

Scientific Publications of Saburo Nagakura

I. Papers on Electronic Structures and Spectra of Unsaturated Molecules

1. "The Molecular Structure of *N*-Methylacetamide," S. Mizushima, T. Shimanouchi, S. Nagakura, K. Kuratani, M. Tsuboi, H. Baba, and O. Fujioka, *J. Am. Chem. Soc.*, **72**, 3490 (1950).
2. "On the Electronic Structure of the Carbonyl and the Amide Groups," S. Nagakura, *Bull. Chem. Soc. Jpn.*, **25**, 164 (1952).
3. "Studies on the Conjugated Double Bond Systems," VIII. On the Electronic Structures of Furan, Pyrrole, and Thiophen. S. Nagakura and T. Hosoya, *Bull. Chem. Soc. Jpn.*, **25**, 179 (1952).
4. "Dipole Moments and Absorption Spectra of *o*-Benzquinone and Its Related Substances," S. Nagakura and A. Kuboyama, *J. Am. Chem. Soc.*, **76**, 1003 (1954).
5. "Electronic Structure of the π -Electron System," S. Nagakura, *Monograph Ser. (Res. Inst. Appl. Elec., Hokkaido Univ.)*, No. 4, 17 (1954).
6. "The Relation between Energy Levels of Substituent Groups and Electron Migration Effects in Some Mono-substituted Benzenes," S. Nagakura and J. Tanaka, *J. Chem. Phys.*, **22**, 236 (1954).
7. "Intramolecular Charge-Transfer Spectra Observed with Some Compounds Containing the Nitro or the Carbonyl Group," S. Nagakura, *Chem. Phys.*, **23**, 1441 (1955).
8. "On the Hematin Linkage in Methemoglobin," T. Nakamura, K. Tokuyama, Y. Ogura, and S. Nagakura, *J. Biochem. (Tokyo)*, **42**, 347 (1955).
9. "Ultraviolet and Infrared Absorption Spectra of Substituted Acetophenones and Benzoic Acids," J. Tanaka, S. Nagakura, and M. Kobayashi, *J. Chem. Phys.*, **24**, 311 (1956).
10. "Appearance of Two Intramolecular Charge Transfer Absorptions Observed with Some Disubstituted Benzenes," J. Tanaka and S. Nagakura, *J. Chem. Phys.*, **24**, 1274 (1956).
11. "Intramolecular Charge-Transfer Absorption Spectra of Formamide and Acrolein," S. Nagakura, *Mol. Phys.*, **3**, 105 (1960).
12. "Ultraviolet Absorption Spectra of Aqueous Solutions and Single Crystals of Thioacetamide and Thiourea," H. Hosoya, J. Tanaka, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **33**, 850 (1960).
13. " $n-\sigma^*$ Absorption Spectra of Saturated Organic Compounds Containing Bromine and Iodine," K. Kimura and S. Nagakura, *Spectrochim. Acta*, **17**, 166 (1961).
14. "Crystal Spectrum of Iodoform," K. Kimura, J. Tanaka, and S. Nagakura, *Spectrochim. Acta*, **17**, 184 (1961).
15. "Ultra-violet Absorption Spectra of Tropone, Troponium Ion, Tropolone, and 2,4,6-Octatrienol," H. Hosoya, J. Tanaka, and S. Nagakura, *Tetrahedron*, **18**, 859 (1962).
16. "The Electronic Spectra and Structures of the Nitrobenzene and Nitrotoluene Anions," A. Ishitani, K. Kuwata, H. Tsubomura, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **36**, 1357 (1963).
17. "Electronic Spectra and Electron Transfer Interaction between Electron Donor and Acceptor," S. Nagakura, *Pure Appl. Chem.*, **7**, 79 (1963).
18. "Vacuum Ultraviolet Absorption Spectra and Electronic Structures of Formic Acid, Acetic Acid, and Ethyl Acetate," S. Nagakura, K. Kaya, and H. Tsubomura, *J. Mol. Spectrosc.*, **13**, 1 (1964).
19. "Electronic Spectra and Electronic Structures of Nitrobenzene and Nitromesitylene," S. Nagakura, M. Kojima, and Y. Maruyama, *J. Mol. Spectrosc.*, **13**, 174 (1964).
20. "Vacuum UV Absorption Spectra of Saturated Organic Compounds with Non-bonding Electrons," H. Tsubomura, K. Kimura, K. Kaya, J. Tanaka, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **37**, 417 (1964).
21. "The Ultraviolet Absorption Spectra of Nitramide and Ethyl Nitrate," K. Kaya, K. Kuwata, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **37**, 1055 (1964).
22. "Vacuum Ultra-violet Absorption Spectra of Aniline and Some of Its *N*-Derivatives," K. Kimura, H. Tsubomura, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **37**, 1336 (1964).
23. "Vacuum Ultra-violet Absorption Spectra of Various Monosubstituted Benzenes," K. Kimura and S. Nagakura, *Mol. Phys.*, **9**, 117 (1965).
24. "Near and Vacuum Ultraviolet Absorption Spectra and Electronic Structures Nitrosobenzene and Its Derivatives," K. Tabei and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **38**, 965 (1965).
25. "Vacuum Ultraviolet Spectra of Styrene, Benzaldehyde, Acetophenone, and Benzonitrile," K. Kimura and S. Nagakura, *Theor. Chim. Acta*, **3**, 164 (1965).
26. "The Electronic Spectrum and Electronic Structure of 1,5-Dinitronaphthalene," M. Kojima, J. Tanaka, and S. Nagakura, *Theor. Chim. Acta*, **3**, 432 (1965).
27. "The Determination of Singlet-Triplet Separation from the Anomalous Hyperfine Structure Observed with a Radical Pair," H. Hayashi, K. Itoh, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **39**, 199 (1966).
28. "Electronic Structures and Electronic Spectra of Some Aliphatic Nitro Compounds," M. Tanaka, J. Tanaka, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **39**, 766 (1966).
29. "Electronic Spectra and Electronic Structures of α - and β -Nitronaphthalenes and 1,8-Dinitronaphthalene," M. Kojima and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **39**, 1262 (1966).
30. "Electronic Structures and Spectra of Adenine and Thymine," M. Tanaka and Nagakura, *Theor. Chim. Acta*, **6**, 320 (1966).
31. "Vacuum Ultraviolet Absorption Spectra of Simple Amides," K. Kaya and S. Nagakura, *Theor. Chim. Acta*, **7**, 117 (1967).
32. "The Electronic Structure and Spectrum of Tropone," H. Hosoya and S. Nagakura, *Theor. Chim. Acta*, **8**, 319 (1967).
33. "Vacuum-ultraviolet Absorption Spectrum of α,α,α -Trichlorotoluene," K. Kimura and S. Nagakura, *J. Chem. Phys.*, **47**, 2916 (1967).
34. "Zeeman Splitting of the Phosphorescence of Pyrazine Crystal," T. Azumi, Y. Udagawa, M. Ito, and S. Nagakura, *J. Chem. Phys.*, **47**, 850 (1967).
35. "The Electronic Absorption Spectra and the Electronic Structures of Cytosine, Isocytosine, and Their Anions and Cations," H. Morita and S. Nagakura, *Theor. Chim. Acta*, **11**, 279 (1968).

