - KINETIC STUDY ON MODELS FOR CYTOCHROME-P-450. *Proceedings of the National Academy of Sciences of the United States of America*, 73(10), 3338-3342. doi: 10.1073/pnas.73.10.3338
16. Chang, C. K., & Dolphin, D. (1976b). OXYGEN BINDING TO MERCAPTIDE-HEME COMPLEXES - MODELS FOR REDUCED CYTOCHROME-P-450. *Journal of the American Chemical Society*, 98(6), 1607-1609. doi: 10.1021/ja00422a069
17. Chang, C. K. (1977a). MU-SUPEROXODICOBALT COMPLEX OF A CO-FACIAL DIPORPHYRIN. *Journal of the Chemical Society-Chemical Communications*(22), 800-801. doi: 10.1039/c39770000800
18. Chang, C. K. (1977b). STACKED DOUBLE-MACROCYCLIC LIGANDS .1. SYNTHESIS OF A CROWNED PORPHYRIN. *Journal of the American Chemical Society*, 99(8), 2819-2822. doi: 10.1021/ja00450a080
19. Chang, C. K., Kuo, M. S., & Wang, C. B. (1977). STACKED DOUBLE-MACROCYCLIC LIGANDS .2. SYNTHESIS OF CO-FACIAL DIPORPHYRINS. *Journal of Heterocyclic Chemistry*, 14(5), 943-945. doi: 10.1116/1.569397
20. Chang, C. K. (1977c). STACKED DOUBLE-MACROCYCLIC LIGANDS .3. SPECTRAL PROPERTIES OF CO-FACIAL DIPORPHYRINS AS A FUNCTION OF INTER-CHROMOPHORE SEPARATION. *Journal of Heterocyclic Chemistry*, 14(7), 1285-1288. doi: 10.1002/jhet.5570140733
21. Chang, C. K., Powell, D., & Traylor, T. G. (1977). KINETICS AND MECHANISMS OF OXIDATION OF HEMOPROTEIN MODEL COMPOUNDS. *Croatica Chemica Acta*, 49(2), 295-307.
22. Paine, J. B., Chang, C. K., & Dolphin, D. (1977). SYNTHESIS OF PORPHYRINS VIA DIPYRROMETHENES. *Heterocycles*, 7, 831-838. doi: 10.3987/S-1977-02-0831
23. Seybert, D. W., Moffat, K., Gibson, Q. H., & Chang, C. K. (1977). ELECTRONIC AND STERIC FACTORS AFFECTING LIGAND-BINDING - HORSE HEMOGLOBINS CONTAINING 2,4-DIMETHYLDEUTEROHEME AND 2,4-DIBROMODEUTEROHEME. *Journal of Biological Chemistry*, 252(12), 4225-4231.
www.jbc.org/content/252/12/4225

- 24.Chang, C. K., & Dolphin, D. (1978). OXIDATION AND OXYGEN ACTIVATION BY HEMOPROTEINS. In E. E. Van Tamelen (Ed.), *Bioorganic Chemistry* (Vol. IV, pp. 37-80): Academic Press.
- 25.DiNello, R. K., & Chang, C. K. (1978). ISOLATION AND MODIFICATION OF NATURALLY OCCURRING PORPHYRINS. In D. Dolphin (Ed.), *The Porphyrins* (Vol. 1, pp. 289-339): Academic Press.
- 26.Araiso, T., Dunford, H. B., & Chang, C. K. (1979). HORSERADISH-PEROXIDASE .37. COMPOUND-I FORMATION FROM RECONSTITUTED ENZYME LACKING FREE CARBOXYL GROUPS AS HEME SIDE-CHAINS. *Biochemical and Biophysical Research Communications*, 90(2), 520-524. doi: 10.1016/0006-291x(79)91266-x
- 27.Babcock, G. T., & Chang, C. K. (1979). OXYGEN BINDING TO FERROUS HEME A AND A SYNTHETIC ANALOG. *Febs Letters*, 97(2), 358-362. doi: 10.1016/0014-5793(79)80121-0
- 28.Chang, C. K. (1979a). BINUCLEAR METAL COMPLEXES OF COFACIAL DIPORPHYRINS. *Inorganic Compounds with Unusual Properties - II* (Vol. ACS Advances in Chemistry 173, pp. 162-177): American Chemical Society. doi: 10.1021/ba-1979-0173.ch015
- 29.Chang, C. K. (1979b). REDUCTION OF OXYGEN BY CYTOCHROME OXIDASE MODELS. In W. S. Caughey (Ed.), *Oxygen Biochemical and Clinical Aspects* (pp. 437-454): Academic Press.
- 30.Chang, C. K., & Kuo, M. S. (1979). REACTION OF IRON(III) PORPHYRINS AND IODOSOXYLENE - ACTIVE OXENE COMPLEX OF CYTOCHROME-P-450. *Journal of the American Chemical Society*, 101(12), 3413-3415. doi: 10.1021/ja00506a063
- 31.Netzel, T. L., Kroger, P., Chang, C. K., Fujita, I., & Fajer, J. (1979). ELECTRON-TRANSFER REACTIONS IN COFACIAL DIPORPHYRINS. *Chemical Physics Letters*, 67(2-3), 223-228. doi: 10.1016/0009-2614(79)85151-9
- 32.Richardson, P., Chang, C., Hanson, L., Spaulding, L., & Fajer, J. (1979). PI-CATION RADICALS OF ISOBACTERIOCHLORINS - IMPLICATIONS FOR NITRITE AND SULFITE REDUCTASES. *Journal of Physical Chemistry*, 83(26), 3420-3424. doi: 10.1021/j100489a021
- 33.Richardson, P., Chang, C., Spaulding, L., & Fajer, J. (1979). RADICALS OF ISOBACTERIOCHLORINS - MODELS OF SIROHEME AND SIROHYDROCHLORIN. *Journal of The American Chemical Society*, 101(26), 7736-7738. doi: 10.1021/ja00520a029
- 34.Traylor, T. G., Chang, C. K., Geibel, J., Berzinis, A., Mincey, T., & Cannon, J. (1979). SYNTHESSES AND NMR CHARACTERIZATION OF CHELATED HEME MODELS OF HEMOPROTEINS. *Journal of the American Chemical Society*, 101(22), 6716-6731. doi: 10.1021/ja00516a038
- 35.Wang, C. B., & Chang, C. K. (1979). CONVENIENT SYNTHESIS OF PYRROLE PRECURSORS FOR OCTAALKYLPORPHYRINS. *Synthesis-Stuttgart*(7), 548-549. doi: 10.1055/s-1979-28758

- 36.Chang, C. K. (1980). SYNTHESIS AND CHARACTERIZATION OF ALKYLATED ISOBACTERIOCHLORINS, MODELS OF SIROHEME AND SIROHYDROCHLORIN. *Biochemistry*, 19(9), 1971-1976. doi: 10.1021/bi00550a037
- 37.Chang, C. K., DiNello, R. K., Dolphin, D., Lever, A. B. P., & Ramaswamy, B. S. (1980). IRON PORPHINES. In D. H. Bush (Ed.), *Inorganic Syntheses* (Vol. 20, pp. 147-155): Wiley. doi: 10.1002/9780470132517.ch35
- 38.Chang, C. K., & Fajer, J. (1980). MODELS OF SIROHEME AND SIROHYDROCHLORIN - PI-CATION RADICALS OF IRON(II) ISOBACTERIOCHLORIN. *Journal of the American Chemical Society*, 102(2), 848-851. doi: 10.1021/ja00522a073
- 39.Hatada, M. H., Tulinsky, A., & Chang, C. K. (1980). CRYSTAL AND MOLECULAR-STRUCTURE OF COFACIAL DICOPPER HEXYLDIPORPHYRIN-7. *Journal of the American Chemical Society*, 102(23), 7115-7116. doi: 10.1021/ja00543a044
- 40.Chang, C. K. (1981). SYNTHESIS OF PORPHINE-DIPROPIONIC ACID AND DEALKYLATED PROTOPORPHYRIN ANALOGS. *Journal of Organic Chemistry*, 46(22), 4610-4612. doi: 10.1021/jo00335a073
- 41.Chang, C. K., & Ebina, F. (1981). NIH SHIFT IN HAEMIN-IODOSYLBENZENE-MEDIATED HYDROXYLATIONS. *Journal of the Chemical Society-Chemical Communications*(15), 778-779. doi: 10.1039/c39810000778
- 42.Chang, C. K., Hanson, L. K., Richardson, P. F., Young, R., & Fajer, J. (1981). PI-CATION RADICALS OF FERROUS AND FREE BASE ISOBACTERIOCHLORINS - MODELS FOR SIROHEME AND SIROHYDROCHLORIN. *Proceedings of the National Academy of Sciences of the United States of America-Physical Sciences*, 78(5), 2652-2656. doi: 10.1073/pnas.78.5.2652
- 43.Feldberg, S. W., Armen, G. H., Bell, J. A., Chang, C. K., & Wang, C. B. (1981). ELECTRON-TRANSPORT ACROSS GLYCEROL MONOOLEATE BILAYER LIPID-MEMBRANES FACILITATED BY MAGNESIUM ETIOCHLORIN. *Biophysical Journal*, 34(1), 149-163. doi: 10.1016/S0006-3495(81)84842-4
- 44.Hanson, L. K., Chang, C. K., Davis, M. S., & Fajer, J. (1981). ELECTRON PATHWAYS IN CATALASE AND PEROXIDASE ENZYMIC CATALYSIS - METAL AND MACROCYCLE OXIDATIONS OF IRON PORPHYRINS AND CHLORINS. *Journal of the American Chemical Society*, 103(3), 663-670. doi: 10.1021/ja00393a028
- 45.Netzel, T. L., Bergkamp, M. A., Chang, C. K., & Dalton, J. (1981). A COMPARISON OF ULTRAFAST ELECTRON TRANSFERS IN PORPHYRIN-QUINONE AND MAGNESIUM-FREE-BASE DIPORPHYRIN MOLECULES - MIMICKING PHOTOSYNTHETIC CHARGE SEPARATIONS. *Journal of Photochemistry*, 17(3-4), 451-460. doi: 10.1016/0047-2670(81)85388-9
- 46.Ward, B., Wang, C. B., & Chang, C. K. (1981). NONBONDING STERIC EFFECT ON CO AND O-2 BINDING TO HEMES - KINETICS OF LIGAND-BINDING IN IRON-COPPER COFACIAL DIPORPHYRINS AND STRAPPED HEMES. *Journal of the American Chemical Society*, 103(17), 5236-5238. doi: 10.1021/ja00407a049

