Yoshihiro MATANO, Dr. Sci.

Professor
Program: Fundamental Sciences
Area: Chemistry
Undergraduate: Dept. of Chemistry
http://chem.sc.niigata-u.ac.jp/~matano/Welcome.html

Professional Expertise

Organic Chemistry (Organoelement Chemistry, Structural Organic Chemistry, Organic Synthesis, Physical Organic Chemistry, Materials Chemistry)
*Synthesis of heteroatom-containing π-conjugated organic compounds.
*Characterization of new compounds by using NMR, IR, MS, and X-ray analysis.
*Clarification of the optical and electrochemical properties of new compounds by using UV-vis absorption/emission spectroscopy, cyclic voltammetry, ESR, etc.

Research Fields of Interest

Heteroatom-containing π-conjugated organic molecules are now indispensable to the development of basic science, materials science, and medical science. One of the research subjects in Matano lab is to create novel heteroatom-containing π-conjugated materials that are applicable to organic devices such as organic photovoltaics, organic light-emitting diodes, and organic field effective transistors. For example, a variety of phosphole-based oligomers, polymers, and fused π-systems have been constructed, and their structure-property relationships have been clarified in detail. Furthermore, some derivatives have been used as sensitizers and n-type semiconductors in organic photovoltaics. The other subject is to create novel porphyrin-based macrocyclic, redox-active ligands and functional dyes. The properties of the porphyrin π-system can be finely tuned by the introduction of some heteroatoms to the porphyrin ring. For example, new classes of phosphorus-, sulfur- and nitrogen-containing porphyrin derivatives have been constructed, and their coordination, optical and electrochemical properties have been disclosed in detail.

Education

1994: Ph.D. in Chemistry, Graduate School of Science, Kyoto University, Japan
1989: M.S. in Chemistry, Graduate School of Science, Kyoto University, Japan
1987: B.S. in Chemistry, Faculty of Science, Kyoto University, Japan

Professional Societies and Activities

1. The Chemical Society of Japan
2. The Society of Synthetic Organic Chemistry, Japan
3. American Chemical Society
4. The Society of Polymer Science, Japan
5. The Kinki Chemical Society, Japan

Awards

1. 2001: Toray Award in Synthetic Organic Chemistry, Japan
2. 2000: Incentive Award in Synthetic Organic Chemistry, Japan

Major Publications

Papers

[1]"Synthesis and Charge-Carrier Transport Properties of Poly(phosphole *P*-alkanesulfonylimide)s", Y. Matano, H. Ohkubo, Y. Honsho, A. Saito, S. Seki, H. Imahori, *Org. Lett.*, 15, 932–935, 2013.

[2]"Free Base and Metal Complexes of 5,15-Diaza-10,20-dimesitylporphyrins: Synthesis, Structures, Optical and Electrochemical Properties, and Aromaticities", Y. Matano, T. Shibano, H. Nakano, Y. Kimura, H. Imahori, *Inorg. Chem.*, 51, 12879–12890, 2012.

[3]"Synthesis and Structure–Property Relationships of 2,2′-Bis(benzo[*b*]phosphole) and 2,2′-Benzo[*b*]phosphole–Benzo[*b*]heterole Hybrid π-Systems", Y. Hayashi, Y. Matano, K. Suda, Y. Kimura, Y. Nakao, H. Imahori *Chem. Eur. J.*, 18, 15972–15983, 2012.

[4]"Nickel(II) and Copper(II) Complexes of *b*-Unsubstituted 5,15-Diazaporphyrins and Pyridazine-Fused Diazacorrinoids: Metal-Template Syntheses and Peripheral Functionalizations", Y. Matano, T. Shibano, H. Nakano, Y. Kimura, H. Imahori, *Chem. Eur. J.*, 18, 6208–6216, 2012.

[5] "Effects of Carbon–Metal–Carbon Linkages on the Optical, Photophysical, and Electrochemical Properties of Phosphametallacycle-Linked Coplanar Porphyrin Dimers", Y. Matano, K. Matsumoto, H. Hayashi, Y. Nakao, T. Kumpulainen, V. Chukharev, N. V. Tkachenko, H. Lemmetyinen, S. Shimizu, N. Kobayashi, D. Sakamaki, A. Ito, K. Tanaka, H. Imahori, *J. Am. Chem. Soc.,* 134, 1825–1839, 2012.

[6] "Divergent Synthesis of 2,5-Diarylphospholes Based on Cross-Coupling Reactions: Substituent Effects on the Optical and Redox Properties of Benzene–Phosphole– Benzene π-Systems", Y. Matano, Y. Kon, A. Saito, Y. Kimura, T. Murafuji, H. Imahori, *Chem. Lett.*, 40, 919–921, 2011.

[7]"Fusion of Phosphole and 1,1'-Biacenaphthene: Phosphorus(V)-Containing Extended π-Systems with High Electron Affinity and Electron Mobility", Y. Matano, A. Saito, T. Fukushima, Y. Tokudome, F. Suzuki, D. Sakamaki, H. Kaji, A. Ito, K. Tanaka, H. Imahori, *Angew. Chem. Int. Ed.*, 50, 8016–8020, 2011.