36. "Zeeman Effect of Phosphorescence. II. Intensity Considerations on Pyrazine Phosphorescence," T. Azumi, S. Nagakura, and M. Ito, *Bull. Chem. Soc. Jpn.*, **42**, 685 (1969).
37. "Theory of Photoselection for Zeeman Split Phosphorescence," T. Azumi and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **42**, 2203 (1969).
38. "Electronic Structures of Pyridine *N*-Oxide and 4-Nitroso-pyridine *N*-Oxide," S. Koinata and S. Nagakura, *Theor. Chim. Acta*, **14**, 415 (1969).
39. "Determination of the Singlet-Triplet Separation of a Weakly Interacting Radical Pair from the E. S. R. Spectrum," K. Itoh, H. Hayashi, and S. Nagakura, *Mol. Phys.*, **17**, 561 (1969).
40. "Electronic Structures of Unsaturated Molecules Containing Heteroatoms—Configuration Interaction Treatment Including Doubly Excited Configurations," F. Hirota and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **43**, 1010 (1970).
41. "Semi-empirical SCF MO Method for Systems Including All Valence Electrons," F. Hirota and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **43**, 1642 (1970).
42. "Rotational Analysis of the 2714 Å Band of *p*-Difluorobenzene," Y. Udagawa, M. Ito, and S. Nagakura, *J. Mol. Spectrosc.*, **36**, 541 (1970).
43. "The 3100 Å System of *s*-Triazine and the Geometry in the Excited State," Y. Udagawa, M. Ito, and S. Nagakura, *J. Mol. Spectrosc.*, **39**, 400 (1971).
44. "Photoelectron Spectra of Nitro-Compounds," Ts. Kobayashi and S. Nagakura, *Chem. Lett.*, **1972**, 903 (1972).
45. "Photoelectron Spectra of Anilines," Ts. Kobayashi and S. Nagakura, *Chem. Lett.*, **1972**, 1013 (1972).
46. "Electronic Absorption Spectra of the 2,5-Diketopiperazine Single Crystal and Evaporated Film," K. Kaya and S. Nagakura, *J. Mol. Spectrosc.*, **44**, 279 (1972).
47. "The $\pi-\pi^*$ Assignment of the Lowest Triplet State in the Acetophenone Crystal," Y. Tanimoto, H. Kobayashi, S. Nagakura, and T. Azumi, *Chem. Phys. Lett.*, **16**, 10 (1972).
48. "Semi-Empirical Calculations of the Zero-Field Splitting Parameters of the Lowest Triplet State of Aromatic Ketones," H. Hayashi and S. Nagakura, *Mol. Phys.*, **24**, 801 (1972).
49. "Correlation of the Zero-Field Splittings with the n,π^* and π,π^* Triplet Levels of Benzaldehyde," H. Hayashi and S. Nagakura, *Chem. Phys. Lett.*, **18**, 63 (1973).
50. "Photoelectron Spectra and Orbital Structures of Higher Alkyl Chlorides, Bromides, and Iodides," K. Kimura, S. Katsumata, Y. Achiba, H. Matsumoto, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **46**, 373 (1973).
51. "The Electronic Absorption Spectra and Electronic Structures of Aromatic Azides, Nitrenes, and Diazonium Ions," H. Kashiwagi, S. Iwata, T. Yamaoka, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **46**, 417 (1973).
52. "Photoelectron Spectra of Tetrahydropyran, 1,3-Dioxane, and 1,4-Dioxane," Ts. Kobayashi and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **46**, 1558 (1973).
53. " π -Electron Structures of Aromatic Hydrocarbons in Their Low-lying Triplet States," H. Kashiwagi, S. Iwata, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **46**, 3289 (1973).
54. "Electronic Spectra and Electronic Structures of [2,2]Paracyclophane and Related Compounds," S. Iwata, K. Fuke, M. Sasaki, S. Nagakura, T. Otsubo, and S. Misumi, *J. Mol. Spectrosc.*, **46**, 1 (1973).
55. "The Crystal Structure of Acetophenone at 154 K," Y. Tanimoto, H. Kobayashi, S. Nagakura, and Y. Saito, *Acta Crystallogr. Sect.*, **29**, 1822 (1973).
56. "Photoelectron Spectra of Styrenes," Ts. Kobayashi, K. Yokota, and S. Nagakura, *J. Electron Spectrosc. Relat. Phenom.*, **2**, 449 (1973).
57. "Theoretical Study of the Photoelectron Intensities and Angular Distributions," S. Iwata and S. Nagakura, *Mol. Phys.*, **27**, 425 (1974).
58. "The Lowest $n\pi^*$ and $\pi\pi^*$ Triplet Levels of Benzaldehydes and Their Correlation with the Zero-Field Splittings," H. Hayashi and S. Nagakura, *Mol. Phys.*, **27**, 969 (1974).
59. "Photoelectron Spectra of Bisdimethylaminocyclopropane and Related Compounds," Ts. Kobayashi, S. Nagakura, Z. Yoshida, H. Konishi, and H. Ogoshi, *Chem. Lett.*, **1974**, 445 (1974).
60. "Pressure Effect on the Absorption Spectra of Iron Compounds," Y. Hara, I. Shirotani, N. Sakai, S. Nagakura, and S. Minomura, *Bull. Chem. Soc. Jpn.*, **47**, 434 (1974).
61. "Polarized Absorption Spectra of the Hydroquinone and 1,4-Dimethoxybenzene Crystals in the Near and Vacuum Ultraviolet Regions," K. Kaya, K. Fuke, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **47**, 438 (1974).
62. "Photoelectron Spectra of Substituted Benzenes," Ts. Kobayashi and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **47**, 2563 (1974).
63. "Photoelectron Spectra of Aminopyridines and Cyanopyridines," Ts. Kobayashi and S. Nagakura, *J. Electron Spectrosc. Relat. Phenom.*, **4**, 207 (1974).
64. "Anomalous Phosphorescence of *p*-Methylacetophenone in Nonpolar Solvent at 77 K," Y. Tanimoto, N. Hirota, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **48**, 41 (1975).
65. "Polarized Reflection and Absorption spectra of the [2,2]-Paracyclophane Crystal," K. Fuke and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **48**, 46 (1975).
66. "Absorption of the Acetophenone Crystal," Y. Tanimoto, T. Azumi, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **48**, 136 (1975).
67. "Photoelectron spectra of the *cis*- and *trans*-Isomers of Some Ethylene Derivatives," Ts. Kobayashi, K. Yokota, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **48**, 412 (1975).
68. "The Triplet-Triplet Absorption Spectra and Electronic Structures of Some Cyano-substituted Benzenes," H. Morita, S. Matsumoto, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **48**, 420 (1975).
69. "Photoelectron Spectra of Substituted Naphthalenes," C. Utsunomiya, Ts. Kobayashi, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **48**, 1852 (1975).
70. "Photoelectron Spectra of *trans*-Azobenzene and Benzylaniline," Ts. Kobayashi, K. Yokota, and S. Nagakura, *J. Electron Spectrosc. Relat. Phenom.*, **6**, 167 (1975).
71. "Photoelectron Spectra of Nitrophenols and Nitroanisoles," Ts. Kobayashi and S. Nagakura, *J. Electron Spectrosc. Relat. Phenom.*, **6**, 421 (1975).
72. "Angular Distribution for the Photoelectron Spectra of Benzene and Hexafluorobenzene," Ts. Kobayashi and S. Nagakura, *J. Electron Spectrosc. Relat. Phenom.*, **7**, 187 (1975).
73. "Photoelectron Spectra of Phenyl Isocyanates and Phenyl Isothiocyanate," Ts. Kobayashi and S. Nagakura, *J. Electron Spectrosc. Relat. Phenom.*, **7**, 488 (1975).

74. "Electronic Structure and Spectra of Acrylic Acid in the Vapor and Condensed Phases," H. Morita, K. Fuke, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **49**, 922 (1976).
75. "The Polarized Reflection and Absorption Spectra of Perylene Crystals in Monomeric and Dimeric Forms," K. Fuke, K. Kaya, T. Kajiwara, and S. Nagakura, *J. Mol. Spectrosc.*, **63**, 98 (1976).
76. "Rydberg Transitions of Aniline and *N,N*-Diethylaniline," K. Fuke and S. Nagakura, *J. Mol. Spectrosc.*, **64**, 139 (1977).
77. "Electronic Structures and Spectra of the Keto and Enol Forms of Acetylacetone," H. Nakanishi, H. Morita, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **50**, 2255 (1977).
78. "Electronic Structures and Spectra of Aminoacetophenones and Related Compounds," R. Nakagaki, S. Nagakura, Ta. Kobayashi, and S. Iwata, *Bull. Chem. Soc. Jpn.*, **51**, 2867 (1978).
79. "Photoelectron Angular Distribution Measurements for Some Pyridines," C. Utsunomiya, Ts. Kobayashi, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **51**, 3482 (1987).
80. "Observation of a New Type Delayed Fluorescence from [2,2]Paracyclophane," K. Matsui, N. Nishi, M. Kinoshita, and S. Nagakura, *Chem. Phys.*, **35**, 111 (1987).
81. "Transannular Interaction in the Excited Triplet States of [2,2]Paracyclophane and Related Compounds," S. Ishikawa, J. Nakamura, S. Iwata, M. Sumitani, S. Nagakura, Y. Sakata, and S. Misumi, *Bull. Chem. Soc. Jpn.*, **52**, 1346 (1979).
82. "Conformations of Acetanilide and Related Compounds Studied by Ultraviolet Photoelectron Spectroscopy," R. Nakagaki, Ts. Kobayashi, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **53**, 901 (1980).
83. "Photoelectron Angular Distribution Measurements for Some Aliphatic Alcohols, Amines, and Halides," C. Utsunomiya, Ts. Kobayashi, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **53**, 1216 (1980).