47. Barkigia, K. M., Fajer, J., Chang, C. K., & Williams, G. J. B. (1982). CRYSTAL AND MOLECULAR-STRUCTURE OF THE ISOBACTERIOCHLORIN 3,7-DIMETHYL-3',7'-DIHYDRO-2,2',8,8',12,13,17,18-OCTAETHYLPORPHYRIN - A MODEL FOR SIROHYDROCHLORIN AND SIROHEME. *Journal of the American Chemical Society*, 104(1), 315-317. doi: 10.1021/ja00365a070
48. Chang, C. K. (1982). HEMES OF HYDROPORPHYRINS. In H. B. Dunford & D. Dolphin (Eds.), *The Biological Chemistry of Iron* (Vol. NATO ASI Series C89), pp. 313-334: Reidel Publishing Co.
49. Chang, C. K., Koo, M. S., & Ward, B. (1982). CYTOCHROME-C OXIDASE MODELS - A MAGNETICALLY COUPLED HEME-COPPER COMPLEX. *Journal of the Chemical Society-Chemical Communications*(13), 716-719. doi: 10.1039/c39820000716
50. Chang, C. K., & Wang, C. B. (1982). BINUCLEAR COMPLEXES: HEME MODEL FOR OXYGEN BINDING AND REDUCTION. In C. Ho, W. A. Eaton, J. P. Collman, Q. H. Gibson, J. S. Leigh, E. Margoliash, K. Moffat & W. R. Scheidt (Eds.), *Electron Transport and Oxygen Utilization* (pp. 237-243): Elsevier.
51. Fujita, I., Fajer, J., Chang, C. K., Wang, C. B., Bergkamp, M. A., & Netzel, T. L. (1982). SOLVENT AND STRUCTURAL EFFECTS ON PICOSECOND ELECTRON-TRANSFER REACTIONS IN DIPORPHYRIN MODELS OF THE PHOTOSYSTEM-II REACTION CENTER OF GREEN PLANTS. *Journal of Physical Chemistry*, 86(19), 3754-3759. doi: 10.1021/j100216a012
52. Fujita, I., Netzel, T. L., Chang, C. K., & Wang, C. B. (1982). PICOSECOND PHOTOCHEMISTRY OF A COFACIAL DIPORPHYRIN CONTAINING IRON(III) AND ZINC(II) - MIMICKING ELECTRON-TRANSFER BETWEEN CYTOCHROME-C AND THE PRIMARY ELECTRON-DONOR IN REACTION CENTERS OF PHOTOSYNTHETIC BACTERIA. *Proceedings of the National Academy of Sciences of the United States of America-Biological Sciences*, 79(2), 413-417. doi: 10.1073/pnas.79.2.413
53. Hanson, L. K., Chang, C. K., Davis, M. S., & Fajer, J. (1982). THE ROLE OF PI-CATION RADICALS IN THE ENZYMATIC CYCLES OF PEROXIDASES, CATALASES, AND NITRITE AND SULFITE REDUCTASES. In C. Ho, W. A. Eaton, J. P. Collman, Q. H. Gibson, J. S. Leigh, E. Margoliash, K. Moffat & W. R. Scheidt (Eds.), *Electron Transport and Oxygen Utilization* (pp. 245-252): Elsevier.
54. Netzel, T. L., Bergkamp, M. A., & Chang, C. K. (1982). BENZOQUINONE QUENCHING OF DIPORPHYRIN EXCITED-STATES - KINETIC EVIDENCE FOR DISTINGUISHING ELECTRON-TRANSFER PHOTOPRODUCTS FROM (PI,PI-STAR) STATES. *Journal of the American Chemical Society*, 104(7), 1952-1957. doi: 10.1021/ja00371a025
55. Ward, B., & Chang, C. K. (1982). A CONVENIENT PHOTOCHEMICAL METHOD FOR REDUCTION OF FERRIC HEMES. *Photochemistry and Photobiology*, 35(5), 757-759. doi: 10.1111/j.1751-1097.1982.tb02643.x
56. Bergkamp, M. A., Chang, C. K., & Netzel, T. L. (1983). QUANTUM YIELD DETERMINATIONS FOR SUB-NANOSECOND-LIVED EXCITED-STATES AND PHOTOPRODUCTS - APPLICATIONS TO INORGANIC COMPLEXES AND PHOTOSYNTHETIC MODELS. *Journal of Physical Chemistry*, 87(22), 4441-4446. doi: 10.1021/j100245a024

- 57.Chang, C. K., & Abdalmuhdi, I. (1983). ANTHRACENE PILLARED COFACIAL DIPORPHYRIN. *Journal of Organic Chemistry*, 48(26), 5388-5390. doi: 10.1021/jo00174a056
- 58.Chang, C. K., Hatada, M. H., & Tulinsky, A. (1983). SYNTHESIS AND MOLECULAR-STRUCTURE OF FORMYLPORPHYRIN - INTRINSIC-PROPERTIES OF PORPHYRIN-A. *Journal of the Chemical Society-Perkin Transactions 2*(3), 371-378. doi: 10.1039/p29830000371
- 59.Liu, H. Y., Weaver, M. J., Wang, C. B., & Chang, C. K. (1983). DEPENDENCE OF ELECTROCATALYSIS FOR OXYGEN REDUCTION BY ADSORBED DICOBALT COFACIAL PORPHYRINS UPON CATALYST STRUCTURE. *Journal of Electroanalytical Chemistry*, 145(2), 439-447. doi: 10.1016/0368-1874(83)80113-0
- 60.Ward, B., Callahan, P. M., Young, R., Babcock, G. T., & Chang, C. K. (1983). RED SHIFTS IN THE OPTICAL-SPECTRA OF PORPHYRIN SCHIFF-BASES UPON PROTONATION. *Journal of the American Chemical Society*, 105(3), 634-636. doi: 10.1021/ja00341a061
- 61.Yu, N. T., Kerr, E. A., Ward, B., & Chang, C. K. (1983). RESONANCE RAMAN DETECTION OF FE-CO STRETCHING AND FE-C-O BENDING VIBRATIONS IN STERICALLY HINDERED CARBONMONOXY STRAPPED HEMES - A STRUCTURAL PROBE OF FE-C-O DISTORTION. *Biochemistry*, 22(19), 4534-4540. doi: 10.1021/bi00288a028
- 62.Barkigia, K. M., Fajer, J., Chang, C. K., & Young, R. (1984). MODELS OF PHOTOSYNTHETIC CHROMOPHORES - MOLECULAR-STRUCTURE AND AGGREGATION OF A BACTERIOCHLORIN. *Journal of the American Chemical Society*, 106(21), 6457-6459. doi: 10.1021/ja00333a080
- 63.Chang, C. K., & Abdalmuhdi, I. (1984). A BIPHENYLENEDIPORPHYRIN - 2 COFACIALLY ARRANGED PORPHYRINS WITH A BIPHENYLENE BRIDGE. *Angewandte Chemie-International Edition in English*, 23(2), 164-165. doi: 10.1002/anie.198401641
- 64.Chang, C. K., Liu, H. Y., & Abdalmuhdi, I. (1984). ELECTROREDUCTION OF OXYGEN BY PILLARED COBALT COFACIAL DIPORPHYRIN CATALYSTS. *Journal of the American Chemical Society*, 106(9), 2725-2726. doi: 10.1021/ja00321a055
- 65.Chang, C. K., Ward, B., & Ebina, S. (1984). KINETIC-STUDY OF CO AND O-2 BINDING TO HORSE HEART MYOGLOBIN RECONSTITUTED WITH SYNTHETIC HEMES LACKING METHYL AND VINYL SIDE-CHAINS. *Archives of Biochemistry and Biophysics*, 231(2), 366-371. doi: 10.1016/0003-9861(84)90399-0
- 66.Fujita, I., & Chang, C. K. (1984). MICROCELL FOR CYCLIC VOLTAMMETRY. *Journal of Chemical Education*, 61(10), 913-913. doi: 10.1021/ed061p913
- 67.Hanson, L. K., Chang, C. K., Ward, B., Callahan, P. M., Babcock, G. T., & Head, J. D. (1984). SPECTRAL PROPERTIES OF PROTONATED SCHIFF-BASE PORPHYRINS AND CHLORINS - INDO-CI CALCULATIONS AND RESONANCE RAMAN STUDIES. *Journal of the American Chemical Society*, 106(14), 3950-3958. doi: 10.1021/ja00326a011

68. Tanaka, T., Yu, N. T., & Chang, C. K. (1984). RESONANCE RAMAN STUDIES OF CYANIDE BINDING TO STERICALLY HINDERED STRAPPED HEMES. *Biophysical Journal*, 45(2), A365-A365.
69. Tsuchida, E., Nishide, H., Yokoyama, H., Young, R., & Chang, C. K. (1984). POLY(VINYLPYRROLIDONE)-BOUND DIPHENYLHEME. *Chemistry Letters*(6), 997-1000. doi: 10.1246/cl.1984.997
70. Ward, B., Chang, C. K., & Young, R. (1984). SPECTRAL SHIFTS UPON REVERSIBLE MODIFICATIONS OF CHO PERIPHERAL SUBSTITUENTS IN PORPHYRIN, CHLORIN, AND BACTERIOCHLORIN - A PHENOMENOLOGICAL EXPLANATION FOR THE RED SHIFT OF PROTONATED SCHIFF-BASE. *Journal of the American Chemical Society*, 106(14), 3943-3950. doi: 10.1021/ja00326a010
71. Abdalmuhdi, I., & Chang, C. K. (1985). A NOVEL SYNTHESIS OF TRIPLE-DECKERED TRIPORPHYRIN. *Journal of Organic Chemistry*, 50(3), 411-413. doi: 10.1021/jo00203a034
72. Andersson, L. A., Loehr, T. M., Chang, C. K., & Mauk, A. G. (1985). RESONANCE RAMAN-SPECTROSCOPY OF METALLOCHLORINS - MODELS FOR GREEN HEME PROTEIN PROSTHETIC GROUPS. *Journal of the American Chemical Society*, 107(1), 182-191. doi: 10.1021/ja00287a033
73. Chang, C. K. (1985). ON THE STRUCTURE OF HEME-D-1 - AN ISOBACTERIOCHLORIN DERIVATIVE AS THE PROSTHETIC GROUP OF DISSIMILATORY NITRITE REDUCTASE. *Journal of Biological Chemistry*, 260(17), 9520-9522. <http://www.jbc.org/content/260/17/9520>
74. Chang, C. K., & Sotiriou, C. (1985a). C-HYDROXYCHLORINS AND C-METHYLCHLORINS - A CONVENIENT ROUTE TO HEME-D AND BONELLIN MODEL COMPOUNDS. *Journal of Organic Chemistry*, 50(24), 4989-4991. doi: 10.1021/jo00224a075
75. Chang, C. K., & Sotiriou, C. (1985b). MIGRATORY APTITUDES IN PINACOL REARRANGEMENT OF VIC-DIHYDROXYCHLORINS. *Journal of Heterocyclic Chemistry*, 22(6), 1739-1741. doi: 10.1002/jhet.5570220654
76. Eaton, S. S., Eaton, G. R., & Chang, C. K. (1985). SYNTHESIS AND GEOMETRY DETERMINATION OF COFACIAL DIPORPHYRINS - EPR SPECTROSCOPY OF DICOPPER DIPORPHYRINS IN FROZEN SOLUTION. *Journal of the American Chemical Society*, 107(11), 3177-3184. doi: 10.1021/ja00297a024
77. Fujita, E., Chang, C. K., & Fajer, J. (1985). COBALT(II) NITROSYL CATION RADICALS OF PORPHYRINS, CHLORINS, AND ISOBACTERIOCHLORINS - MODELS FOR NITRITE AND SULFITE REDUCTASES AND IMPLICATIONS FOR A1U HEME RADICALS. *Journal of the American Chemical Society*, 107(25), 7665-7669. doi: 10.1021/ja00311a073
78. Kessel, D., Chang, C. K., & Musselman, B. (1985). CHEMICAL, BIOLOGIC AND BIOPHYSICAL STUDIES ON HEMATOPORPHYRIN DERIVATIVE. In D. Kessel (Ed.), *Methods in Porphyrin Photosensitization. Advances in Experimental Medicine and Biology*, 193, 213-227. WOS:A1985AYM5000024

