

個人情報

学会活動等

日本化学会：

欧文誌編集委員会幹事 Physical and Theoretical Section Editor (1997-01)

日本分光学会：

理事(1995-96) 評議員(1997-98 ; 2001-02) 関西支部長(1995-97)

光化学協会： 理事(1996-97; 2000-01)

超高速現象国際会議：

UP2004 組織委員長 (2003-04) Program Committee (1994-2000; 2003-04)

文部省科学研究費審査委員 (1996-01)

学術審議会審査会専門委員(1996-99)

分子科学研究所：

運営協議会委員 (1997-01) UVSOR 運営委員 (1986-1990)

分子制御レーザー開発研究センター運営委員(1997-05)

大阪科学技術センター評議員(2002-03)

主な科学研究費

・溶媒 溶質相互作用，溶媒和，配向緩和ダイナミクスに関する研究

特別推進研究「溶液中の反応基礎過程の解明と分子間相互作用ダイナミクスの確立」

(1998 - 2001年度)；

重点領域研究「光反応ダイナミクス・環境場制御による新展開」“溶媒和によるエネルギー緩和とスペクトル幅の緩和のダイナミクス”(1994-1996年度)；

国際協力研究(共同研究)「溶媒・溶質相互作用のマイクロダイナミクスと溶媒誘起電子構造変化」(1993 - 1994年度)；

重点領域研究「溶液の非平衡過程の分子論的アプローチ」(1990 - 1992年度)；

・光解離とジェミネートダイナミクスに関する研究

一般研究B「光解離で生じたジェミネート分子間の溶媒ケージ内反応マイクロダイナミクス」(1994-1995年度)；

一般研究C「溶液中における光開裂によって生じたジェミネート分子間のダイナミクス」(1992年度)；

一般研究B「溶液中における化学結合の切断・組み換えのダイナミクス」(1990-1991年度)

・光誘起電子移動, Exciplex に関する研究

創成的科学研究費(新プログラム)「人工制御機能性分子システムの研究」,

分担課題“人工光合成反応中心モデル化合物の研究”(1991-1995年度);

総合研究大学院大学グループ研究「エネルギー変換科学」(1992-1993年度)

一般研究C「高密度流体中における励起状態の挙動と分子間相互作用」

(1984-1985年度)

試験研究2「高速多波長蛍光分光光度計の試作」(1981年度)

奨励研究A「分子内、分子間エキサイプレックス系における電荷移動現象初期過程

・Photon counting 法による研究」(1972年度)

・豊田理化学研究所における研究

基盤研究B「ハイドレート・過冷却水・ガラス中の溶存状態とダイナミクスに関する光化学的研究」(2005-2007年度)

主な研究成果

溶液中の光反応初期過程の研究を、ナノ秒からフェムト秒領域の時間分解吸収スペクトル、発光の時間依存性、非線形分光、コヒーレント分光などの測定手法を用いて、反応の動的側面に注目して推し進めその機構の解明に貢献した。

(1) 溶媒和ダイナミクスにおける非線形現象の研究

動的ホールバーニング分光法を用いて系の平均エネルギーの緩和時間とエネルギー分散の緩和時間が大きく異なることを初めて実験的に示した。また、統計力学理論 (Reference Interaction-Site Model) により多原子分子では系のエネルギー緩和時間にも非線形性が顕著に現れることを示した。

- "Solute-Structure Dependence of Solvation Dynamics Studied by Reference Interaction-Site Model Theory", K. Nishiyama, F. Hirata, and T. Okada, J. Chem. Phys., 118(2003) 2279-2285.
- "Relaxation of Average Energy and Rearrangement of Solvent Shells in Various Polar Solvents in Connection with Solvation Dynamics: Studied by RISM Theory" K. Nishiyama, F. Hirata, and T. Okada, Chem. Phys. Lett., 330(2000) 125-131.
- "Relaxation of Inhomogeneous Spectral Band Width of Dye Molecules in Polar Solvents Studied by Time- Resolved Hole and Fluorescence Spectroscopy." K.Nishiyama and T.Okada, J. Phys. Chem.A, 101(1997) 5729-5735.
- "Solvation Dynamics of Dye Molecules in Polar Solvents Studied by Time Resolved Hole Burning Spectroscopy." K. Nishiyama, Y. Asano, N. Hashimoto, and T. Okada, J. Mol. Liquids, 65/66(1995) 41-48.