II. Papers on Hydrogen Bonding

84. "Dipole Moments and Near Ultraviolet Absorption of Some Mono-substituted Benzenes—The Effect of Solvents and Hydrogen Bonding," S. Nagakura and H. Baba, *J. Am. Chem. Soc.*, **74**, 5693 (1952).
85. "A Note on the Hydrogen Bond," K. Nukasawa, J. Tanaka, and S. Nagakura, *J. Phys. Soc. Jpn.*, **8**, 792 (1953).
86. "Determinations of the Energy and the Entropy Change Due to Hydrogen Bonding by the Use of the Near Ultraviolet Absorption—the Effect of the Chlorine Atom on the Proton-donating and the Proton-accepting Powers," S. Nagakura, *J. Am. Chem. Soc.*, **76**, 3070 (1954).
87. "Effect of Hydrogen Bonding on the Near Ultraviolet Absorption of Naphthol," S. Nagakura and M. Gouterman, *J. Chem. Phys.*, **26**, 881 (1957).
88. "Ultraviolet Absorption Spectra of Monomer and Dimer of Benzoic Acid," H. Hosoya, J. Tanaka, and S. Nagakura, *J. Mol. Spectrosc.*, **8**, 257 (1962).
89. "The Charge-Transfer Mechanism of Hydrogen Bonding as Revealed from Electronic Absorption Spectra," S. Nagakura, *J. Chim. Phys.*, **61**, 217 (1964).
90. "Electronic Absorption Spectra of Hydrogen Bonded Amides," K. Kaya and S. Nagakura, *Theor. Chim. Acta*, **7**, 124 (1967).
91. "Near-infrared Spectra of Hydrogen-bonded Cyclic Dimers of Some Carboxylic Acids," H. Morita and S. Nagakura, *J. Mol. Spectrosc.*, **41**, 54 (1972).

92. "O—H Overtone Bands and Potential Energy Curves of the Hydrogen-Bonded Formic and Acetic Acids," H. Morita and S. Nagakura, *J. Mol. Spectrosc.*, **42**, 536 (1972).
93. "CNDO/2 Calculations and Configuration Analyses for Some Hydrogen-Bonded Systems," H. Morita and S. Nagakura, *Theor. Chim. Acta*, **27**, 325 (1972).
94. "Hydrogen-Bonded O—H and O—D Overtone Bands and Potential Energy Curve of Methanol," H. Morita and S. Nagakura, *J. Mol. Spectrosc.*, **49**, 401 (1974).
95. "Charge-Transfer Character in the Intramolecular Hydrogen Bond: Electronic Structures and Spectra of Hydrogen Maleate Anion and Related Molecules," H. Morita, K. Fuke, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **50**, 645 (1977).
96. "Charge-Transfer Bands Observed with the Intermolecular Hydrogen-Bonded Systems between Acetic Acid and Some Aliphatic Amines," H. Nakanishi, H. Morita, and S. Nagakura, *J. Mol. Spectrosc.*, **65**, 295 (1977).
97. "Charge-Transfer Character in the Intramolecular Hydrogen Bond: Vacuum Ultraviolet Spectra of Acetylacetone and Its Fluoro Derivatives," H. Nakanishi, H. Morita, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **51**, 1723 (1978).
98. "Photoelectron Spectra of Hydrogen-Bonded Complexes," C. Utsunomiya, Ts. Kobayashi, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **52**, 3223 (1979).

III. Papers on Electron Donor–Acceptor Complexes

99. "On the Binding Energies of Some Molecular Compounds between *p*-Benzoquinone and Various Aromatic Substances," A. Kuboyama and S. Nagakura, *J. Am. Chem. Soc.*, **77**, 2644 (1955).
100. "Dipole Moment of the Molecular Complex between Triethylamine and Iodine," H. Tsubomura and S. Nagakura, *J. Chem. Phys.*, **27**, 819 (1957).
101. "Molecular Complexes and Their Spectra. VIII. Molecular Complex between Iodine and Triethylamine," S. Nagakura, *J. Am. Chem. Soc.*, **80**, 520 (1958).
102. "Charge-Transfer Complexes between Iodine and Various Aliphatic Amines," H. Yada, J. Tanaka, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **33**, 1660 (1960).
103. "Infrared Absorption Spectrum of Charge-Transfer Complex between Trimethylamine and Iodine," H. Yada, J. Tanaka, and S. Nagakura, *J. Mol. Spectrosc.*, **9**, 461 (1962).
104. "Spectroscopic and Theoretical Studies of Charge-Transfer Type Molecular Complexes between Monoolefins and Metal Ions: Selective Complex Formation Abilities of Copper(I), Silver(I), and Mercury(II) Ions," H. Hosoya and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **37**, 249 (1964).
105. "Charge-Transfer Complexes of Trinitrobenzene With Tetramethyl-*p*-phenylenediamine and *p*-Dimethoxybenzene," S. Iwata, H. Tsubomura, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **37**, 1506 (1964).
106. "Molecular Complexes between 1,2,4,5-Tetracyanobenzene and Some Electron Donors," S. Iwata, J. Tanaka, and S. Nagakura, *J. Am. Chem. Soc.*, **88**, 894 (1966).
107. "Dipole Moment of Charge-Transfer Complexes between Iodine and Some Aliphatic Amines," T. Kobilata and S. Nagakura, *J. Am. Chem. Soc.*, **88**, 3905 (1966).
108. "Absorption and Emission Spectra of 1,2,4,5-Tetracyanobenzene-Naphthalene Complex Crystal," S. Iwata, J. Tanaka, and S. Nagakura, *J. Am. Chem. Soc.*, **89**, 2813 (1967).