- 79.Liu, H. Y., Abdalmuhdi, I., Chang, C. K., & Anson, F. C. (1985). CATALYSIS OF THE ELECTROREDUCTION OF DIOXYGEN AND HYDROGEN-PEROXIDE BY AN ANTHRACENE-LINKED DIMERIC COBALT PORPHYRIN. *Journal of Physical Chemistry*, 89(4), 665-670. doi: 10.1021/j100250a021
- 80.Young, R., & Chang, C. K. (1985). SYNTHESIS AND CHARACTERIZATION OF BLOCKED AND LIGAND-APPENDED HEMES DERIVED FROM ATROPISOMERIC MESO-DIPHENYLPORPHYRINS. *Journal of the American Chemical Society*, 107(4), 898-909. doi: 10.1021/ja00290a027
- 81.Andersson, L. A., Loehr, T. M., Sotiriou, C., Wu, W., & Chang, C. K. (1986). RESONANCE RAMAN-SPECTROSCOPY OF METALLOCHLORINS .2. PROPERTIES OF MESOSUBSTITUTED SYSTEMS. *Journal of the American Chemical Society*, 108(11), 2908-2916. doi: 10.1021/ja00271a020
- 82.Chang, C. K., Barkigia, K. M., Hanson, L. K., & Fajer, J. (1986). MODELS OF HEME-D1 - STRUCTURE AND REDOX CHEMISTRY OF DIOXISOBACTERIOCHLORINS. *Journal of the American Chemical Society*, 108(6), 1352-1354. doi: 10.1021/ja00266a068
- 83.Chang, C. K., & Kondylis, M. P. (1986). INTRAMOLECULAR HYDROGEN-BONDING AFFECTING DIOXYGEN BINDING TO COBALT(II) PORPHYRINS. *Journal of the Chemical Society-Chemical Communications*(4), 316-318. doi: 10.1039/c39860000316
- 84.Chang, C. K., Sotiriou, C., & Wu, W. (1986). DIFFERENTIATION OF BACTERIOCHLORIN AND ISOBACTERIOCHLORIN FORMATION BY METALATION - HIGH-YIELD SYNTHESIS OF PORPHYRINDIONES VIA OSO₄ OXIDATION. *Journal of the Chemical Society-Chemical Communications*(15), 1213-1215. doi: 10.1039/c39860001213
- 85.Chang, C. K., Takamura, S., Musselman, B. D., & Kessel, D. (1986). CHEMISTRY AND STRUCTURE OF THE PRINCIPAL TUMOR-LOCALIZING PORPHYRIN PHOTSENSITIZER IN HEMATOPORPHYRIN DERIVATIVE. *ACS Symposium Series*, 321, 347-361. doi: 10.1021/bk-1986-0321.ch023
- 86.Chang, C. K., Timkovich, R., & Wu, W. (1986). EVIDENCE THAT HEME D1 IS A 1,3-PORPHYRINDIONE. *Biochemistry*, 25(26), 8447-8453. doi: 10.1021/bi00374a019
- 87.Chang, C. K., & Wu, W. (1986a). ON THE HYDROGEN-PEROXIDE SULFURIC-ACID OXIDATION OF MESOPORPHYRIN - SYNTHESIS OF MESOPORPHYRINDIONES. *Journal of Organic Chemistry*, 51(11), 2134-2137. doi: 10.1021/jo00361a042
- 88.Chang, C. K., & Wu, W. (1986b). THE PORPHINEDIONE STRUCTURE OF HEME-D1 - SYNTHESIS AND SPECTRAL PROPERTIES OF MODEL COMPOUNDS OF THE PROSTHETIC GROUP OF DISSIMILATORY NITRITE REDUCTASE. *Journal of Biological Chemistry*, 261(19), 8593-8596.
<http://www.jbc.org/content/261/19/8593>
- 89.Fillers, J. P., Ravichandran, K. G., Abdalmuhdi, I., Tulinsky, A., & Chang, C. K. (1986). CRYSTAL AND MOLECULAR-STRUCTURE OF ANTHRACENE AND BIPHENYLENE PILLARED COFACIAL DIPORPHYRINS. *Journal of the American Chemical Society*, 108(3), 417-424. doi: 10.1021/ja00263a011

90. Musselman, B. D., Watson, J. T., & Chang, C. K. (1986). DIRECT EVIDENCE FOR PREFORMED IONS OF PORPHYRINS IN THE SOLVENT MATRIX FOR FAST-ATOM-BOMBARDMENT MASS-SPECTROMETRY. *Organic Mass Spectrometry*, 21(4), 215-219. doi: 10.1002/oms.1210210408
91. Salehi, A., Oertling, W. A., Babcock, G. T., & Chang, C. K. (1986). ONE-ELECTRON OXIDATION OF THE PORPHYRIN RING OF COBALTOUS OCTAETHYLPORPHYRIN (COII OEP) - ABSORPTION AND RESONANCE RAMAN SPECTRAL CHARACTERISTICS OF THE COII OEP⁺.CLO₄-PI-CATION RADICAL. *Journal of the American Chemical Society*, 108(18), 5630-5631. doi: 10.1021/ja00278a047
92. Andersson, L. A., Sotiriou, C., Chang, C. K., & Loehr, T. M. (1987). FACILE LACTONIZATION AND INVERSION OF VICINAL DIOLS IN HEME D-TYPE CHLORINS - A SPECTROSCOPIC STUDY. *Journal of the American Chemical Society*, 109(1), 258-264. doi: 10.1021/ja00235a039
93. Chang, C. K., & Sotiriou, C. (1987). A NOVEL METHOD OF FUNCTIONALIZING THE ETHYL CHAIN OF OCTAETHYLPORPHYRIN. *Journal of Organic Chemistry*, 52(5), 926-929. doi: 10.1021/jo00381a038
94. Kessel, D., Thompson, P., Musselman, B., & Chang, C. K. (1987a). CHEMISTRY OF HEMATOPORPHYRIN-DERIVED PHOTOSENSITIZERS. *Photochemistry and Photobiology*, 46(5), 563-568. doi: 10.1111/j.1751-1097.1987.tb04814.x
95. Kessel, D., Thompson, P., Musselman, B., & Chang, C. K. (1987b). PROBING THE STRUCTURE AND STABILITY OF THE TUMOR-LOCALIZING DERIVATIVE OF HEMATOPORPHYRIN BY REDUCTIVE CLEAVAGE WITH LIALH₄. *Cancer Research*, 47(17), 4642-4645.
<http://cancerres.aacrjournals.org/content/47/17/4642>
96. Loehr, T. M., Andersson, L. A., Sotiriou, C., Wu, W., Chang, C. K., Simpson, D. J., Smith, K. M., Stershic, M., & Stolzenberg, A. M. (1987). RESONANCE RAMAN AND IR SPECTROSCOPY OF BIOLOGICAL AND MODEL SATURATED PORPHYRIN COMPLEXES. *Recueil Des Travaux Chimiques Des Pays-Bas-Journal of the Royal Netherlands Chemical Society*, 106(6-7), 328-328.
97. Ni, C. L., Abdalmuhdi, I., Chang, C. K., & Anson, F. C. (1987). BEHAVIOR OF 4 ANTHRACENE-LINKED DIMERIC METALLOPORPHYRINS AS ELECTROCATALYSTS FOR THE REDUCTION OF DIOXYGEN. *Journal of Physical Chemistry*, 91(5), 1158-1166. doi: 10.1021/j100289a028
98. Oertling, W. A., Salehi, A., Chang, C. K., & Babcock, G. T. (1987). RESONANCE RAMAN-SPECTROSCOPIC DETECTION OF DEMETALLATION OF METALLOPORPHYRIN PI-CATION RADICALS. *Journal of Physical Chemistry*, 91(11), 3114-3116. doi: 10.1021/j100295a095
99. Oertling, W. A., Salehi, A., Chung, Y. C., Leroi, G. E., Chang, C. K., & Babcock, G. T. (1987). VIBRATIONAL, ELECTRONIC, AND STRUCTURAL-PROPERTIES OF COBALT, COPPER, AND ZINC OCTAETHYLPORPHYRIN-PI-CATION RADICALS. *Journal of Physical Chemistry*, 91(23), 5887-5898. doi: 10.1021/j100307a016

100. Salehi, A., Oertling, W. A., Babcock, G. T., & Chang, C. K. (1987). IRON PORPHYRIN PI-CATION RADICALS - SOLUTION RESONANCE RAMAN-SPECTRA OF (OEP.+) $\text{Fe}^{\text{III}}(\text{X})(\text{X}')$. *Inorganic Chemistry*, 26(25), 4296-4298. doi: 10.1021/ic00272a033
101. Tanaka, T., Yu, N. T., & Chang, C. K. (1987). RESONANCE RAMAN STUDIES OF STERICALLY HINDERED CYANOMET STRAPPED HEMES - EFFECTS OF LIGAND DISTORTION AND BASE TENSION ON IRON-CARBON BOND. *Biophysical Journal*, 52(5), 801-805. doi: 10.1016/S0006-3495(87)83274-5
102. Wu, W. S., & Chang, C. K. (1987). STRUCTURE OF DIONEHEME - TOTAL SYNTHESIS OF THE GREEN HEME PROSTHETIC GROUP IN CYTOCHROME CD1 DISSIMILATORY NITRITE REDUCTASE. *Journal of the American Chemical Society*, 109(10), 3149-3150. doi: 10.1021/ja00244a050
103. Yu, N. T., Thompson, H. M., & Chang, C. K. (1987). RESONANCE RAMAN STUDIES OF DIOXYGEN AND CARBON-MONOXIDE BINDING TO IMIDAZOLE-APPENDED HEMES. *Biophysical Journal*, 51(2), 283-287. doi: 10.1016/S0006-3495(87)83334-9
104. Chang, C. K., Ward, B., Young, R., & Kondylis, M. P. (1988). FINE TUNING OF HEME REACTIVITY - HYDROGEN-BONDING AND DIPOLE INTERACTIONS AFFECTING LIGAND-BINDING TO HEMOPROTEINS. *Journal of Macromolecular Science-Chemistry*, A25(10-11), 1307-1326. doi: 10.1080/00222338808053423
105. Musselman, B., & Chang, C. K. (1988). CHARACTERIZATION OF OLIGOMERIC HEMATOPORPHYRIN TUMORICIDAL REAGENTS FOR PHOTODYNAMIC THERAPY. Paper presented at the New Directions in Photodynamic Therapy, San Diego. *Proceedings of SPIE*, 847, 96-100. doi: 10.1117/12.942695
106. Musselman, B., Kessel, D., & Chang, C. K. (1988). FAST ATOM BOMBARDMENT MASS-SPECTROMETRY OF HIGH-MOLECULAR-WEIGHT FRACTION OF PORPHYRIN-BASED PHOTODYNAMIC THERAPY DRUGS. *Biomedical and Environmental Mass Spectrometry*, 15(5), 257-263. doi: 10.1002/bms.1200150505
107. Salehi, A., Fonda, H. N., Oertling, A. W., Babcock, G. T., & Chang, C. K. (1988). PREPARATION OF TRANS-OCTAETHYLCHLORIN-D₂(ALPHA,BETA), TRANS-OCTAETHYLCHLORIN-D₂(GAMMA,DELTA), AND TRANS-OCTAETHYLCHLORINE-D₄ AS WELL AS OCTAETHYLPORPHYRIN-D₂ USING ACID-CATALYZED EXCHANGE-REACTION. *Journal of Labelled Compounds & Radiopharmaceuticals*, 25(12), 1333-1337. doi: 10.1002/jlcr.2580251207
108. Salehi, A., Oertling, W. A., Fonda, H. N., Babcock, G. T., & Chang, C. K. (1988). RESONANCE RAMAN-SPECTRA OF THE PI-CATION RADICALS OF COPPER, COBALT, AND NICKEL METHYLOCTAETHYLCHLORINS - VIBRATIONAL CHARACTERISTICS OF CHLOROPHYLL MODELS. *Photochemistry and Photobiology*, 48(4), 525-530. doi: 10.1111/j.1751-1097.1988.tb02856.x
109. Sotiriou, C., & Chang, C. K. (1988). SYNTHESIS OF THE HEME-D PROSTHETIC GROUP OF BACTERIAL TERMINAL OXIDASE. *Journal of the American Chemical Society*, 110(7), 2264-2270. doi: 10.1021/ja00215a042