[8]"Synthesis of a,a'-Linked Oligophospholes and Polyphospholes by Using Pd–CuI-Promoted Stille-Type Coupling", A. Saito, Y. Matano, H. Imahori, *Org. Lett.*, 12, 2675–2677, 2010.

[9]"Synthesis, Structures, and Aromaticity of Phosphole-Containing Porphyrins and their Metal Complexes", Y. Matano, T. Nakabuchi, H. Imahori, *Pure Appl. Chem.*, 82, 583–593, 2010.

[10] "Synthesis and Reactions of Phosphaporphyrins: Dramatic Alteration of p-Electronic Structures Caused by Chemical Modification of Core-Phosphorus Atom", T. Nakabuchi, M. Nakashima, S. Fujishige, H. Nakano, Y. Matano, H. Imahori, *J. Org. Chem*., 75, 375–389, 2010.

[11] "Remarkable Effects of P-Perfluorophenyl Group on the Synthesis of Core-Modified Phosphaporphyrinoids and Phosphadithiasapphyrin", T. Nakabuchi, Y. Matano, H. Imahori, *Org. Lett.*, 12, 1112–1115, 2010.

[12]"Phosphole-Containing Calixpyrroles, Calilxphyrins, and Porphyrins: Synthesis and Coordination Chemistry", Y. Matano, H. Imahori, *Acc. Chem. Res.*, 42, 1193–1204, 2009.

[13]"Acenaphtho[1,2-*c*]phosphole *P*–Oxide: Phosphole–Naphthalene p-Conjugated System with High Electron Mobility", A. Saito, T. Miyajima, M. Nakashima, T. Fukushima, H. Kaji, Y. Matano, H. Imahori, *Chem. Eur. J.*, 15, 10000–10004, 2009.

[14]"Phosphole–Triazole Hybrids: A Facile Synthesis and Complexation with Pd(II) and Pt(II) Salts", Y. Matano, M. Nakashima, A. Saito, H. Imahori, *Org. Lett.*, 11, 3338–3341, 2009.

[15]"A Convenient Method for the Synthesis of a-Ethynylphospholes and Modulation of Their p-Conjugated Systems", Y. Matano, M. Nakashima, H. Imahori, *Angew. Chem. Int. Ed.*, 48, 4002–4005, 2009.

[16]"Redox-Coupled Complexation of 23-Phospha-21-thiaporphyrin with Group 10 Metals: A Convenient Access to Stable Core-Modified Isophlorin Metal Complexes", Y. Matano, T. Nakabuchi, S. Fujishige, H. Nakano, H. Imahori, *J. Am. Chem. Soc.*, 130, 16446–16447, 2008.

[17]"Regioselective □-Metalation of *meso*-Phosphanylporphyrins. Structure and Optical Properties of Porphyrin Dimers Linked by Peripherally Fused Phosphametallacycles", Y. Matano, K. Matsumoto, Y. Nakao, H. Uno, S. Sakaki, H. Imahori, *J. Am. Chem. Soc.*, 130, 4588–4589, 2008.

[18] "Syntheses, Structures, and Coordination Chemistry of Phosphole-Containing Hybrid Calixphyrins: Promising Macrocyclic P,N_2,X-Mixed Donor Ligands for Designing Reactive Transition Metal Complexes", Y. Matano, T. Miyajima, N. Ochi, T. Nakabuchi, M. Shiro, Y. Nakao, S. Sakaki, H. Imahori, *J. Am. Chem. Soc.*, 130, 990–1002, 2008.

[19] "Design and Synthesis of Phosphole-Based p Systems for Novel Organic Materials", Y. Matano, H. Imahori, *Org. Biomol. Chem.*, 7, 1258–1271, 2008.

[20]"Triaryl(1-pyrenyl)bismuthonium Salts: Efficient Photoinitiators for Cationic Polymerization of Oxiranes and a Vinyl Ether", Y. Matano, T. Shinokura, O. Yoshikawa, H. Imahori, *Org. Lett*., 10, 2167–2170, 2008.

[21]"Synthesis of 2-Aryl-5-styrylphospholes: Promising Candidates for the Phosphole-based NLO Chromophores", Y. Matano, T. Miyajima, H. Imahori, Y. Kimura, *J. Org. Chem.*, 72, 6200–6205, 2007.

Book Chapters

[1] Matano, Y. 2012. "Pentavalent Organobismuth Reagents in Organic Synthesis: Alkylation, Alcohol Oxidation, and Cationic Photopolymerization," *Topics in Current Chemistry*: *Organic Synthesis Using Bismuth*, Springer, vol. 311, pp. 19–44.

[2] Matano, Y. 2004. "Antimony and Bismuth," *Comprehensive Organometallic Chemistry III*, Elsevier, Chapter 09.11, pp. 425–456.

[3] Matano, Y. 2004. "Antimony and Bismuth in Organic Synthesis," *Main Group Metals in Organic Synthesis*, Wiley-VCH, Chapter 14, pp. 753–811.