109. "Charge-Transfer Complexes between Substituted Pyridyl Radicals," M. Itoh and S. Nagakura, *J. Am. Chem. Soc.*, **89**, 3959 (1967).
110. "Phosphorescence of the Charge-Transfer Triplet States of Some Molecular Complexes," S. Iwata, J. Tanaka, and S. Nagakura, *J. Chem. Phys.*, **47**, 2203 (1967).
111. "E.S.R. of the Charge-Transfer Triplet State of the Durene-Tetracyanobenzene Complex," H. Hayashi, S. Nagakura, and S. Iwata, *Mol. Phys.*, **13**, 489 (1967).
112. "Charge-Transfer Triplet State of Some Molecular Complexes," S. Iwata, J. Tanaka, and S. Nagakura, in *The Triplet State*, Zahlan, A. B., Ed.; Cambridge University Press: Cambridge, 1967; p 433.
113. "Electronic Structure of Tris(α -diimine)iron(III) Complexes," T. Ito, N. Tanaka, I. Hanazaki, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **41**, 365 (1968).
114. "The Electronic Structure and Electronic Spectrum of Dichlorodipyridine-cobalt(II). Charge-Transfer Band between Halide Ion and Cobalt(II) Cation," Y. Bando and S. Nagakura, *Inorg. Chem.*, **7**, 893 (1968).
115. "The Electronic Structure and Spectrum of the Silver(I) Perchlorate-Pyridine Complex," Y. Bando and S. Nagakura, *Theor. Chim. Acta*, **9**, 210 (1968).
116. "Electronic Structures of the Tris(acetylacetonato) Complexes of the Iron-Series Transition-Metal Ions. I. General Theory and Its Application to Simple Complexes," I. Hanazaki, F. Hanazaki, and S. Nagakura, *J. Chem. Phys.*, **50**, 265 (1969).
117. "Electronic Structures of the Tris(acetylacetonato) Complexes of the Iron-Series Transition Metal Ions. II. Complexes Containing Paramagnetic-Metal Ions," I. Hanazaki, F. Hanazaki, and S. Nagakura, *J. Chem. Phys.*, **50**, 276 (1969).
118. "ESR Spectra of the Charge-Transfer Triplet States of Some Molecular Complexes," H. Hayashi, S. Iwata, and S. Nagakura, *J. Chem. Phys.*, **50**, 993 (1969).
119. "Phosphorescence and ESR Spectra of the Charge-Transfer Triplet States of Some Molecular Complexes Containing Tetracyanobenzene as Electron Acceptor," H. Hayashi, S. Nagakura, and S. Iwata, in *Molecular Luminescence*; Lim, E. C., Ed.; Benjamin: New York, 1969; p 351.
120. "Electronic Structure of Tris(1,10-phenanthroline)iron(II) Complex," T. Itoh, N. Tanaka, I. Hanazaki, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **42**, 702 (1969).
121. "The Electronic Structure of the Tris(α,α' -Dipyridyl)iron(II) Ion," I. Hanazaki and S. Nagakura, *Inorg. Chem.*, **8**, 648 (1969).
122. "Optical Rotatory Power of the Metal Chelate Compounds Containing Organic Unsaturated Molecules as Ligands," I. Hanazaki and S. Nagakura, *Inorg. Chem.*, **8**, 654 (1969).
123. "Charge-Transfer Complexes of Maleic Anhydride and Dichloromaleic Anhydride with Various Aromatic Compounds," T. Kobayashi, S. Iwata, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **43**, 713 (1970).
124. "The E.S.R. and Phosphorescence Spectra of Some Dicyanobenzene Complexes with Methyl-Substituted Benzenes," H. Hayashi and S. Nagakura, *Mol. Phys.*, **19**, 45 (1970).
125. "Spectroscopic Study of the Interaction between the Central Metal Ions in the Crystals of Bis(dimethylglyoximato)nickel(II) and Related Complexes," Y. Ohashi, I. Hanazaki, and S. Nagakura, *Inorg. Chem.*, **9**, 2551 (1970).
126. "Electronic Structures of Tris(2,2'-bipyridyl) Complexes of Transition Metals in Lower Oxidation States," I. Hanazaki and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **44**, 2312 (1971).
127. "Charge-Transfer Interaction and Fluorescence in Some Tetracyanobenzene Complexes," Ta. Kobayashi, K. Yoshihara, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **44**, 2603 (1971).
128. "The Triplet-Triplet Absorption Observed for Some Tetracyanobenzene Complexes," S. Matsumoto, S. Nagakura, S. Iwata, and J. Nakamura, *Chem. Phys. Lett.*, **13**, 463 (1972).
129. "Energy Transfer Concerning the Lowest Triplet State of Tetracyanobenzene with Methyl-Substituted Benzenes," Ta. Kobayashi and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **45**, 987 (1972).
130. "Complex Formation in the Ground and Excited States of the Pyrene-N,N-Dimethylaniline System," K. Yoshihara, K. Futamura, and S. Nagakura, *Chem. Lett.*, **1972**, 1243 (1972).
131. "Spin Alignment in the Charge-Transfer Phosphorescent State of the Tetracyanobenzene-Biphenyl Complex in Crystalline State," M. Yagi and S. Nagakura, *Chem. Phys. Lett.*, **21**, 119 (1973).
132. "Delayed Charge-Transfer Fluorescence of the Tetracyanobenzene-Biphenyl Complex in the Crystalline State," M. Yagi, S. Nagakura, and H. Hayashi, *Chem. Phys. Lett.*, **18**, 272 (1973).
133. "The Triplet-Triplet Absorption Spectra of Electron Donor-Acceptor Complexes," S. Matsumoto, S. Nagakura, S. Iwata, and J. Nakamura, *Mol. Phys.*, **26**, 1465 (1973).
134. "Time-Resolved Phosphorescence Spectra of EDA Complexes of Aromatic Carbonyls with Anilines," H. Hayashi, N. Hirota, and S. Nagakura, *Chem. Lett.*, 979 (1973).
135. "The Evaluation of the Semiempirical Parameters from the Atomic Spectroscopic Term Values. I. The Slater-Condon Parameters for the First Transition Elements," I. Hanazaki and S. Nagakura, *Sci. Papers Inst. Phys. Chem. Res.*, **67**, 119 (1973).
136. "The Evaluation of the Semiempirical Parameters from the Atomic Spectroscopic Term Values. II. Semiempirical One-Center Integrals," I. Hanazaki and S. Nagakura, *Sci. Papers Inst. Phys. Chem. Res.*, **67**, 135 (1973).
137. "A New Method for Measuring S_n-S₁ Absorption Spectra," Ta. Kobayashi, S. Matsumoto, and S. Nagakura, *Chem. Lett.*, 235 (1974).
138. "The Triplet States of 1,3,5-Tricyanobenzene Complexes with Methyl-Substituted Benzenes," S. Matsumoto, S. Nagakura, Y. Shimozato, H. Hayashi, and J. Nakamura, *Bull. Chem. Soc. Jpn.*, **47**, 604 (1974).
139. "Electron Donor-Acceptor Complexes in Their Excited States," S. Nagakura, in *Excited States*; Lim, E. C., Ed.; Academic Press: New York, 1975; Vol. 2, p 321.
140. "The Phosphorescent State of the 1,2,4,5-Tetracyanobenzene-Naphthalene Complex," M. Yagi, N. Nishi, M. Kinoshita, S. Nagakura, and H. Hayashi, *Mol. Phys.*, **30**, 147 (1975).
141. "The Triplet States of Complexes with Tetrachlorophthalic Anhydride and Phthalic Anhydride as Electron Acceptors," S. Matsumoto, S. Nagakura, and H. Hayashi, *Mol. Phys.*, **29**, 167 (1975).

142. "Electronic Structure and Dynamic Behavior of the Triplet State of Some Electron Donor-Acceptor Complexes," S. Nagakura, *Magn. Reson. Relat. Phenom., Proc. Congr. Ampere, 19th*, 17 (1976).
143. "Kinetics of the Phosphorescent Triplet States of Tetra-cyanobenzene Complexes as Studied by Microwave Induced Delayed Phosphorescence," M. Yagi, N. Nishi, M. Kinoshita, and S. Nagakura, *Chem. Phys. Lett.*, **39**, 240 (1976).
144. "Photoelectron Spectra of Electron Donor-Acceptor Complexes between Bromine and Alkylamines," C. Utsunomiya, Ts. Kobayashi, and S. Nagakura, *Chem. Phys. Lett.*, **39**, 245 (1976).
145. "The Absorption and Fluorescence Spectra of the Ion-Pairs of 1,2,4,5-Tetracyanobenzene with Several Methyl-Substituted Benzenes," S. Matsumoto, S. Nagakura, and Ta. Kobayashi, *Bull. Chem. Soc. Jpn.*, **49**, 2967 (1976).
146. "Kinetics of the Phosphorescent Triplet States of Electron Donor-Acceptor Complexes as Studied by Microwave-Induced Delayed Phosphorescence," M. Yagi, N. Nishi, M. Kinoshita, and S. Nagakura, *Mol. Phys.*, **35**, 1369 (1978).
160. "Electron Transfer between Anion Radicals and Neutral Molecules as Revealed by Electron Spin Resonance Spectra," A. Ishitani and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **38**, 367 (1965).
161. "The Electron Spin Resonance and Electronic Absorption Spectra of the 3-Nitropyridine Anion Radical," M. Itoh and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **38**, 825 (1965).
162. "The Electronic Spectra of Aniline and *N*-Methylaniline Adsorbed on Aluminum Chloride," H. Sato, K. Hirota, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **38**, 962 (1965).
163. "The Formation of the Anion Radical of Pyromeritonitrile and Tetracyanoethylene by Flash Irradiation," M. Sofue and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **38**, 1048 (1965).
164. "Electronic Structures of the Benzenium Ions and Its Methyl Derivatives," I. Hanazaki and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **38**, 1298 (1965).
165. "The Electronic Spectra of Aniline and *N*-Methylaniline Adsorbed on Aluminum Chloride. II. The Theoretical Treatment," H. Sato, S. Nagakura, and K. Hirota, *Bull. Chem. Soc. Jpn.*, **38**, 1730 (1965).
166. "Pi-Complex between the Substituted Pyridinyl Radicals," M. Itoh and S. Nagakura, *Tetrahedron Lett.*, **1966**, 227 (1966).
167. "Ultraviolet, Infrared, and Raman Spectra of Protonated Carboxylic Acids," S. Hoshino, H. Hosoya, and S. Nagakura, *Can. J. Chem.*, **14**, 1961 (1966).
168. "The Electron Spin Resonance and Electronic Spectra of 4-Substituted Pyridinyl Radicals," M. Itoh and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **39**, 369 (1966).
169. "The Photoinduced Isomerization of Anthrone to Anthranol," N. Kanamaru and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **39**, 1355 (1966).
170. "The Basicities of Tropone and Tropolone," H. Hosoya and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **39**, 1414 (1966).
171. "The Electronic Spectra of the Anion Radicals of Substituted Benzenes," A. Ishitani and S. Nagakura, *Theor. Chim. Acta*, **4**, 236 (1966).
172. "Electronic Absorption and ESR Spectra of the Benzene and Paracyclophane Anions," A. Ishitani and S. Nagakura, *Mol. Phys.*, **12**, 1 (1967).
173. "Electron Spin Resonance of Irradiated Single Crystals of Sodium and Potassium 1-Oximinopropionates," H. Hayashi, K. Ito, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **40**, 284 (1967).
174. "Spectroscopic Studies of the Protonation of *s*-Triaminobenzene," T. Yamaoka, H. Hosoya, and S. Nagakura, *Tetrahedron*, **24**, 6203 (1968).
175. "Kinetics and Mechanisms of Thermal Decomposition Reaction of Cobalt(III) Complexes. Hexamine-, Halogenoamine- and Oxalato-amine-cobalt(III) Complexes," N. Tanaka, K. Nagase, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **41**, 1143 (1968).
176. "Studies on Pyrimidine Derivatives and Related Compounds. LVII. Cyclization Mechanisms of Ethyl 2-(5-Pyrazolyl)aminoalkylidenecyanoacetates," A. Takamizawa, Y. Hamashima, S. Sakai, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **41**, 2141 (1968).
177. "Electronic Structures of the Meisenheimer and Janovsky Complexes," H. Hosoya, S. Hosoya and S. Nagakura, *Theor. Chim. Acta*, **12**, 117 (1968).
178. "Photoinduced Anthrone to Anthranol Isomerization in Ethyl Ether," N. Kanamaru and S. Nagakura, *J. Am. Chem. Soc.*, **90**, 6905 (1968).