- 110.Lessard, R. B., Wallace, M. M., Oertling, W. A., Chang, C. K., Berglund, K. A., & Nocera, D. G. (1989). THE FORMATION OF MOLECULAR COMPOSITES BY A MODIFIED SOL-GEL PROCESS. Paper presented at the Processing Science of Advanced Ceramics. *MRS Proceedings*, 155, 109-118. doi: 10.1557/PROC-155-109
- 111.Martinis, S. A., Sotiriou, C., Chang, C. K., & Sligar, S. G. (1989). CHARACTERIZATION OF CYTOCHROME-B5 RECONSTITUTED WITH A FERRIC CHLORIN AND A FERRIC OXOCHLORIN. *Biochemistry*, 28(2), 879-884. doi: 10.1021/bi00428a071
- 112.Oertling, W. A., Salehi, A., Chang, C. K., & Babcock, G. T. (1989). RESONANCE RAMAN VIBRATIONAL ANALYSIS OF CU-II, FE-III, AND CO-III PORPHYRIN PI-CATION RADICALS AND THEIR MESO-DEUTERIATED ANALOGS. *Journal of Physical Chemistry*, 93(4), 1311-1319. doi: 10.1021/j100341a028
- 113.Proniewicz, L. M., Odo, J., Goral, J., Chang, C. K., & Nakamoto, K. (1989). RESONANCE RAMAN-SPECTRA OF DIOXYGEN ADDUCTS OF PILLARED DICOBALT COFACIAL DIPORPHYRINS. *Journal of the American Chemical Society*, 111(6), 2105-2110. doi: 10.1021/ja00188a025
- 114.Renner, M. W., Forman, A., Wu, W., Chang, C. K., & Fajer, J. (1989). ELECTROCHEMICAL, THEORETICAL, AND ESR CHARACTERIZATIONS OF PORPHYCENES - THE PI-ANION RADICAL OF NICKEL(II) PORPHYCENE. *Journal of the American Chemical Society*, 111(23), 8618-8621. doi: 10.1021/ja00205a010
- 115.Sandusky, P. O., Salehi, A., Chang, C. K., & Babcock, G. T. (1989). AN ENDOR STUDY OF SPIN DISTRIBUTIONS IN OCTAETHYLMETALLOPORPHYRIN PI-CATION RADICALS. *Journal of the American Chemical Society*, 111(16), 6437-6439. doi: 10.1021/ja00198a074
- 116.Yu, N. T., Lin, S. H., Chang, C. K., & Gersonde, K. (1989). RESONANCE RAMAN ENHANCEMENT OF THE MN-N-O BENDING MODE IN NITROSYL MANGANESE STRAPPED AND OPEN HEME COMPLEXES. *Biophysical Journal*, 55(6), 1137-1144. doi: 10.1016/S0006-3495(89)82910-8
- 117.Andersson, L. A., Loehr, T. M., Wu, W., Chang, C. K., & Timkovich, R. (1990). MODELING HEME D1 - THE SPECTRAL PROPERTIES OF COPPER(II) PORPHYRINDIONES. *Febs Letters*, 267(2), 285-288. doi: 10.1016/0014-5793(90)80946-g
- 118.Chang, C. K., Sotiriou, C., & Wu, W. (1990). SYNTHETIC APPROACHES TO LONG-WAVELENGTH ABSORBING PHOTOSENSITIZERS: PORPHYRINONE AND DERIVATIVES. Paper presented at the Photodynamic Therapy: Mechanisms II, Los Angeles. *Proceedings of SPIE*, 1203, 281-286. doi: 10.1117/12.17673
- 119.Fonda, H. N., Oertling, W. A., Salehi, A., Chang, C. K., & Babcock, G. T. (1990). NORMAL-MODE CHARACTERISTICS OF CHLOROPHYLL MODELS - VIBRATIONAL ANALYSIS OF METALLOOCTAETHYLCHLORINES AND THEIR SELECTIVELY DEUTERATED ANALOGS. *Journal of the American Chemical Society*, 112(26), 9497-9507. doi: 10.1021/ja00182a008
- 120.Renner, M. W., Cheng, R. J., Chang, C. K., & Fajer, J. (1990). CONFORMATIONAL AND SUBSTITUENT EFFECTS ON SPIN DISTRIBUTIONS IN PORPHYRIN CATION RADICALS. *Journal of Physical Chemistry*, 94(23), 8508-8511. doi: 10.1021/j100386a006

121. Barkigia, K. M., Chang, C. K., & Fajer, J. (1991). MOLECULAR-STRUCTURE OF A DIHYDROXYCHLORIN - A MODEL OF THE GREEN HEME-D AND OF A PHOTODYNAMIC THERAPY SENSITIZER. *Journal of the American Chemical Society*, 113(19), 7445-7447. doi: 10.1021/ja00019a065
122. Dawson, J. H., Bracete, A. M., Huff, A. M., Kadkhodayan, S., Zeitler, C. M., Sono, M., Chang, C. K., & Loewen, P. C. (1991). THE ACTIVE-SITE STRUCTURE OF ESCHERICHIA-COLI HP11 CATALASE - EVIDENCE FAVORING COORDINATION OF A TYROSINATE PROXIMAL LIGAND TO THE CHLORIN IRON. *Febs Letters*, 295(1-3), 123-126. doi: 10.1016/0014-5793(91)81401-s
123. Kessel, D., Dougherty, T. J., & Chang, C. K. (1991). PHOTOSENSITIZATION BY SYNTHETIC DIPORPHYRINS AND DICHLORINS INVIVO AND INVITRO. *Photochemistry and Photobiology*, 53(4), 475-479. doi: 10.1111/j.1751-1097.1991.tb03659.x
124. Mylrajan, M., Andersson, L. A., Loehr, T. M., Wu, W. S., & Chang, C. K. (1991). SPECTROSCOPIC ANALYSIS OF MODELS FOR HEME D1 - ISOMERIC COPPER(II) PORPHYRINDIONES. *Journal of the American Chemical Society*, 113(13), 5000-5005. doi: 10.1021/ja00013a040
125. Oertling, W. A., Wu, W. S., Lopezgarriga, J. J., Kim, Y. Y., & Chang, C. K. (1991). OPTICAL ABSORPTIONS AND RAMAN-SCATTERING OF METALLOPORPHYCENES REVEAL ELECTRONIC AND VIBRONIC PROPERTIES DISTINCT FROM THOSE OF METALLOPORPHYRINS. *Journal of the American Chemical Society*, 113(1), 127-134. doi: 10.1021/ja00001a020
126. Sandusky, P. O., Oertling, W. A., Chang, C. K., & Babcock, G. T. (1991). EPR AND ENDOR STUDIES OF THE METALLOOCTAETHYLPORPHYRIN PI-CATION RADICAL. *Journal of Physical Chemistry*, 95(11), 4300-4307. doi: 10.1021/j100164a024
127. WEEGAERSSSENS, E., WU, W., YE, R., TIEDJE, J., & CHANG, C. (1991). PURIFICATION OF CYTOCHROME CD1 NITRITE REDUCTASE FROM PSEUDOMONAS-STUTZERI JM300 AND RECONSTITUTION WITH NATIVE AND SYNTHETIC HEME-D1. *JOURNAL OF BIOLOGICAL CHEMISTRY*, 266(12), 7496-7502. <http://www.jbc.org/content/266/12/7496>
128. Aviles, G., & Chang, C. K. (1992). N-15 NMR OF STERICALLY DISTORTED CYANOMET HEMES. *Journal of the Chemical Society-Chemical Communications*(1), 31-32. doi: 10.1039/c39920000031
129. Barkigia, K. M., Chang, C. K., Fajer, J., & Renner, M. W. (1992). MODELS OF HEME-D1 - MOLECULAR-STRUCTURE AND NMR CHARACTERIZATION OF AN IRON(III) DIOXOISOBACTERIOCHLORIN (PORPHYRINDIONE). *Journal of the American Chemical Society*, 114(5), 1701-1707. doi: 10.1021/ja00031a025
130. Chang, C. K., Wu, W. S., Chern, S. S., & Peng, S. M. (1992). 1ST EXAMPLE OF A CHLOROPHIN FROM AN UNEXPECTED OXIDATIVE RING-OPENING OF AN (OCTADECYDROCORRINATO)NICKEL(II) SALT. *Angewandte Chemie-International Edition in English*, 31(1), 70-72. doi: 10.1002/anie.199200701