(2) エキサイプレックス系の溶媒誘起電子構造変化の研究

電子励起状態でのみ形成される電荷移動錯体系の蛍光スペクトルの測定と共に蛍光寿命、過渡吸収スペクトルを初めて測定し、溶媒の極性によって分子配置と電子構造が異なることを実験的に示した。

- "Picosecond Laser Spectroscopy of Intramolecular Heteroexcimer Systems., Time-Resolved Absorption Studies of p-(CH₂)₂NC₆H₄-(CH₂)_n-(1-Pyrenyl) and -(9-Anthryl) Systems", T. Okada, M. Migita, N.Mataga, Y. Sakata, and S. Misumi, J. Am. Chem. Soc., 103(1981) 4715-4720.
- "Intramoleciuar Charge-Transfer Interactions and Dynamical Behaviors of Excited p-(9-Anthryl)-(N,N-Dimethylaniline)", T. Okada, T. Fujita, and N. Mataga, Z. Phys. Chem. N. F., 101 (1976) 57-66.

- “Intramolecular Electron Donor-Acceptor Interactions in the Excited State of (Anthracene)-(CH₂)_n-(N,N-Dimethylaniline) Systems”, T. Okada, T. Fujita, M. Kubota, S. Masaki, N. Mataga, R. Ide, Y. Sakata, and S. Misumi, Chem. Phys. Lett., 1(1972) 563-568.
- “Heat of Formation and the Structure of Pyrene-N, N-Dimethylaniline Heteroexcimer”, T. Okada, N. Matsui, H. Oohari, H. Matsumoto, and N. Mataga, J. Chem. Phys., 49(1968) 4717-4718.
- “Electronic Processes in Heteroexcimers and the Mechanism of Fluorescence Quenching”, N. Mataga, T. Okada, and N. Yamamoto, Chem. Phys. Lett., 1(1967) 119-121.

論文リスト

Original papers

溶媒 溶質相互作用, 溶媒和, 配向緩和ダイナミクスに関する研究

"Solvation Dynamics in Water Investigated by RISM/Mode-Coupling Theory", K. Nishiyama, T. Yamaguchi, F. Hirata, and T. Okada, *J. Mol. Liquids*, 119(2005) 63-66.

"Enhancement and Suppression of Vibrational Coherence in Degenerate Four-Wave-Mixing Signal Generated from Dye-Doped Polymer Films", Y. Nagasawa, Y. Mori, Y. Nakagawa, H. Miyasaka, and T. Okada, *J. Phys. Chem. B* 109(2005) 11946-11952.

"The Microscopic Viscosity of Water-Alcohol Binary Solvents Studied by Ultrafast Spectroscopy Utilizing Diffusive Phenyl Ring Rotation of Malachite Green as a Probe", Y. Nagasawa, Y. Nakagawa, A. Nagafuji, T. Okada, and H. Miyasaka, *J. Mol. Struct.*, 735/736(2005) 217-223.

"Solute Dependence of Polar Solvation Dynamics Studied by RISM / Mode-Coupling Theory", K. Nishiyama, T. Yamaguchi, F. Hirata, and T. Okada, *J. Solution Chem.*, 33(2004) 631-639.

"Polar Solvation Dynamics: A Combination of the Reference Interaction-site Model and Mode-coupling Theories", K. Nishiyama, T. Yamaguchi, F. Hirata, T. Okada, *Pure. Appl. Chem.*, 76(2004) 71-77.

"Ultrafast Relaxation Dynamics in the Higher Excited States of Malachite Green : Studied by Femtosecond Upconversion spectroscopy", A. C. Bhasikuttan, A. V. Sapre, and T. Okada, *J. Phys. Chem. A.*, 107(2003) 3030-3035.

"Microscopic Viscosity of Aqueous Solution of Saccharides: A Study by Ultrafast Pump-probe Spectroscopy." Y. Nagasawa, Y. Nakagawa, J. Kenmochi, and T. Okada, *Cryobio. Cryotech.*, 49(2003) 87-95.

"Solute-Structure Dependence of Solvation Dynamics Studied by Reference Interaction-Site Model Theory", K. Nishiyama, F. Hirata, and T. Okada, *J. Chem. Phys.*, 118(2003) 2279-2285.

"Two-Dimensional Analysis of Integrated Three-Pulse Photon Echo Signals of Nile Blue Doped in PMMA", Y. Nagasawa, K. Seike, T. Muromoto, and T. Okada, *J. Phys. Chem. A*, 107(2003) 2431-2441.

"Solute Dependence of Three Pulse Photon Echo Peak Shift Measurements in Methanol Solution", Y. Nagasawa, A. Watanabe, H. Takikawa, and T. Okada, *J. Phys. Chem. A*, 107(2003) 632-641.

"Ultrafast Fluorescence Detection in Tris-(2,2'Bipyridine)Ruthenium(II) Complex in Solution: Relaxation Dynamics Involving Higher Excited States", A.C. Bhasikuttan, M. Suzuki, S. Nakashima, and T. Okada, *J. Am. Chem. Soc.*, 124(2002) 8398-8405.