IV. Papers on Reaction Intermediates and Reaction Mechanisms

147. "Diels-Alder Reaction of β -Naphthyl and Maleic Anhydride: Isolation of Another Isomeric Adduct," K. Takeda, S. Nagakura, and K. Kinoshita, *Pharmacol. Bull.*, **1**, 135 (1953).
148. "On the Relation between the Chemical Reactivity and Energy Levels of the Chemical Reagent," S. Nagakura and J. Tanaka, *J. Chem. Phys.*, **22**, 563 (1954).
149. "Spectrophotometric Studies on the Interaction between Acetone and Sulfuric Acid," S. Nagakura, A. Minegishi, and K. Stanfield, *J. Am. Chem. Soc.*, **79**, 1033 (1957).
150. "Theoretical Study on the Mechanism of the Aromatic Substitution," S. Nagakura and J. Tanaka, *Bull. Chem. Soc. Jpn.*, **32**, 734 (1959).
151. "Ultra-Violet Absorption Spectra and π -Electron Structures of Nitromethane and Related Anion," S. Nagakura, *Mol. Phys.*, **3**, 152 (1960).
152. "Spectroscopic Studies on Reactive Intermediates of Esterification of Aromatic Carboxylic Acids," H. Hosoya and S. Nagakura, *Spectrochim. Acta*, **17**, 324 (1961).
153. "Charge-Transfer Mechanism of Heterolytic Aromatic Substitution," S. Nagakura, *Tetrahedron*, **19**, 361 (1963).
154. "Dissociation Constants of Some Pseudo-Acids and Ultraviolet Absorption Spectra of Their Anions," F. Hashimoto, J. Tanaka, and S. Nagakura, *J. Mol. Spectrosc.*, **10**, 401 (1963).
155. "The Electron Spin Resonance and Electronic Spectra of the Anion Radicals of 4-Nitropyridine and 4-Nitropyridine 1-Oxide," *Bull. Chem. Soc. Jpn.*, **36**, 1665 (1963).
156. "The Electronic Structure of the *t*-Butyl Cation," I. Hanazaki, H. Hosoya, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **36**, 1673 (1963).
157. "Electronic Structures of the Protonated Benzoic Acid and the Related Ions," H. Hosoya and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **37**, 1500 (1964).
158. "The Electronic Spectra and Electronic Structures of the Benzyl Cation and Its Methyl Derivatives," I. Hanazaki and S. Nagakura, *Tetrahedron*, **21**, 2441 (1965).
159. "Preparation, ESR Spectra and Electronic Absorption Spectra of Substituted Pyridinyl Radicals," M. Itoh and S. Nagakura, *Tetrahedron Lett.*, **8**, 417 (1965).

179. "Charge-Transfer Interaction and Chemical Reaction. I. Reaction of Aniline with Chloranil," T. Nogami, K. Yoshihara, H. Hosoya, and S. Nagakura, *J. Phys. Chem.*, **73**, 2670 (1969).
180. "Spectroscopic Behavior of Wurster's Blue Perchlorate and *N*-Ethylphenazyl Crystal," T. Sakata and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **42**, 1497 (1969).
181. "Charge-Transfer Interaction and Chemical Reaction. II. Interaction of *s*-Triaminobenzene with Several Electron Acceptors," T. Yamaoka and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **43**, 355 (1970).
182. "Charge-Transfer Interaction in Linear Chain Molecular Crystals," T. Sakata and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **43**, 1346 (1970).
183. "Electronic Absorption Spectra and Electronic Structures of Some Wurster's Blue Salts," T. Sakata and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **43**, 2414 (1970).
184. "Electronic Structures of Aromatic Ketyl Radicals and Related Hydrocarbon Radicals," N. Kanamaru and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **43**, 3443 (1970).
185. "Absorption Spectrum of Solid Wurster's Blue Perchlorate and Its Phase Transition Mechanism," T. Sakata and S. Nagakura, *Mol. Phys.*, **19**, 321 (1970).
186. "Thermochemical Studies on the Protonation of 1,3,6-Triaminobenzene," T. Yamaoka, H. Hosoya, and S. Nagakura, *Tetrahedron*, **26**, 4125 (1970).
187. "Charge-Transfer Interaction between *N,N,N',N'*-Tetramethyl-*p*-phenylenediamine and Chloranil," T. Nogami, K. Yoshihara, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **44**, 295 (1971).
188. "Charge-Transfer Interaction and Chemical Reaction. III. Reactions of *m*-Phenylenediamine and Related Compounds with Chloranil," T. Nogami, T. Yamaoka, K. Yoshihara, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **44**, 380 (1971).
189. "Ionization of Some Quinones by the Interaction with Aliphatic Amines," T. Yamaoka and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **44**, 1780 (1971).
190. "Reactions of Aliphatic Amines with *p*-Benzoquinone and Its Chloro Derivatives," T. Yamaoka and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **44**, 2971 (1971).
191. "The Energy Transfer Mechanism in *cis*-Dichloro and Dibromo-*bis*(α,α' -dipyridyl)rhodium(III) Complexes," Y. Ohashi, K. Yoshihara, and S. Nagakura, *J. Mol. Spectrosc.*, **38**, 43 (1971).
192. "Charge-Transfer Interaction and Chemical Reaction. IV. Reactions of *p*-Substituted Derivatives of Aniline with Chloranil," T. Nogami, K. Yoshihara, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **45**, 122 (1972).
193. "Interactions of β -Naphthol and β -Naphthylamine in Their Excited Singlet States with Triethylamine," A. Matsuzaki, S. Nagakura, and K. Yoshihara, *Bull. Chem. Soc. Jpn.*, **47**, 1152 (1974).
194. "Charge-Transfer Interaction and Chemical Reaction. V. Reactions of *o*-Phenylenediamine with Chloranil," T. Nogami, T. Hashida, Y. Shirota, H. Mikawa, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **47**, 2103 (1974).
195. "Transient Ansorption in the Sensitized Photoisomerization of Stilbene," M. Sumitani, K. Yoshihara, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **51**, 2503 (1978).
196. "Spectroscopic and Kinetic Study of an Intramolecular Aromatic Nucleophilic Photosubstitution. Reaction Mechanism of a Photo-Smiles Rearrangement," K. Yokoyama, R. Nakagaki, J. Nakamura, K. Mutai, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **53**, 2472 (1980).
- V. Papers on Electronic Structures of Excited Molecules and Their Dynamical Behavior**
197. "Phosphorescence and Triplet-Singlet Absorption Spectra of Benzophenone Crystal at 4.2 K," Y. Udagawa, T. Azumi, M. Itoh, and S. Nagakura, *J. Chem. Phys.*, **49**, 3764 (1968).
198. "Optical Detection ESR for the *n*- π^* Triplet State of Benzil," H. Hayashi, K. Morigaki, and S. Nagakura, *Chem. Phys. Lett.*, **9**, 119 (1971).
199. "Time Resolved Spectra of Pyrene Excimer and Pyrene-Dimethylaniline Exciplex," K. Yoshihara, T. Kasuya, A. Inoue, and S. Nagakura, *Chem. Phys. Lett.*, **9**, 469 (1971).
200. "Fluorescence Quenching Due to Interaction between Excimers or Exciplexes," Ta. Kobayashi, K. Yoshihara, and S. Nagakura, *Mol. Phys.*, **21**, 573 (1971).
201. "The Spectral Dependence of Fluorescence Decay Times Observed for the Benzo(*g,h,i*)perylene Crystal and Its Mixed Crystal with Perylene," Ta. Kobayashi, K. Yoshihara, and S. Nagakura, *J. Mol. Spectrosc.*, **41**, 44 (1972).
202. "Two-Photon Excitation in Organic Crystals by Dye Laser," Ta. Kobayashi and S. Nagakura, *Chem. Phys. Lett.*, **13**, 217 (1972).
203. "Effect of High Density Excitations on Fluorescence of Naphthalene-Tetracyanobenzene Complex Crystal," K. Yoshihara, A. Inoue, and S. Nagakura, *Chem. Phys. Lett.*, **13**, 459 (1972).
204. "The Photo-decomposition of 1-Azidopyrene in the Benzene Solution," T. Yamaoka, H. Kashiwagi, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **5**, 361 (1972).
205. "Excimer and Monomer Defect Emissions of Perylene and Pyrene Crystals as Studied by the Nanosecond Time-Resolved Spectroscopy Technique," A. Inoue, K. Yoshihara, T. Kasuya, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **45**, 720 (1972).
206. "Exciton-Exciton Interaction and Exciton Migration in Anthracene, Pyrene, and Perylene Crystals," A. Inoue, K. Yoshihara, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **45**, 1973 (1972).
207. "The Biexcitonic Quenching and Exciton Migration Rate in Aromatic Crystals," Ta. Kobayashi and S. Nagakura, *Mol. Phys.*, **24**, 695 (1972).
208. "Bimolecular Quenching of Fluorescence and Interaction between Excited Molecules in Solution," Ta. Kobayashi and S. Nagakura, *Mol. Phys.*, **23**, 1211 (1972).
209. "Spectral Dependence of Fluorescence Lifetime as a Monitor for Purity of Fluoranthene Crystal," Ta. Kobayashi, S. Iwashima, S. Nagakura, and H. Inokuchi, *Mol. Cryst. Liq. Cryst.*, **18**, 117 (1972).
210. "Flash-Spectroscopic Study of Phthalazine," N. Kanamaru, S. Nagakura, and K. Kimura, *Bull. Chem. Soc. Jpn.*, **47**, 745 (1974).
211. "The Effect of High Density Excitation on the Fluorescence Spectrum of the Anthracene-Tetracene Mixed Crystal," Ta. Kobayashi and S. Nagakura, *Mol. Cryst. Liq. Cryst.*, **25**, 153 (1974).
212. "The Bimolecular Annihilation of Excitons and Singlet-Exciton Migration in Anthracene Crystals," A. Inoue, S. Nagakura, and K. Yoshihara, *Mol. Cryst. Liq. Cryst.*, **25**, 199 (1974).