132. Gagliardi, C. D., Dunuwila, D., Chang, C. K., & Berglund, K. A. (1992). DIFFUSION OF CARBON MONOXIDE IN METALLORGANIC THIN FILMS DERIVED FROM METAL ALKOXIDE CARBOXYLATES. Paper presented at the Better Ceramics through Chemistry V. *MRS Proceedings*, 271, 645-651. doi: 10.1557/PROC-271-645
133. Lee, W. L., Gage, D. A., Huang, Z. H., Chang, C. K., Kanatzidis, M. G., & Allison, J. (1992). CHARACTERIZATION OF IRON SULFUR CUBANE CLUSTERS BY FAST-ATOM-BOMBARDMENT MASS-SPECTROMETRY - THE FORMATION OF IONIC $Fe(M)S(N)$ CLUSTERS THROUGH GAS-PHASE UNIMOLECULAR REDUCTION PROCESSES AND THEIR SOLUTION PARALLELS. *Journal of the American Chemical Society*, 114(18), 7132-7141. doi: 10.1021/ja00044a027
134. Li, Z. Y., Huang, J. S., Che, C. M., & Chang, C. K. (1992). UNUSUAL METALLOPORPHYCENES - 1ST SYNTHESSES OF CARBONYL-CONTAINING AND DIOXO-CONTAINING OSMIUM AND RUTHENIUM TETRAPROPYLPORPHYCENE COMPLEXES. *Inorganic Chemistry*, 31(12), 2670-2672. doi: 10.1021/ic00038a070
135. Turro, C., Chang, C. K., Leroi, G. E., Cukier, R. I., & Nocera, D. G. (1992). PHOTOINDUCED ELECTRON-TRANSFER MEDIATED BY A HYDROGEN-BONDED INTERFACE. *Journal of the American Chemical Society*, 114(10), 4013-4015. doi: 10.1021/ja00036a081
136. Wu, W., Chang, C. K., Varotsis, C., Babcock, G. T., Puustinen, A., & Wikstrom, M. (1992). STRUCTURE OF THE HEME O PROSTHETIC GROUP FROM THE TERMINAL QUINOL OXIDASE OF ESCHERICHIA-COLI. *Journal of the American Chemical Society*, 114(4), 1182-1187. doi: 10.1021/ja00030a009
137. Zaleski, J. M., Chang, C. K., Leroi, G. E., Cukier, R. I., & Nocera, D. G. (1992). ROLE OF SOLVENT DYNAMICS IN THE CHARGE RECOMBINATION OF A DONOR-ACCEPTOR PAIR. *Journal of the American Chemical Society*, 114(9), 3564-3565. doi: 10.1021/ja00035a066
138. Andersson, L. A., Mylrajan, M., Loehr, T. M., & Chang, C. K. (1993). VIBRATIONAL-SPECTRA OF ISOMERIC COPPER(II)-DIMETHYLOCTAETHYLISOBACTERIOCHLORIN COMPLEXES - EFFECTS OF NONCONJUGATED SUBSTITUENTS. *Spectrochimica Acta Part a-Molecular and Biomolecular Spectroscopy*, 49(13-14), 2105-2116. doi: 10.1016/S0584-8539(09)91020-0
139. Chang, C. K. (1993). STUDIES ON PIGMENTS OF LIFE: NOVEL PORPHYRINOIDS FROM BACTERIA. *Youji Huaxue (Chinese Journal of Organic Chemistry)*, 13, 171.
140. Huff, A. M., Chang, C. K., Cooper, D. K., Smith, K. M., & Dawson, J. H. (1993). IMIDAZOLE-LIGATED AND ALKYLAMINE-LIGATED IRON(II, III) CHLORIN COMPLEXES AS MODELS FOR HISTIDINE AND LYSINE COORDINATION TO IRON IN DIHYDROPORPHYRIN-CONTAINING PROTEINS - CHARACTERIZATION WITH MAGNETIC CIRCULAR-DICHROISM SPECTROSCOPY. *Inorganic Chemistry*, 32(8), 1460-1466. doi: 10.1021/ic00060a023

- 141.Kessel, D., Chang, C. K., & Henderson, B. W. (1993). PHOTSENSITIZATION WITH METHYLENE-LINKED PORPHYRIN DIMERS. *Journal of Photochemistry and Photobiology B-Biology*, 18(2-3), 177-180. doi: 10.1016/1011-1344(93)80060-m
- 142.Levanon, H., Regev, A., Galili, T., Hugerat, M., Chang, C. K., & Fajer, J. (1993). PHOTOELECTRON TRANSFER BETWEEN A MAGNESIUM-FREE-BASE PORPHYRIN HETERODIMER AND DUROQUINONE - SELECTIVE EXCITATION AND TIME-RESOLVED EPR STUDIES. *Journal of Physical Chemistry*, 97(50), 13198-13205. doi: 10.1021/j100152a026
- 143.Li, X.-Y., Lipscomb, L. A., Chang, C. K., & Yu, N.-T. (1993). VIBRATIONAL PROPERTIES OF SEVERAL SYNTHETIC HEME MODELS STUDIED BY RAMAN RELATED TECHNIQUES. Paper presented at the Laser Spectroscopy of Biomolecules, Jyväskylä, Finland. *Proceedings of SPIE*, 1921, 309-314. doi: 10.1117/12.146133
- 144.Zaleski, J. M., Chang, C. K., & Nocera, D. G. (1993). INFLUENCE OF SOLVENT DYNAMICS ON INVERTED REGION ELECTRON-TRANSFER OF COFACIAL PORPHYRIN PORPHYRIN AND PORPHYRIN CHLORIN COMPLEXES. *Journal of Physical Chemistry*, 97(50), 13206-13215. doi: 10.1021/j100152a027
- 145.Zaleski, J. M., Wu, W. S., Chang, C. K., Leroi, G. E., Cukier, R. I., & Nocera, D. G. (1993). DYNAMICAL SOLVENT EFFECTS IN INVERTED REGION ELECTRON-TRANSFER. *Chemical Physics*, 176(2-3), 483-491. doi: 10.1016/0301-0104(93)80256-9
- 146.Bracete, A. M., Kadkhodayan, S., Sono, M., Huff, A. M., Zhuang, C. F., Cooper, D. K., Smith, K. M., Chang, C. K., & Dawson, J. H. (1994). IRON CHLORIN-RECONSTITUTED HISTIDINE-LIGATED HEME-PROTEINS AS MODELS FOR NATURALLY-OCCURRING IRON CHLORIN PROTEINS - MAGNETIC CIRCULAR-DICHROISM SPECTROSCOPY AS A PROBE OF IRON CHLORIN COORDINATION STRUCTURE. *Inorganic Chemistry*, 33(22), 5042-5049. doi: 10.1021/ic00100a032
- 147.Chang, C. K. (1994). HEME D(1) AND OTHER HEME COFACTORS FROM BACTERIA. In D. J. Chadwick & K. Ackrill (Eds.), *Biosynthesis of the Tetrapyrrole Pigments* (Vol. Ciba Foundation Symposium, 180, pp. 228-238). WOS:A1994BA41X00015
- 148.Chang, C. K., Aviles, G., & Bag, N. Z. (1994). VERDOHEME-LIKE OXAPORPHYRIN FORMATION BY OXYGENATION OF A CO(II) PORPHYRINYL NAPHTHOIC ACID - A NEW MODEL OF HEME DEGRADATION. *Journal of the American Chemical Society*, 116(26), 12127-12128. doi: 10.1021/ja00105a093
- 149.Dunuwila, D. D., Torgerson, B. A., Chang, C. K., & Berglund, K. A. (1994). SOL-GEL DERIVED TITANIUM CARBOXYLATE THIN-FILMS FOR OPTICAL-DETECTION OF ANALYTES. *Analytical Chemistry*, 66(17), 2739-2744. doi: 10.1021/ac00089a022

- 150.Kessel, D., Woodburn, K. W., Chang, C. K., & Henderson, B. W. (1994). PHOTODYNAMIC THERAPY WITH CATIONIC PHOTSENSITIZERS. Paper presented at the 5th International Photodynamic Association Biennial Meeting, Amelia Island, Florida. *Proceedings of SPIE*, 2371, 334-338. doi: 10.1117/12.203370
- 151.Woodburn, K., Chang, C. K., Lee, S. W., Henderson, B., & Kessel, D. (1994). BIODISTRIBUTION AND PDT EFFICACY OF A KETOCHLORIN PHOTSENSITIZER AS A FUNCTION OF THE DELIVERY VEHICLE. *Photochemistry and Photobiology*, 60(2), 154-159. doi: 10.1111/j.1751-1097.1994.tb05083.x
- 152.Bag, N., Chern, S. S., Peng, S. M., & Chang, C. K. (1995a). BIS-POCKET PORPHYRINS WITHOUT MESOSUBSTITUENTS - TETRAMETHYLTETRA(2,4,6-TRIISOPROPYLPHENYL)PORPHYRIN-I AND TETRAMETHYLTETRATERPHENYLPORPHYRIN-I. *Tetrahedron Letters*, 36(36), 6409-6412. doi: 10.1016/0040-4039(95)01326-d
- 153.Bag, N., Chern, S. S., Peng, S. M., & Chang, C. K. (1995b). MOLECULAR AND CRYSTAL-STRUCTURE OF A BINUCLEAR MU-ACETATO-COUPLED ZNN3 ZN PORPHYRIN, N-3=BIS(2-PICOLYL)AMINE - SYNTHETIC APPROACH TO MODEL THE CYTOCHROME-C-OXIDASE ACTIVE-SITE. *Inorganic Chemistry*, 34(3), 753-756. doi: 10.1021/ic00107a031
- 154.Chang, C. K., & Bag, N. (1995). PHENYLPYRROLES BY SUZUKI CROSS-COUPILING AND A SYNTHESIS OF TYPE-I TETRAMETHYLTETRAPHENYLPORPHYRIN. *Journal of Organic Chemistry*, 60(21), 7030-7032. doi: 10.1021/jo00126a068
- 155.Chang, C. K., Liang, Y., & Aviles, G. (1995). CONFORMATIONAL CONTROL OF INTRAMOLECULAR HYDROGEN-BONDING IN HEME MODELS - MAXIMAL CO-II-O-2 BINDING IN A C-CLAMP PORPHYRIN. *Journal of the American Chemical Society*, 117(14), 4191-4192. doi: 10.1021/ja00119a044
- 156.Chang, C. K., Morrison, I., Wu, W. S., Chern, S. S., & Peng, S. M. (1995). SYNTHESIS AND STRUCTURE OF N,N'-BRIDGED PORPHYCENE. *Journal of the Chemical Society-Chemical Communications*(11), 1173-1174. doi: 10.1039/c39950001173
- 157.Coulter, E. D., Sono, M., Chang, C. K., Lopez, O., & Dawson, J. H. (1995). ELECTRON PARAMAGNETIC RESONANCE SPECTROSCOPY AS A PROBE OF COORDINATION STRUCTURE IN GREEN HEME SYSTEMS: IRON CHLORINS AND IRON FORMYLPORPHYRINS RECONSTITUTED INTO MYOGLOBIN. *Inorganica Chimica Acta*, 240(1-2), 603-608. doi: 10.1016/0020-1693(95)04588-0
- 158.Dawson, J. H., Bracete, A. M., Huff, A. M., Kadkhodayan, S., Chang, C. K., & Sono, M. (1995). MAGNETIC CIRCULAR DICHROISM SPECTROSCOPY AS A PROBE OF THE ACTIVE SITE STRUCTURES OF IRON CHLORIN- AND FORMYLPORPHYRIN-CONTAINING GREEN HEME PROTEINS. In H. H. Thorp, V. L. Pecoraro (Eds.), *Mechanistic Bioinorganic Chemistry* (Vol. Advances in Chemistry 246, pp. 351-371). doi: 10.1021/ba-1995-0246.ch013
- 159.Kessel, D., Luo, Y., Woodburn, K. W., Chang, C. K., & Henderson, B. W. (1995). MECHANISMS OF PHOTOTOXICITY CATALYZED BY TWO PORPHYCENES. Paper presented at the Optical Methods for