"Ultrafast Excited State Deactivation of Triphenylmethane Dyes", Y. Nagasawa, Y. Ando, D. Kataoka, H. Matsuda, H. Miyasaka, and T. Okada, *J. Phys. Chem. A*, 106(2002) 2024-2035.

"Solute-Shape Dependence in Solvation Dynamics: Investigated by RISM Theory " K. Nishiyama, F. Hirata, and T. Okada, *J. Mol. Liq.*, 96/97(2002) 391-395.

"Temperature Dependence of Low-Frequency Responses of Liquid 1-Alkenes Studied by Femtosecond Optical Kerr Effect Spectroscopy" S. Yoshioka, T. Yagi, S. Nakashima, and T. Okada, *J. Mol. Liq.*, 96/97(2002) 275-285.

"Nonlinear Response of Solvent Molecules Induced by Instantaneous Change of Solute Electronic Structure: Studied by RISM Theory" K. Nishiyama, F. Hirata, and T. Okada, *J. Mol. Struct.*, 565/566(2001) 31-34.

"Solvent Dependence of the Ultrafast Ground State Recovery Dynamics of Phenol Blue" Y. Nagasawa, A. Watanabe, Y. Ando and T. Okada, *J. Mol. Liq.*, 90(2001) 295-302.

"Average Energy Relaxation and Rearrangement of Solute-Solvent Radial Distribution Function in Solvation Dynamics: A Connection between Spectroscopic Results and RISM Theory." K. Nishiyama, F. Hirata, and T. Okada, *J. Mol. Liq.*, 90(2001) 251-260.

"Molecular Dynamics Simulation of the Geminate Radical Recombination in Solution: Effects of the Large Dipole Moment of the Radicals" Y. Hirata and T. Okada, *Res. Chem. Intermed.*, 27(2001) 35-45.

"Relaxation of Average Energy and Rearrangement of Solvent Shells in Various Polar Solvents in Connection with Solvation Dynamics: Studied by RISM Theory" K. Nishiyama, F. Hirata, and T. Okada, *Chem. Phys. Lett.*, 330(2000) 125-131.

"Solvent Dependent Ultrafast Ground State Recovery Dynamics of Triphenylmethane Dyes" Y. Nagasawa, Y. Ando and T. Okada, *J. Chinese Chem. Soc.*, 47(2000) 699-704.

"Importance of Acoustic Solvent Mode and Solute-Solvent Radial Distribution Functions in Solvation Dynamics : Studied by RISM Theory." K. Nishiyama, F. Hirata, and T. Okada, *J. Chinese Chem. Soc.*, 47(2000) 837-842.

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"Photophysical Properties of Diphenylacetylene and Diphenylbutadiyne Derivatives in Solution Phase." Y.Hirata, T.Okada and T.Nomoto, *Acta Physica Polonica A*, 94(1998) 627-636.

"Relaxation Dynamics of Inhomogeneous Spectral Width in Binary Solvents Studied by Transient Hole-Burning Spectroscopy." K.Nishiyama and T.Okada, *J. Phys. Chem. A*, 102(1998) 9729-9733.

"Geminate Recombination of p-Aminophenylthiyl Radical Pair Produced by the Photodissociation of p-Aminophenyldisulfide in Nonpolar Solvents." Y.Hirata, Y.Niga, S.Makita, and T.Okada, *J. Phys. Chem. A*, 101(1997) 561-565.

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"Relaxation of Inhomogeneous Spectral Band Width of Dye Molecules in Polar Solvents Studied by Time- Resolved Hole and Fluorescence Spectroscopy." K.Nishiyama and T.Okada, *J. Phys. Chem.A*, 101(1997) 5729-5735.

"The effect of S₁ torsional dynamics on the time resolved fluorescence spectra of 9, 9'-bianthryl in solution." K. Elich, M. Kitazawa, R. Wortmann, and T. Okada, *J. Phys. Chem. A*, 101(1997) 2010-2015.

"Photophysical Properties of Diphenylacetylene Derivatives in Solution Phase" Y. Hirata, T. Okada and T. Nomoto, *Chem.Phys.Lett.*, 257(1996) 513-518.

"Solvent Viscosity Dependence of Bimolecular Reaction Rate Constant of the Excited 9-Cyanoanthracene Quenched by 1,3-Cyclohexadiene." M. Kitazawa, T. Yabe, Y. Hirata, and T. Okada, *J. Mol. Liquids*, 65/66(1995) 321-324.

"Solvation Dynamics of Dye Molecules in Polar Solvents Studied by Time Resolved Hole Burning Spectroscopy." K. Nishiyama, Y. Asano, N. Hashimoto, and T. Okada, *J. Mol. Liquids*, 65/66(1995) 41-48.