213. "Reabsorption and High Density Excitation Effects on the Time-Resolved Fluorescence Spectra of Anthracene Crystal," Ta. Kobayashi and S. Nagakura, *Mol. Cryst. Liq. Cryst.*, **26**, 33 (1974).
214. "Laser Photolysis Study of *Trans-Cis* Photoisomerization of *Trans*-1-phenyl-2(2-naphthyl)-ethylene," M. Sumitani, S. Nagakura, and K. Yoshihara, *Chem. Phys. Lett.*, **29**, 410 (1974).
215. "Purification and Single Crystal Growth of *N*-Ethylcarbazole," K. Kato, M. Yokoyama, K. Okamoto, S. Kusabayashi, H. Mikawa, K. Yoshihara, and S. Nagakura, *Mol. Cryst. Liq. Cryst.*, **28**, 37 (1974).
216. "Two-Photon Absorption Spectrum of (2,2)Paracyclophane," K. Fuke, S. Nagakura, and Ta. Kobayashi, *Chem. Phys. Lett.*, **31**, 205.
217. "The Primary Process of the Photochemical Formation of 1-Nitrenopyrene," M. Sumitani, S. Nagakura, and K. Yoshihara, *Bull. Chem. Soc. Jpn.*, **49**, 2995 (1976).
218. "Picosecond Time-Resolved Spectroscopy and the Intersystem Crossing Rates of Anthrone and Fluorenone," Ta. Kobayashi and S. Nagakura, *Chem. Phys. Lett.*, **43**, 429 (1976).
219. "Spectroscopic and Kinetic Studies of the Photochromism of *N*-Salicylideneanilines and Related Compounds," R. Nakagaki, Ta. Kobayashi, J. Nakamura, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **50**, 1909 (1977).
220. "The Rates of Internal Conversion and Photoisomerization of Some Carbocyanine Dyes as Revealed from Picosecond Time-Resolved Spectroscopy," Ta. Kobayashi and S. Nagakura, *Chem. Phys.*, **23**, 153 (1977).
221. "Squid Hypsorhodopsin and Bathorhodopsin by a Picosecond Laser Photolysis," Y. Shichida, T. Yoshizawa, Ta. Kobayashi, H. Ohtani, and S. Nagakura, *FEBS Lett.*, **80**, 214 (1977).
222. "Temperature Dependence of Fluorescence Lifetimes of *Trans*-Stilbene," M. Sumitani, N. Nakashima, K. Yoshihara, and S. Nagakura, *Chem. Phys. Lett.*, **51**, 183 (1977).
223. "Picosecond Laser Photolysis of Squid Rhodopsin at Room and Low Temperatures," Y. Shichida, Ta. Kobayashi, H. Ohtani, T. Yoshizawa, and S. Nagakura, *Photochem. Photobiol.*, **27**, 335 (1977).
224. "Oxygen Effect on the Photoisomerization and Photoionization of Fumaronitrile through Its Exciplexes," H. Hayashi and S. Nagakura, *Chem. Phys. Lett.*, **53**, 201 (1978).
225. "Luminescence Properties and the Primary Process of Photochromism of 2-(2-Hydroxyphenyl)benzothiazole," R. Nakagaki, Ta. Kobayashi, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **51**, 1671 (1978).
226. "Picosecond Time-Resolved Spectroscopic Study of Solvated Electron Formation from the Photoexcited Naphthalate Ion," A. Matsuzaki, Ta. Kobayashi, and S. Nagakura, *J. Phys. Chem.*, **82**, 1201 (1978).
227. "Observation of a New Type Delayed Fluorescence from [2,2]Paracyclophane," K. Matsui, N. Nishi, M. Kinosita, and S. Nagakura, *Chem. Phys.*, **35**, 111 (1978).
228. "Direct Observation of Excimer Formation in Anthracene and 9,9'-Bianthryl," Ta. Kobayashi, S. Nagakura, and M. Szwarc, *Chem. Phys.*, **39**, 105 (1979).
229. "Picosecond Spectroscopy Studies of the Intersystem Crossing of Aromatic Carbonyl and Nitro Compounds in Solution," H. Ohtani, Ta. Kobayashi, K. Suzuki, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **53**, 43 (1980).
230. "Direct Observation of the Type II Biradical and Triplet State of Valerophenone Excited by the Fourth Harmonic of a Nd:YAG Laser," H. Hayashi and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **53**, 1519 (1980).
231. "Fluorescence Quenching Process of Anthracene by Maleic Anhydride," H. Yesaka, Ta. Kobayashi, K. Suzuki, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **53**, 2181 (1980).
232. "Observation of Intramolecular Excimer Emission of Benzyl Radical Pair Produced by Photolysis of [2,2]-Paracyclophane," S. Ishikawa, J. Nakamura, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **53**, 2476 (1980).
233. "Laser Induced Biphotonic Dissociation of Nitrobenzene Derivatives in Solution," Yokoyama, J. Nakamura, Ta. Kobayashi, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **53**, 3474 (1980).
234. "Mechanistic Studies of Photochemical Reactions of *N*-Ethylphthalimide with Olefins," H. Hayashi, S. Nagakura, Y. Kubo, and K. Maruyama, *Chem. Phys. Lett.*, **72**, 291 (1980).
235. "Laser-Photolysis Study of Biradical Formation from the Triplet State of 2,4,6-Triisopropylbenzophenone," H. Hayashi, S. Nagakura, Y. Ito, Y. Umehara, and T. Matsuura, *Chem. Lett.*, 939 (1980).
236. "Observation of Picosecond Time-Resolved Spectrum of Squid Bathorhodopsin at Room Temperature," K. Suzuki, Ta. Kobayashi, H. Ohtani, H. Yesaka, S. Nagakura, Y. Shichida, and T. Yoshizawa, *Photochem. Photobiol.*, **32**, 809 (1980).