- 160.Kessel, D., Woodburn, K., Henderson, B. W., & Chang, C. K. (1995). SITES OF PHOTODAMAGE IN-VIVO AND IN-VITRO BY A CATIONIC PORPHYRIN. *Photochemistry and Photobiology*, 62(5), 875-881. doi: 10.1111/j.1751-1097.1995.tb09150.x
- 161.Kirby, J. P., Vandantzig, N. A., Chang, C. K., & Nocera, D. G. (1995). FORMATION OF PORPHYRIN DONOR-ACCEPTOR COMPLEXES VIA AN AMIDINIUM-CARBOXYLATE SALT BRIDGE. *Tetrahedron Letters*, 36(20), 3477-3480. doi: 10.1016/0040-4039(95)00569-x
- 162.Liang, Y., & Chang, C. K. (1995). INCLUSION COMPLEX AND SUBSTRATE RECOGNITION BY C-CLAMP PORPHYRINS CONTAINING KEMPS TRIACID. *Tetrahedron Letters*, 36(22), 3817-3820. doi: 10.1016/0040-4039(95)00686-7
- 163.Zhang, H., Schmidt, E., Wu, W., Chang, C. K., & Babcock, G. T. (1995). PICOSECOND TIME-RESOLVED RESONANCE RAMAN-SPECTROSCOPY OF THE CHARGE SEPARATED STATE OF MG-FREE BASE DIPORPHYRINS. *Chemical Physics Letters*, 234(1-3), 133-140. doi: 10.1016/0009-2614(95)00042-3
- 164.Liang, Y., Chang, C. K., & Peng, S. M. (1996). MOLECULAR RECOGNITION WITH C-CLAMP PORPHYRINS: SYNTHESIS, STRUCTURAL, AND COMPLEXATION STUDIES. *Journal of Molecular Recognition*, 9(2), 149-157. doi: 10.1002/(sici)1099-1352(199603)9:2<149::aid-jmr256>3.0.co;2-o
- 165.Luo, Y., Chang, C. K., & Kessel, D. (1996a). MODULATION OF PDT-INDUCED APOPTOSIS BY PROTEIN KINASES AND PHOSPHATASES. Paper presented at the Optical Methods for Tumor Treatment and Detection: Mechanisms and Techniques in Photodynamic Therapy V, San Jose. *Proceedings of SPIE*, 2675, 132-137. doi: 10.1117/12.237530
- 166.Luo, Y., Chang, C. K., & Kessel, D. (1996b). RAPID INITIATION OF APOPTOSIS BY PHOTODYNAMIC THERAPY. *Photochemistry and Photobiology*, 63(4), 528-534. doi: 10.1111/j.1751-1097.1996.tb03079.x
- 167.Schmidt, E., Zhang, H., Chang, C. K., Babcock, G. T., & Oertling, W. A. (1996). ROOM TEMPERATURE BINDING OF CO TO COBALTOUS PORPHYRIN PI CATION RADICAL: SPECTROSCOPIC CHARACTERIZATION OF MONO AND BIS CO COMPLEXES WITH COBALTIC PORPHYRIN. *Journal of the American Chemical Society*, 118(12), 2954-2961. doi: 10.1021/ja950744q
- 168.Deng, Y. Q., Roberts, J. A., Peng, S. M., Chang, C. K., & Nocera, D. G. (1997). THE AMIDINIUM-CARBOXYLATE SALT BRIDGE AS A PROTON-COUPLED INTERFACE TO ELECTRON TRANSFER PATHWAYS. *Angewandte Chemie-International Edition in English*, 36(19), 2124-2127. doi: 10.1002/anie.199721241
- 169.Kessel, D., Luo, Y., Chang, C. K., Henderson, B. W., & Woodburn, K. W. (1997). MODES OF CYTOTOXICITY ASSOCIATED WITH PHOTODYNAMIC THERAPY. Paper presented at the Optical Methods for Tumor

Treatment and Detection: Mechanisms and Techniques in Photodynamic Therapy VI, San Jose. *Proceedings of SPIE*, 2972, 103-109. doi: 10.1117/12.273494

170. Kessel, D., Luo, Y., Deng, Y. Q., & Chang, C. K. (1997). THE ROLE OF SUBCELLULAR LOCALIZATION IN INITIATION OF APOPTOSIS BY PHOTODYNAMIC THERAPY. *Photochemistry and Photobiology*, 65(3), 422-426. doi: 10.1111/j.1751-1097.1997.tb08581.x
171. Sun, J., Chang, C. K., & Loehr, T. M. (1997). Q-BAND RESONANCE RAMAN ENHANCEMENT OF FE-CO VIBRATIONS IN FERROUS CHLORIN COMPLEXES: POSSIBLE MONITOR OF AXIAL LIGANDS IN D CYTOCHROMES. *Journal of Physical Chemistry B*, 101(8), 1476-1483. doi: 10.1021/jp963439f
172. Varotsis, C., Wu, W., Chang, C. K., Babcock, G. T., Wikstrom, M., & Puustinen, A. (1999). RESONANCE RAMAN SCATTERING FROM HEME O COMPLEXES AND CYTOCHROME BO(3) OXIDASE. *Laser Chemistry*, 19(1-4), 227-228. doi: 10.1155/1999/24629
173. Chang, C. J., Deng, Y. Q., Heyduk, A. F., Chang, C. K., & Nocera, D. G. (2000). XANTHENE-BRIDGED COFACIAL BISPORPHYRINS. *Inorganic Chemistry*, 39(5), 959-966. doi: 10.1021/ic990987+
174. Chang, C. J., Deng, Y. Q., Shi, C. N., Chang, C. K., Anson, F. C., & Nocera, D. G. (2000). ELECTROCATALYTIC FOUR-ELECTRON REDUCTION OF OXYGEN TO WATER BY A HIGHLY FLEXIBLE COFACIAL COBALT BISPORPHYRIN. *Chemical Communications*(15), 1355-1356. doi: 10.1039/b001620i
175. Chang, C. K. (2000). PORPHYRINS IN PHOTODYNAMIC THERAPY. *Chemistry (The Chinese Chemical Society, Taipei)*, 58, 531-536.
176. Chang, C. K., & Lai, T.-S. (2000). ORGANIC TRANSFORMATIONS BY METALLOPORPHYRINS. *Chemistry (The Chinese Chem. Soc., Taipei)*, 58, 449-458.
177. Chang, C. K., Yeh, C. Y., & Lai, T. S. (2000). SYNTHESIS OF STERICALLY ENCUMBERED PORPHYRINS AS CATALYSTS FOR SHAPE-SELECTIVE OXIDATIONS. *Macromolecular Symposia*, 156, 117-124. doi: 10.1002/1521-3900(200007)156:1<117::aid-masy117>3.0.co;2-2
178. Coulter, E. D., Cheek, J., Ledbetter, A. P., Chang, C. K., & Dawson, J. H. (2000). PREPARATION AND INITIAL CHARACTERIZATION OF THE COMPOUND I, II, AND III STATES OF IRON METHYLCHLORIN-RECONSTITUTED HORSERADISH PEROXIDASE AND MYOGLOBIN: MODELS FOR KEY INTERMEDIATES IN IRON CHLORIN ENZYMES. *Biochemical and Biophysical Research Communications*, 279(3), 1011-1015. doi: 10.1006/bbrc.2000.4077
179. Deng, Y. Q., Chang, C. K., & Nocera, D. G. (2000). FACILE SYNTHESIS OF BETA-DERIVATIZED PORPHYRINS - STRUCTURAL CHARACTERIZATION OF A BETA-BETA-BIS-PORPHYRIN. *Angewandte Chemie-International Edition*, 39(6), 1066-1068. doi: 10.1002/(sici)1521-3773(20000317)39:6<1066::aid-anie1066>3.0.co;2-g

180. Sotiriou-Leventis, C., & Chang, C. K. (2000). KINETIC STUDY OF CO AND O₂ BINDING TO HORSE HEART MYOGLOBIN RECONSTITUTED WITH SYNTHETIC IRON CHLORIN GREEN HEMES. *Inorganica Chimica Acta*, 311(1-2), 113-118. doi: 10.1016/s0020-1693(00)00320-0
181. Lai, T. S., Ng, K. H., Liu, H. Y., Chang, C. K., & Yeung, L. L. (2002). EFFECT OF FIFTH COORDINATION IN CATALYTIC EPOXIDATION BY A CHIRAL MANGANESE PORPHYRIN. *Synlett*(9), 1475-1478. doi: 10.1055/s-2002-33523
182. Chang, C. K., Bag, N., Guo, B. M., & Peng, S. M. (2003). PORPHYRIN XANTHENE AMIDES: ANCHORING DISTAL H-BONDING IN HEME MODELS. *Inorganica Chimica Acta*, 351, 261-268. doi: 10.1016/s0020-1693(03)00118-x
183. Lai, T. S., Lee, S. K. S., Yeung, L. L., Liu, H. Y., Williams, I. D., & Chang, C. K. (2003). REMARKABLE AXIAL LIGAND EFFECT ON REGIOSELECTIVITY TOWARDS TERMINAL ALKENES IN EPOXIDATION OF DIENES BY A ROBUST MANGANESE PORPHYRIN. *Chemical Communications*(5), 620-621. doi: 10.1039/b210645k
184. Liu, H. Y., Lai, T. S., Yeung, L. L., & Chang, C. K. (2003). FIRST SYNTHESIS OF PERFLUORINATED CORROLE AND ITS MN=O COMPLEX. *Organic Letters*, 5(5), 617-620. doi: 10.1021/ol027111i
185. Mak, N. K., Kok, T. W., Wong, R. N. S., Lam, S. W., Lau, Y. K., Leung, W. N., Cheung, N. H., Huang, D. P., Yeung, L. L., & Chang, C. K. (2003). PHOTODYNAMIC ACTIVITIES OF SULFONAMIDE DERIVATIVES OF PORPHYCENE ON NASOPHARYNGEAL CARCINOMA CELLS. *Journal of Biomedical Science*, 10(4), 418-429. doi: 10.1159/000071161
186. Chang, C. K., Lau, Y.-K., Lai, T.-S., Yeung, L.-L., Leung, W.-N., & Mak, N.-K. (2004). SYNTHESIS AND PHOTODYNAMIC ACTIVITIES OF MODIFIED BENZOCHLORIN DERIVATIVES ON NASOPHARYNGEAL CELLS. Paper presented at the Optical Methods for Tumor Treatment and Detection: Mechanisms and Techniques in Photodynamic Therapy XIII, San Jose. *Proceedings of SPIE*, 5315, 49-60. doi: 10.1117/12.527557
187. Lai, S. W., Hou, Y. J., Che, C. M., Pang, H. L., Wong, K. Y., Chang, C. K., & Zhu, N. Y. (2004). ELECTRONIC SPECTROSCOPY, PHOTOPHYSICAL PROPERTIES, AND EMISSION QUENCHING STUDIES OF AN OXIDATIVELY ROBUST PERFLUORINATED PLATINUM PORPHYRIN. *Inorganic Chemistry*, 43(12), 3724-3732. doi: 10.1021/ic049902h
188. Mak, N. K., Li, K. M., Leung, W. N., Wong, R. N. S., Huang, D. P., Lung, M. L., Lau, Y. K., & Chang, C. K. (2004). INVOLVEMENT OF BOTH ENDOPLASMIC RETICULUM AND MITOCHONDRIA IN PHOTOKILLING OF NASOPHARYNGEAL CARCINOMA CELLS BY THE PHOTOSENSITIZER ZN-BC-AM. *Biochemical Pharmacology*, 68(12), 2387-2396. doi: 10.1016/j.bcp.2004.08.024
189. Che, C. M., Zhan, J. L., Zhang, R., Huang, J. S., Lai, T. S., Tsui, W. M., Zhou, X. G., Zhou, Z. Y., Zhou, N. Y., & Chang, C. K. (2005). HYDROCARBON OXIDATION BY BETA-HALOGENATED DIOXORUTHENIUM(VI) PORPHYRIN COMPLEXES: EFFECT OF REDUCTION POTENTIAL (RU-VI/V) AND C-H BOND-