"Photodissociation and Geminate Dynamics in Solution Phase-Picosecond Transient Absorption Studies of Tetraphenylhydrazines and Diphenyl Disulfides." Y. Hirata, Y. Niga, M. Ohta, M. Takizawa and T. Okada, *J. Mol. Liquids*, 65/66(1995) 421-424.

"Photodissociation and geminate dynamics in solution phase - Picosecond transient absorption studies of tetraphenylhydrazines and phenyldisulfides." Y. Hirata, Y. Niga, M. Ohta, M. Takizawa and T. Okada, *Res. Chem. Intermed.*, 21(1995) 823-836.

"Photodissociation of p-aminophenyldisulfide and p-aminophenylthiol in liquid phase: geminate recombination and the dimer formation of p-aminophenylthiol." Y. Hirata, Y. Niga and T. Okada, *Chem. Phys. Lett.*, 221(1994) 283-288.

"Photophysical Properties of Diphenylacetylene Derivatives in Solution Phase 3: Thermal Repopulation of the S₂ State of (Aminophenyl)phenylacetylene." Y.Hirata, T.Okada, and T.Nomoto, *J. Phys. Chem.*, 97(1993) 9677-9681.

"Higher Excited Singlet State of Diphenylacetylene in Solution Phase.", Y.Hirata, T.Okada, and T.Nomoto, *Chem. Phys. Lett.*, 209(1993) 397-402.

"Transient Hole-Burning and Time-Resolved Fluorescence Spectra of Dye Molecule in Solution : Evidence for Ground-State Relaxation and Hole-Filling Effect", H. Murakami, S. Kinoshita, Y. Hirata, T. Okada and N. Mataga, *J. Chem. Phys.*, 97(1992) 7881-7888.

"Picosecond Time-Resolved Absorption Spectrum Measurements of the Higher Excited Singlet State of Diphenylacetylene in the Solution Phase", Y. Hirata, T. Okada, N. Mataga and T. Nomoto, *J. Phys. Chem.*, 96(1992) 6559-6563.

"Femtosecond Laser Photolysis Studies on the Cooling Process of Chrysene in the Vibrationally Hot

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“Direct Observation of Photodissociation of Tetraphenylhydrazine and Its Derivatives in the Solution Phase : Picosecond Study of N-N Bond Rupture in the Fluorescence State”, Y. Hirata, M. Ohta, T. Okada, and N. Mataga, J. Phys. Chem., 95(1992) 1517-1520.

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TICT , 溶媒誘起効果に関する研究

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"Ultrafast Anisotropy Measurements on Charge Transfer Dynamics in Plastocyanin" S. Nakashima, K. Seike, Y. Nagasawa, T. Okada, M. Sato, and T. Kohzuma, J. Chinese Chem. Soc., 47(2000) 693-697.

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“Solvation Induced Charge Separation in the Excited State of Composite Systems with Identical Halves and Intramolecular Excimer Formation by Recombination. Picosecond Laser Photolysis Studies on 1, 2-Dianthrylethanes”, H. Yao, T. Okada, and N. Mataga, J. Phys. Chem., 93(1989) 7388-7394.

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"Role of Special Pair in Charge-Separating Event in Photosynthesis", H. Ozeki, A. Nomoto, K. Ogawa, Y. Kobuke, M. Murakami, K. Hosoda, M. Ohtani, S. Nakashima, H. Miyasaka, and T. Okada, *Chem. Eur. J.*, 10(2004) 6393-6401.

"Picosecond Electron Transfer Dynamics in Polymer Systems in Solutions: Cellulose tris(9-ethylcarbazolyl-3- carbamate) and Amylose tris(9-ethylcarbazolyl-3-carbamate)", S. R. Khan, A. Itaya, H. Miyasaka, T. Okada, C. Yamamoto, and Y. Okamoto, *J. Photochem. Photobio. A.* 161(2003) 35-42.

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“Synthesis of Directly Linked Zinc[II] Porphyrin-Imide Dyads and Energy Gap Dependence of Intramolecular Electron Transfer Reactions”, N. Yoshida, T. Ishizuka, K. Yofu, M. Murakami, H. Miyasaka, T. Okada, Y. Nagata, A. Itaya, D.H. Kim, H.S. Cho, and A. Osuka, *Chem.Euro.J.*, 9(2003) 2854-2866.

"Ultrafast Charge Separation from the S_2 Excited State of Directly Linked Porphyrin-Imide Dyads : First Unequivocal Observation of the Whole Bell-Shaped Energy-Gap Law and Its Solvent Dependencies", N. Mataga, H. Chosrowjan, S. Taniguchi, Y. Shibata, N. Yoshida, A. Osuka, T. Kikuzawa, and T. Okada, *J. Phys. Chem. A*, 106(2002) 12191-12201.

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