VI. Papers on External Magnetic Field Effects upon Dynamical Behavior of Excited Molecules and Chemical Reactions

237. "The Determination of Singlet-Triplet Separation from the Anomalous Hyperfine Structure Observed with a Radical Pair," H. Hayashi, K. Itoh, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **39**, 199 (1966).
238. "Determination of the Singlet-Triplet Separation of a Weakly Interacting Radical Pair from ESR Spectrum," K. Itoh, H. Hayashi, and S. Nagakura, *Mol. Phys.*, **17**, 561 (1969).
239. "Magnetic Quenching of Fluorescence Observed with Carbon Disulfide Excited by a Nitrogen Laser," A. Matsuzaki and S. Nagakura, *Chem. Lett.*, 675 (1974).
240. "Magnetic Field Effect on the Fluorescence of Glyoxal," A. Matsuzaki and S. Nagakura, *Chem. Phys. Lett.*, **37**, 204 (1976).
241. "The Gas-Phase Emission Spectrum of Carbon Disulfide Excited by an N_2 Laser—Magnetic Quenching Effect," A. Matsuzaki and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **49**, 359 (1976).
242. "Magnetic Quenching of Fluorescence Observed with Carbon Disulfide and Glyoxal," A. Matsuzaki and S. Nagakura, *J. Lumin.*, **12/13**, 787 (1976).
243. "The External Magnetic Field Effect on the Singlet Sensitized Photolysis of Dibenzoyl Peroxide," Y. Tanimoto, H. Hayashi, S. Nagakura, H. Sakuragi, and Tokumaru, *Chem. Phys. Lett.*, **41**, 267 (1976).
244. "The Gas-Phase Emission Spectrum of Glyoxal—Magnetic Quenching of Fluorescence," A. Matsuzaki and S. Nagakura, *Z. Phys. Chem. Neue Folge*, **101**, 283 (1976).
245. "On the Mechanism of Magnetic Quenching of Fluorescence in Gaseous State," A. Matsuzaki and S. Nagakura, *Helv. Chim. Acta*, **61**, 675 (1978).

246. "The Theoretical Study of External Magnetic Field Effect on Chemical Reactions in Solution," H. Hayashi and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **51**, 2862 (1978).
247. "On the Mechanism of Magnetic Quenching of Fluorescence in the Gaseous State," A. Matsuzaki and S. Nagakura, *J. Lumin.*, **18/19**, 115 (1979).
248. "Classification of the External Magnetic Field Effects on the Photodecomposition Reaction of Dibenzoyl Peroxide," Y. Sakaguchi, H. Hayashi, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **53**, 39 (1980).
249. "A New Assisted Reaction in the Photodecomposition Reaction of Dibenzoyl Peroxide," Y. Sakaguchi, H. Hayashi, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **53**, 3059 (1980).
250. "External Magnetic Field Effect on the Decay Rate of Benzophenone Ketyl Radical in a Micelle," Y. Sakaguchi, S. Nagakura, and H. Hayashi, *Chem. Phys. Lett.*, **72**, 420 (1980).
251. "Magnetic Field Effect on the Fluorescence of Methylglyoxal," K. Hashimoto, S. Nagakura, J. Nakamura, and S. Iwata, *Chem. Phys. Lett.*, **74**, 228 (1980).
252. "Laser-Photolysis Study of the External Magnetic Field Effect upon the Photodecomposition Reaction of 1,3-Diphenyl-2-Propanone in a Micelle," H. Hayashi, Y. Sakaguchi, and S. Nagakura, *Chem. Lett.*, 1149 (1980).
253. "External Magnetic Field Effect on the Fluorescence of Glyoxal," J. Nakamura, K. Hashimoto, and S. Nagakura, *J. Lumin.*, **24/25**, 763 (1981).
254. "Magnetic Isotope Effect upon the Decay Rate of the Benzophenone Ketyl Radical in a Micelle," Y. Sakaguchi, S. Nagakura, A. Minoh, and H. Hayashi, *Chem. Phys. Lett.*, **82**, 213 (1981).
255. "External Magnetic Field Effect on the Fluorescence of Glyoxal," J. Nakamura, K. Hashimoto, and S. Nagakura, *J. Lumin.*, **24/25**, 763 (1981).
256. "Magnetic Field Effect on the Fluorescence of CS₂," H. Orita, H. Morita, and S. Nagakura, *Chem. Phys. Lett.*, **81**, 29 (1981).
257. "Collisional Quenching Constants and Collision-Free Lifetime of Fluorescence of Gaseous Carbon Disulfide," H. Orita, H. Morita, and S. Nagakura, *Chem. Phys. Lett.*, **81**, 33 (1981).
258. "Magnetic Field Effect on the Fluorescence of D₂CO Excited to the 4⁰ and 4¹ Levels of the ¹A₂ State," H. Orita, H. Morita, and S. Nagakura, *Chem. Phys. Lett.*, **81**, 409 (1981).
259. "Collision and Magnetic Field Effects on Time-Resolved Fluorescence of D₂CO Excited by a N₂ Laser," H. Orita, H. Morita, and S. Nagakura, *Chem. Phys. Lett.*, **86**, 123 (1982).
260. "Laser-Photolysis Study of the External Magnetic Field Effect upon the Photochemical Processes of Carbonyl Compounds in Micelles," Y. Sakaguchi, H. Hayashi, and S. Nagakura, *J. Phys. Chem.*, **86**, 3177 (1982).
261. "External Magnetic Field Effects upon Photochemical Reactions in Solution," S. Nagakura and H. Hayashi, *Radiat. Phys. Chem.*, **21**, 91 (1983).
262. "The Theoretical Study of Relaxation Mechanism in Magnetic Field Effect on Chemical Reactions," H. Hayashi and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **57**, 322 (1984).
263. "External Magnetic Field Effects upon Photochemical Reactions," S. Nagakura and H. Hayashi, *Int. J. Quantum Chem.*, **18**, 571 (1984).
264. "Magnetic Isotope and External Magnetic Field Effects upon the Photo-Fries Rearrangement of 1-Naphthyl Acetate," R. Nakagaki, M. Hiramatsu, T. Watanabe, Y. Tanimoto, and S. Nagakura, *J. Phys. Chem.*, **89**, 3222 (1985).
265. "Magnetic Field Effects on Photoionization of N,N,N',N'-Tetramethyl-p-phenylenediamine in 2-Propanol," Y. Tanimoto, T. Watanabe, R. Nakagaki, M. Hiramatsu, and S. Nagakura, *Chem. Phys. Lett.*, **116**, 341 (1985).
266. "External Magnetic Field Effects on the Emission Intensities of the NO(B-X) Bands in an Afterglow Produced by a Microwave Discharge," Y. Fukuda, H. Hayashi, and S. Nagakura, *Chem. Phys. Lett.*, **119**, 480 (1985).
267. "Photochemistry of Biochromophoric Chain Molecules Containing Electron Donor and Acceptor Moieties. Dependence of Reaction Pathways on the Chain Length and Mechanism of Photoredox Reaction of N-[ω -(p-nitrophenoxy)alkyl]anilines," R. Nakagaki, M. Hiramatsu, K. Mutai, and S. Nagakura, *Chem. Phys. Lett.*, **121**, 262 (1985).
268. "Mulliken's Charge-Transfer Theory and Its Application to Chemical Reactions," S. Nagakura, *Mol. Cryst. Liq. Cryst.*, **126**, 9 (1985).
269. "Photo-Smiles Rearrangement (IV). Electron-Transfer Mechanism of an Intramolecular Aromatic Nucleophilic Substitution," R. Nakagaki, M. Hiramatsu, K. Mutai, and S. Nagakura, *Mol. Cryst. Liq. Cryst.*, **126**, 69 (1985).
270. "Magnetic Isotope and External Magnetic Field Effects upon the Photo-Fries Rearrangement of 1-Naphthyl Acetate," R. Nakagaki, M. Hiramatsu, T. Watanabe, Y. Tanimoto, and S. Nagakura, *J. Phys. Chem.*, **89**, 3222 (1985).
271. "The Magnetic Field Effects on the Electrolysis of Hexacyanoferrate(II) Oxidation and Hexacyanoferrate(III) Reduction," T. Watanabe, Y. Tanimoto, T. Sakata, R. Nakagaki, M. Hiramatsu, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **58**, 1251 (1985).
272. "External Magnetic Field Effects on the Emission Intensities of the OH(A-X) and CH(A-X) Bands in Low Pressure C₂H₂/O₂ and C₃H₈/O₂ Flames," Y. Fukuda, H. Abe, H. Hayashi, T. Imamura, and S. Nagakura, *Chem. Lett.*, 777 (1986).
273. "Magnetic Field Effects on the Photoinduced Electron Transfer Reaction of 1-Acetonaphthone and Diphenylamine in Micellar Solution," Y. Tanimoto, M. Takayama, M. Itoh, R. Nakagaki, and S. Nagakura, *Chem. Phys. Lett.*, **129**, 414 (1986).
274. "Photochemistry of Biochromophoric Chain Molecules Containing Electron Donor and Acceptor Moieties. External Magnetic Field Effects upon the Photochemistry of N-[ω -(p-nitrophenoxy)alkyl]anilines," R. Nakagaki, M. Hiramatsu, K. Mutai, Y. Tanimoto, and S. Nagakura, *Chem. Phys. Lett.*, **134**, 171 (1987).
275. "External Magnetic Field Effect on the Fluorescence of CS₂ Excited to the V ¹B₂ State with Nanosecond and Picosecond Dye Lasers," T. Imamura, N. Tamai, Y. Fukuda, I. Yamazaki, S. Nagakura, H. Abe, and H. Hayashi, *Chem. Phys. Lett.*, **135**, 208 (1987).
276. "Mechanism for Photoisomerization of an Olefin in the Presence of Electron Acceptors as Studied by Magnetic Field Effects," H. Sakuragi, R. Nakagaki, T. Oguchi, T. Arai, K. Tokumaru, and S. Nagakura, *Chem. Phys. Lett.*, **135**, 325 (1987).