DISSOCIATION ENERGY ON RATE CONSTANTS. *Chemistry-a European Journal*, 11(23), 7040-7053. doi: 10.1002/chem.200500814

190. Gu, H. W., Xu, K. M., Yang, Z. M., Chang, C. K., & Xu, B. (2005). SYNTHESIS AND CELLULAR UPTAKE OF PORPHYRIN DECORATED IRON OXIDE NANOPARTICLES - A POTENTIAL CANDIDATE FOR BIMODAL ANTICANCER THERAPY. *Chemical Communications*(34), 4270-4272. doi: 10.1039/b507779f
191. Gu, H. W., Yang, Z. M., Gao, J. H., Chang, C. K., & Xu, B. (2005). HETERODIMERS OF NANOPARTICLES: FORMATION AT A LIQUID-LIQUID INTERFACE AND PARTICLE-SPECIFIC SURFACE MODIFICATION BY FUNCTIONAL MOLECULES. *Journal of the American Chemical Society*, 127(1), 34-35. doi: 10.1021/ja045220h
192. Li, Q., Chang, C. K., & Huie, C. W. (2005a). INVESTIGATION OF SOLVENT EFFECTS IN CAPILLARY ELECTROPHORESIS FOR THE SEPARATION OF BIOLOGICAL PORPHYRIN METHYL ESTERS. *Electrophoresis*, 26(17), 3349-3359. doi: 10.1002/elps.200500190
193. Li, Q., Chang, C. K., & Huie, C. W. (2005b). MICROEMULSION AND MICELLAR ELECTROKINETIC CHROMATOGRAPHY OF HEMATOPORPHYRIN D: A STARTING MATERIAL OF HEMATOPORPHYRIN DERIVATIVE. *Electrophoresis*, 26(4-5), 885-894. doi: 10.1002/elps.200410232
194. Li, Y. W., Gu, G. B., Liu, H. Y., Sung, H. H. Y., Williams, I. D., & Chang, C. K. (2005). A NEW ISO-AMYL BENZOTHAZOLYL SULFOXIDE AS AN EXTRACTANT FOR PALLADIUM AND THE CRYSTAL STRUCTURE OF ITS PALLADIUM(II) COMPLEX. *Molecules*, 10(8), 912-921. doi: 10.3390/10080912
195. Liu, H. Y., Tian, J. C., Ying, X., Xu, Z. G., Liao, S. J., & Chang, C. K. (2005). THEORETICAL INVESTIGATION ON THE SECOND-ORDER NONLINEAR OPTICAL PROPERTIES OF CHIRAL AMINO ACID ZINC(II) PORPHYRINS. *Chinese Journal of Structural Chemistry*, 24(3), 263-268.
196. Neya, S., Chang, C. K., Okuno, D., Hoshino, T., Hata, M., & Funasaki, N. (2005). CONTROL OF IRON(III) SPIN-STATE IN THE MODEL COMPLEXES OF AZIDE HEMOPROTEIN BY PORPHYCENE, CORRPHYCENE, AND HEMIPORPHYCENE MACROCYCLES. *Inorganic Chemistry*, 44(5), 1193-1195. doi: 10.1021/ic048353c
197. Chang, C. K., Kong, P.-W., Liu, H. Y., Yeung, L.-L., Koon, H.-K., & Mak, N.-K. (2006). SYNTHESIS AND PHOTODYNAMIC ACTIVITIES OF MODIFIED CORRLE DERIVATIVES ON NASOPHARYNGEAL CARCINOMA CELLS. Paper presented at the Optical Methods for Tumor Treatment and Detection: Mechanisms and Techniques in Photodynamic Therapy XV, San Jose. Proceedings of SPIE, 6139, 613915-1 – 61391-11. doi: 10.1117/12.646328
198. Li, K. M., Sun, X., Koon, H. K., Leung, W. N., Fung, M. C., Wong, R. N. S., Lung, M. L., Chang, C. K., & Mak, N. K. (2006). APOPTOSIS AND EXPRESSION OF CYTOKINES TRIGGERED BY PYROPHEOPHORBIDE-A METHYL ESTER MEDIATED PHOTODYNAMIC THERAPY IN NASOPHARYNGEAL CARCINOMA CELLS. *Photodiagnosis and Photodynamic Therapy*, 3, 247. doi: 10.1016/j.pdpdt.2006.09.001

- 199.Liang, G., Wang, L., Yang, Z., Koon, H., Mak, N., Chang, C. K., & Xu, B. (2006). USING ENZYMATIC REACTIONS TO ENHANCE THE PHOTODYNAMIC THERAPY EFFECT OF PORPHYRIN DITYROSINE PHOSPHATES. *Chemical Communications*(48), 5021-5023. doi: 10.1039/b611557h
- 200.Liu, H.-Y., Guo, P.-Y., Kong, P.-W., Ying, X., Liao, S.-J., Mak, N.-K., & Chang, C.-K. (2006). HEAVY-ATOM EFFECT OF CORROLE PHOTOSENSITIZER FOR PHOTODYNAMIC THERAPY. *Chemical Journal of Chinese Universities-Chinese*, 27(7), 1363-1365. <http://www.cjcu.jlu.edu.cn/EN/Y2006/V27/I7/1363>
- 201.Xu, Z.-G., Gu, G.-B., Liu, H.-Y., Jiang, H.-F., & Chang, C.-K. (2006). AB-INITIO AND DFT CALCULATIONS OF PDCL(2)L(2)(L = DHSO, DPSO) COMPLEXES. *Chinese Journal of Structural Chemistry*, 25(12), 1524-1530. WOS:000243087800020
- 202.Yang, Z., Xu, K., Zhang, B., Xu, B., Zhang, X., & Chang, C. K. (2006). PHOTOSENSITIZER DECORATED IRON OXIDE NANOPARTICLES: BIMODAL AGENT FOR COMBINED HYPERHERMIA AND PHOTODYNAMIC THERAPY. Paper presented at the Optical Methods for Tumor Treatment and Detection: Mechanisms and Techniques in Photodynamic Therapy XV, San Jose. *Proceedings of SPIE*, 6139, 613906-1 – 613906-10. doi: 10.1117/12.646341
- 203.Ying, X., Zhang, X.-W., Liao, S.-J., Liu, H.-Y., & Chang, C.-K. (2006). INVESTIGATION ON SECOND-ORDER NONLINEAR OPTICAL PROPERTY OF AMINO ACID BRIDGED CHIRAL PORPHYRIN DIMMER. *Chemical Journal of Chinese Universities-Chinese*, 27(12), 2381-2385. <http://www.cjcu.jlu.edu.cn/EN/Y2006/V27/I12/2381>
- 204.Koon, H. K., Lo, K. W., Lung, M. L., Chang, C. K., Wong, R. N. S., & Mak, N. K. (2007). *PHOTODYNAMIC THERAPY INDUCED PRODUCTION OF CYTOKINES BY LATENT EPSTEIN BARR VIRUS INFECTED EPITHELIAL TUMOR CELLS*. Paper presented at the Progress in Biomedical Optics and Imaging - Proceedings of SPIE. *Proceedings of SPIE*, 6438, 64380M1-6. doi: 10.1117/12.712836
- 205.Liu, H.-Y., Guo, P.-Y., Xu, Z.-G., Ying, X., Jiang, H.-F., & Chang, C.-K. (2007). STUDY ON THE PI-PI STACKING EFFECT OF TRI-PHENYL CORROLE AND ITS COPPER COMPLEX. *Chinese Journal of Inorganic Chemistry*, 23(3), 504-508. doi: 10.3321/j.issn:1001-4861.2007.03.024
- 206.Liu, H.-Y., Liu, L.-Y., Zhang, L., Ying, X., Wang, X.-L., Jiang, H.-F., & Chang, C.-K. (2007). OXIDATIVE DNA CLEAVAGE CATALYZED BY MN(III) CORROLES. *Chemical Journal of Chinese Universities-Chinese*, 28(9), 1628-1630. <http://www.cjcu.jlu.edu.cn/EN/Y2007/V28/I9/1628>
- 207.Liu, H.-Y., Zhou, H., Liu, L.-Y., Ying, X., Jiang, H.-F., & Chang, C.-K. (2007). THE EFFECT OF AXIAL LIGAND ON THE REACTIVITY OF OXOMANGANESE(V) CORROLE. *Chemistry Letters*, 36(2), 274-275. doi: 10.1246/cl.2007.274
- 208.Mak, N. K., Lung, M. L., Chang, C. K., & Leung, K. N. (2007). PHOTOSENSITIZERS AS NOVEL COMPOUNDS IN APOPTOSIS RESEARCH. In A. J. Corvin (Ed.), *New Developments in Cell Apoptosis Research* (pp. 241-272): Nova Science Publishers.