277. "Magnetic Field Effects on the Fluorescence of Intramolecular Electron-Donor-Acceptor Systems," Y. Tanimoto, N. Okada, M. Itoh, K. Iwai, K. Sugioka, F. Takemura, R. Nakagaki, and S. Nagakura, *Chem. Phys. Lett.*, **136**, 42 (1987).
278. "The Magnetic Field Effects on Electrolysis. II. The Anodic Surface Oxidation of Gold," T. Watanabe, Y. Tanimoto, R. Nakagaki, M. Hiramatsu, T. Sakata, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **60**, 4163 (1987).
279. "The Magnetic Field Effects on Electrolysis. III. The Anodic Surface Oxidation of Phenylacetate Ion," T. Watanabe, Y. Tanimoto, R. Nakagaki, M. Hiramatsu, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **60**, 4166 (1987).
280. "Intermolecular Photo-oxidation of Triphenylphosphine and 10-Alkylphenothiazine by Nitro-aromatic Moieties: Magnetic Field Effects and Long-range Oxygen Transfer," M. Hiramatsu, R. Nakagaki, Y. Tanimoto, K. Mutai, H. Tukada, and S. Nagakura, *Chem. Phys. Lett.*, **142**, 413 (1987).
281. "Dynamics of CS₂ Excited by a Synchronously Pumped Mode-Locked Dye Laser and the Effects of Magnetic Field," H. Kato, K. Yokoyama, M. Baba, N. Tamai, I. Yamazaki, and S. Nagakura, *J. Chem. Phys.*, **87**, 1987 (1987).
282. "Magnetic Field Effects upon Photochemistry of Bichromophotic Chain Molecules Containing Nitro-aromatic and Arylamino Moieties: Elucidation of Reaction Mechanism and Control of Reaction Yields," R. Nakagaki, K. Mutai, M. Hiramatsu, H. Tsukada, and S. Nagakura, *Can. J. Chem.*, **66**, 1989 (1988).
283. "Photochemistry of Chain Molecules Containing 4-Nitro-1-Naphthoxy and Anilino Chromophores. Switching of Reaction Pathways due to Methylene Chain Length and Magnetic Field Effects," R. Nakagaki, K. Mutai, and S. Nagakura, *Chem. Phys. Lett.*, **154**, 581 (1989).
284. "The Magnetic Predissociation of the B ³P_{0u}⁺ State of the Iodine Molecules," M. Baba, M. Kimura, T. Tsuboi, H. Kato, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **62**, 17 (1989).
285. "External Magnetic Field Effects on CS₂ Banded Emission. Laser Excitation in the Wavelength Region of Nitrogen Laser," T. Imamura, S. Nagakura, H. Abe, Y. Fukuda, and H. Hayashi, *J. Phys. Chem.*, **93**, 69 (1989).
286. "Magnetic Field Effects on the Intra- and Intermolecular Exciplex Fluorescence of Phenanthrene and Dimethyl-aniline," Y. Tanimoto, K. Hasegawa, N. Okada, M. Itoh, K. Iwai, K. Sugioka, F. Takemura, R. Nakagaki, and S. Nagakura, *J. Chem. Phys.*, **93**, 3586 (1989).
287. "Laser Flash Photolysis Studies of the Magnetic Field Effects on the Hydrogen Abstraction Reaction of 2-Naphthylphenylcarbene in Micellar Solution," Y. Tanimoto, C. Jinda, Y. Fujiwara, M. Itoh, K. Hirai, H. Tomioka, R. Nakagaki, and S. Nagakura, *J. Photochem. Photobiol. A*, **47**, 269 (1989).
288. "External Magnetic Field Effect on the Fluorescence of Gaseous CS₂ Excited to the V ¹B₂ State with Nanosecond and Picosecond Dye Laser," H. Abe, H. Hayashi, T. Imamura, and S. Nagakura, *Chem. Phys.*, **137**, 297 (1989).
289. "Effects on Trivalent Lanthanide Complexes on the Lifetimes of Methylene-Chain-Linked Biradicals in Magnetic Fields," Y. Tanimoto, A. Kita, M. Itoh, M. Okazaki, R. Nakagaki, and S. Nagakura, *Chem. Phys. Lett.*, **165**, 184 (1990).
290. "Magnetic Field Effects upon Photoredox Reactions of Bifunctional Chain Molecules Containing Anilino and Nitro-aromatic Chromophores," R. Nakagaki, K. Mutai, and S. Nagakura, *Chem. Phys. Lett.*, **167**, 439 (1990).
291. "Magnetic Field Effects on the Intramolecular Photoreaction of n-Alkyl Anthraquinone-2-carboxylates," Y. Tanimoto, M. Uehara, M. Takashima, M. Itoh, M. Hiramatsu, R. Nakagaki, T. Watanabe, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **63**, 2164 (1990).
292. "External Magnetic Field Effect on the β Band Emission of NO," M. Sumitani, H. Abe, and S. Nagakura, *J. Chem. Phys.*, **94**, 1923 (1991).
293. "Magnetic Predissociation of D¹ Σ^+_u State of the Cesium Molecule," H. Kato, T. Kobayashi, Y. C. Wang, K. Ishikawa, M. Baba, and S. Nagakura, *Chem. Phys.*, **162**, 107 (1992).
294. "Hyperfine versus Relaxation Mechanisms of the Magnetic Field Effect on Recombination Fluorescence of Geminate Pairs," M. Okazaki, Y. Tai, K. Nunome, K. Toriyama, and S. Nagakura, *Chem. Phys.*, **162**, 177 (1992).
295. "Mechanism of External Magnetic Field Dependent Fluorescence Decays of Gaseous Carbon Disulfide," Y. Fujimura, H. Hayashi, and S. Nagakura, *Chem. Phys.*, **162**, 205 (1992).
296. "Solvent Dependence of Magnetic Field Effects upon Photoionization of 2-(2,3-Dimethyl-1-butyl)naphthalene in the Presence of Electron Acceptors," H. Sakuragi, R. Nakagaki, K. Naitoh, T. Oguchi, T. Arai, K. Tokumaru, and S. Nagakura, *Bull. Chem. Soc. Jpn.*, **67**, 86 (1994).
297. "Effects of Maganetic Field on the 15 V 31,344.9 Band of CS₂ Studies by Sub-Doppler High-Resolution Spectroscopy," H. Kato, A. Doi, Y. Taroura, and S. Nagakura, *J. Chem. Phys.*, **103**, 4869 (1995).