- 209.Wang, Q., Yang, Z., Zhang, X., Xiao, X., Chang, C. K., & Xu, B. (2007). A SUPRAMOLECULAR-HYDROGEL-ENCAPSULATED HEMIN AS AN ARTIFICIAL ENZYME TO MIMIC PEROXIDASE. *Angewandte Chemie-International Edition*, 46(23), 4285-4289. doi: 10.1002/anie.200700404
- 210.Xu, B., Liang, G., Wang, L., Yang, Z., Chan, K., & Chang, C. K. (2007). ENHANCING PDT DRUG DELIVERY BY ENZYMATIC CLEAVAGE OF PORPHYRIN PHOSPHATES. Paper presented at the Optical Methods for Tumor Treatment and Detection: Mechanism and Techniques in Photodynamic Therapy XVI, San Jose. *Proceedings of SPIE*, 6427, 64271A-1 – 64271A-1 – 64271A-6. doi: 10.1117/12.701185
- 211.Ying, X., Deng, Q., Liao, S.-J., Hu, X.-M., Liu, H. Y., & Chang, C. K. (2007). THEORETICAL CALCULATIONS ON THE SECOND-ORDER NONLINEAR OPTICAL PROPERTIES OF CHIRAL BIS-CORROLES. *Chinese Journal of Structural Chemistry*, 26(8), 955-961. WOS:000249261600016
- 212.Liu, H.-Y., Li, L., Ying, X., Wang, X.-L., Xu, Z.-G., Liao, S.-J., & Chang, C.-K. (2008). DFT CALCULATIONS ON MANGANESE(III) 5,10,15-TRIS(PENTAFLUOROPHENYL)-CORROLE. *Acta Physico-Chimica Sinica*, 24(9), 1602-1608. doi: 10.3866/PKU.WHXB20080913
- 213.Liu, H. Y., Chen, L., Yam, F., Zhan, H. Y., Ying, X., Wang, X. L., Jiang, H. F., & Chang, C. K. (2008). REDUCTIVE DEMETALATION OF MANGANESE CORROLES: THE SUBSTITUENT EFFECT. *Chinese Chemical Letters*, 19(8), 1000-1003. doi: 10.1016/j.cclet.2008.05.025
- 214.Wang, Q., Yang, Z., Ma, M., Chang, C. K., & Xu, B. (2008). HIGH CATALYTIC ACTIVITIES OF ARTIFICIAL PEROXIDASES BASED ON SUPRAMOLECULAR HYDROGELS THAT CONTAIN HEME MODELS. *Chemistry-a European Journal*, 14(16), 5073-5078. doi: 10.1002/chem.200702010
- 215.Yang, C., Yang, Z., Gu, H., Chang, C. K., Gao, P., & Xu, B. (2008). FACET-SELECTIVE 2D SELF-ASSEMBLY OF TIO(2) NANOLEAVES VIA SUPRAMOLECULAR INTERACTIONS. *Chemistry of Materials*, 20(24), 7514-7520. doi: 10.1021/cm8021352
- 216.Chan, P. S., Koon, H. K., Wu, Z. G., Wong, R. N. S., Lung, M. L., Chang, C. K., & Mak, N. K. (2009). ROLE OF P38 MAPKS IN HYPERICIN PHOTODYNAMIC THERAPY-INDUCED APOPTOSIS OF NASOPHARYNGEAL CARCINOMA CELLS. *Photochemistry and Photobiology*, 85(5), 1207-1217. doi: 10.1111/j.1751-1097.2009.00572.x
- 217.Koon, H.-K., Chan, P.-S., Wong, R. N.-S., Wu, Z.-G., Lung, M. L., Chang, C.-K., & Mak, N.-K. (2009). TARGETED INHIBITION OF THE EGFR PATHWAYS ENHANCES ZN-BC-AM PDT-INDUCED APOPTOSIS IN WELL-DIFFERENTIATED NASOPHARYNGEAL CARCINOMA CELLS. *Journal of Cellular Biochemistry*, 108(6), 1356-1363. doi: 10.1002/jcb.22366
- 218.Lian, P., Liu, H.-Y., Chen, L., Yam, F., & Chang, C.-K. (2009). DEMETALATION OF MANGANESE CORROLES. *Chinese Journal of Inorganic Chemistry*, 25(8), 1420-1425. doi: 10.3321/j.issn:1001-4861.2009.08.018

- 219.Lian, P., Liu, H. Y., Liu, L. Y., Shi, L., Jiang, H. F., & Chang, C. K. (2009). SYNTHESIS OF BINAPHTHYL BRIDGED CHIRAL BIS-CORROLE. *Chinese Chemical Letters*, 20(1), 21-24. doi: 10.1016/j.cclet.2008.10.016
- 220.Liu, H.-Y., Leng, K., Hu, J., Ying, X., Xu, Z.-G., & Chang, C.-K. (2009). EFFECT OF MESO-SUBSTITUENTS ON BETA (1)H-NMR OF A(3) TYPE CORROLE. *Acta Physico-Chimica Sinica*, 25(4), 694-700. doi: 10.3866/PKU.WHXB20090408
- 221.Liu, H.-Y., Yam, F., Xie, Y.-T., Li, X.-Y., & Chang, C. K. (2009). A BULKY BIS-POCKET MANGANESE(V)-OXO CORROLE COMPLEX: OBSERVATION OF OXYGEN ATOM TRANSFER BETWEEN TRIPLY BONDED MN(V) O AND ALKENE. *Journal of the American Chemical Society*, 131(36), 12890-12891. doi: 10.1021/ja905153r
- 222.Shi, L., Liu, H.-Y., Shen, H., Hu, J., Zhang, G.-L., Wang, H., Ji, L. N., Chang, C. K., & Jiang, H.-F. (2009). FLUORESCENCE PROPERTIES OF HALOGENATED MONO-HYDROXYL CORROLES: THE HEAVY-ATOM EFFECTS. *Journal of Porphyrins and Phthalocyanines*, 13(12), 1221-1226. doi: 10.1142/s1088424609001546
- 223.Ying, X., Peng, C.-C., Tang, A.-M., Wang, X.-C., Liu, H.-Y., & Chang, C.-K. (2009). ELECTRONIC SPECTRA AND SECOND-ORDER NONLINEAR OPTICAL PROPERTIES OF BINAPHTHYL BRIDGED CHIRAL BIS-PORPHYRINS. *Acta Physico-Chimica Sinica*, 25(9), 1895-1905. doi: 10.3866/PKU.WHXB20090924
- 224.Koon, H.-K., Lo, K.-W., Leung, K.-N., Lung, M. L., Chang, C. C.-K., Wong, R. N.-S., Leung, W.-N., & Mak, N.-K. (2010). PHOTODYNAMIC THERAPY-MEDIATED MODULATION OF INFLAMMATORY CYTOKINE PRODUCTION BY EPSTEIN-BARR VIRUS-INFECTED NASOPHARYNGEAL CARCINOMA CELLS. *Cellular & Molecular Immunology*, 7(4), 323-326. doi: 10.1038/cmi.2010.4
- 225.Koon, H. K., Chan, P. S., Wu, Z. G., Wong, R. N. S., Lung, M. L., Chang, C. K., & Mak, N. K. (2010). ROLE OF MITOGEN-ACTIVATED PROTEIN KINASE IN ZN-BC-AM PDT-INDUCED APOPTOSIS IN NASOPHARYNGEAL CARCINOMA CELLS. *Cell Biochemistry and Function*, 28(3), 239-248. doi: 10.1002/cbf.1650
- 226.Shi, L., Liu, H. Y., Si, L. P., Peng, K. M., You, L. L., Wang, H., Zhang, L., Ji, L. N., Chang, C. K., & Jiang, H. F. (2010). THE HEAVY ATOM EFFECT ON PHOTOCLEAVAGE OF DNA BY MONO-HYDROXYL HALOGENATED CORROLES. *Chinese Chemical Letters*, 21(3), 373-375. doi: 10.1016/j.cclet.2009.11.027
- 227.Lu, J., Liu, H. Y., Shi, L., Wang, X. L., Ying, X., Zhang, L., Ji, L. N., Zang, L. Q., & Chang, C. K. (2011). DNA CLEAVAGE MEDIATED BY WATER-SOLUBLE MANGANESE CORROLE. *Chinese Chemical Letters*, 22(1), 101-104. doi: 10.1016/j.cclet.2010.09.005
- 228.Xing, B., Jiang, T., Bi, W., Yang, Y., Li, L., Ma, M., Chang, C. K., Xu, B., & Yeow, E. K. L. (2011). MULTIFUNCTIONAL DIVALENT VANCOMYCIN: THE FLUORESCENT IMAGING AND PHOTODYNAMIC ANTIMICROBIAL PROPERTIES FOR DRUG RESISTANT BACTERIA. *Chemical Communications*, 47(5), 1601-1603. doi: 10.1039/c0cc04434b

229. Ying, X., Long, X. Y., Mahmood, M. H. R., Hu, Q. Y., Liu, H. Y., & Chang, C. K. (2012). SECOND-ORDER NONLINEAR OPTICAL PROPERTIES OF CORROLES: EXPERIMENTAL AND THEORETICAL INVESTIGATIONS. *Journal of Porphyrins and Phthalocyanines*, 16, 1276-1284. doi: 10.1142/S1088424612501416
230. Liu, H. Y., Mahmood, M. H. R., Qiu, S.-X., & Chang, C. K. (2013). RECENT DEVELOPMENTS IN MANGANESE CORROLE CHEMISTRY. *Coordination Chemistry Reviews*, 257, 1306-1333. doi: 10.1016/j.ccr.2012.12.017
231. Mahmood, M. H. R., Liu, H. Y., Wang, H. H., Jiang, Y. Y., & Chang, C. K. (2013). UNEXPECTED ONE-POT SYNTHESIS OF A3-TYPE UNSYMMETRICAL PORPHYRIN. *Tetrahedron Letters*, 54, 5853-5856. doi: 10.1016/j.tetlet.2013.08.086
232. Yu, L., Wang, Q., Dai, L., Li, W.-Y., Chen, R., Mahmood, M. H. R., Liu, H. Y., & Chang, C. K. (2013). SOLVENT EFFECTS ON OXYGEN ATOM TRANSFER REACTION BETWEEN MN(V)-OXO CORROLE AND ALKENE. *Chinese Chemical Letters*, 24, 447-449. doi: 10.1016/j.cclet.2013.03.029
233. Mahmood, M. H. R., Wang, H.-H., Liu, H.-Y.*, Chang, C. K.* (2015). Oxygen Atom Transfer Reactions from Sterically Encumbered Brominated (Oxo)manganese(V) Corroles to Styrene. *J. Porphyrins Phthalocyan.*, 19, 1238-1250.
234. Zoi, H.-B., Yang, H., Liu, Z.-Y., Mahmood, M. H. R., Mei, G.-Q., Liu, H. Y.*, Chang, C. K.* (2015) Iron(IV)-Corrole Catalyzed Stereoselective Olefination of Aldehydes with Ethyl Diazoacetate. *Organometallics*, 34, 2791-2795.
235. Chang, C. K. (2016) Paul Rothmund and S. Ferguson MacDonald, and their Namesake Reactions - The Influence of the Fischer School on my life in Porphyrin Chemistry. *Israel J. Chem.*, 56, 130-143.
236. Kashi, C.; Wu, C.-C., Mai, C.-L., Yeh, C.-Y.*, Chang, C. K.* (2016) Synthesis of Octafluoroporphyrin, *Angew. Chem. Int. Ed.*, 55, 5035-5039.
237. Zhang, Z., Wen, J.-Y., Lv, B.-B., Li, Xu., Ying, X., Wang, Y.-J., Zhang, H.-T., Wang, H., Liu, H.-Y.*, Chang, C. K.* (2016) Phototoxicity and G-quadruplex DNA Interaction of water-soluble Gallium(III) tris(N-methyl-4-pyridyl)corrole Complex. *Appl. Organometal. Chem.*, 30, 132-139.
238. Wang, H.-H., Wen, W.-H., Zou, H.-B., Cheng, F., Ali, A., Shi, L., Liu, H.-Y.*, Chang, C. K.* (2017) Copper Porphyrin Catalyzed Esterification of C(sp³)-H via a Cross-dehydrogenative Coupling Reaction. *New J. Chem.*, 41, 5308-5314.