

List of Dissertation Abstract (Environment and Natural Sciences Life Sciences Course)

Name	Supervisor	Title	Abstract
Yoshihiro ABE	Kazuyuki HIRATSUKA	Identification and Characterization of a Small Molecule that Induce Pathogenesis-responsive Gene Arabidopsis VSP1	Plant activators induce systemic acquired resistance and are successfully used for disease control, but defense gene inducers activating jasmonic acid (JA) signaling pathways have not been reported so far. Thereby we have established useful experimental system for investigating novel plant activators through bioluminescence monitoring fusion gene of Arabidopsis VSP1 gene, which have been identified as marker gene of JA signaling pathways, and luminescence gene. Using this experimental system, I investigated a novel compound as plant activators candidate.
Yoshitaka IKEDA	Kiyoshi HONDA	[4+2] cycloaddition of 2-oxo- 2H-pyrane-4,5- diethyldicarboxylate with acetylenes and Synthetic investigation toward isoindolocyclooctynes for application to click chemistry.	2-oxo-2H-pyrane is oxygen-containing heterocyclic compound and is known as 4π component of [4+2] cycloadditions. In this study, I investigated a new and simple method of synthesis of phthalic acid derivatives by [4+2] cycloaddition of 2-oxo-2H-pyrane-4, 5-diethyldicarboxylate with acetylenes. In addition, isoindolocyclooctine derivative for strain-promoted click reaction was prepared by using the present [4+2] cycloaddition as a key step.
Hiroataka ISHIDA	Kazuyuki HIRATSUKA	The monitoring of protein dynamics related to disease resistance using luciferase- fused protein	We developed the gene-expression monitoring system with luciferase reporter fused promoter region of a target gene. This system is applied to high-throughput screening for new bioactive compounds. However, it is difficult to analyze mechanisms of bioactive candidates because this assay only monitors gene expression indirectly. Here, to investigate mechanisms of candidates, we attempted to develop a new assay system for monitoring protein dynamics using luciferase-fused protein. As a result, we succeed in monitoring protein-protein interaction and protein degradation related to disease resistance.
Arisa ITO	Kiyoshi HONDA	Selective synthesis of pinanol derivative via intramolecular [2+2]photocycloaddition and application to bergamotenes	Intramolecular [2+2]photocycloaddition is an important method in organic synthesis directed toward target molecules. Bicyclo[3.1.1]heptane skeleton is common structure of bergamotene family which is famous for perfume and/or having bioactivity. In this study, regioselective intramolecular [2+2]photocycloaddition of 1,6,8-trienes having ester moiety for constructing the bicyclo[3.1.1]heptane ring system was achieved. Furthermore, bergamotenoic acid, which is expected as the agrochemicals, and its derivatives are synthesized by applying this protocol.

Yoshihiro ITOH	Takashi AMEMIYA	Relationships between the glycolytic oscillations and the quiescence in cervical cancer HeLa cells	We report the first data of glycolytic oscillations in individual cancer (HeLa) cells. HeLa cells starved of glucose or both glucose and serum exhibited glycolytic oscillations in nicotinamide adenine dinucleotide (NADH). We also found that glycolytic oscillations have strong relevance to cellular proliferative potential. Our results demonstrate that starved HeLa cells exhibited glycolytic oscillations induced by the Crabtree and/or the Warburg effect, and that their strong oscillations were probably due to the less use of anabolic pathway.
Takuya UEHARA	Shinya MATSUMOTO	Carrier Transport Properties of Field-Effect Transistors based on Molecularly-Oriented Thin Films and Single Crystals of a Bisazomethine Dye	The carrier transport properties of molecularly-oriented film and single crystal transistors with bisazomethine derivatives were discussed. The enhancement of the carrier mobility was observed in the molecularly-oriented films. The polarization microscopy revealed that the π - π stacking direction is tilted at about 60 degree to the long axis of the needle crystal. The bottom-contact single crystal transistor showed a hole mobility of $1.1 \times 10^{-2} \text{ cm}^2 \text{ V}^{-1} \text{ s}^{-1}$ which is the highest value observed in the bisazomethine derivatives.
Yu ONOHARA	Kazuyuki HIRATSUKA	Bioluminescence reporter system to monitor defense gene expression in response to Herbicide Safeners treatment	Plants are capable of detoxifying toxic substances through defense genes such as Cytochrome P450 (CYP) and Glutathione S-transferase (GST). In this study, I established an experimental system of bioluminescence reporter assay to GST expression in Arabidopsis thaliana transformed by recombinant vector fused GST promoter and firefly luciferase. Moreover, I investigated a group of compounds activating detoxification ability: Herbicide Safeners (HS), and searched candidate compounds of HS by using its experimental system.
Tatsuya OHASHI	Shinya MATSUMOTO	Cocrystal of a color developer, 3,3'-diallyl-4,4'-dihydroxy-diphenyl sulfone, with a fluoran dye for high performance thermal paper	The cocrystals of a fluoran dye and a bisphenol-S derivative 1 for high-performance thermal paper were obtained. The structure of the cocrystal was analyzed by X-ray structure analysis and the result showed that the hydroxy group of 1 plays an important role in the coloration of the fluoran dye. This cocrystal structure was also found to be thermally stable. Various intermolecular interactions between 1 and the dye were suggested to contribute to the stability of the cocrystal structure.
Yasuhiko OHARA	Takashi AMEMIYA	The stoichiometry of the silver nanoparticles synthesis in catechol derivatives	The silver nanoparticle synthesis using tannic acid, green and low cost synthesis is expected, but the reaction mechanism is unknown. In this study, we examined the stoichiometric ratio of this reaction using catechol derivatives (3,4-dihydroxybenzoic acid and 4-methylcatechol) similar to tannic acid. As a result, we confirmed that both of them reduced 4 or 6 silver ions per molecule and the conventional hypothesis is wrong.

Kento KURAUCHI	Kiyoshi HONDA	Synthesis of 1-pyrazoline having C ₂ -symmetric spirobiindane structure and its oxides	2,2'-spirobiindane has a rigid backbone and is thought to be a promising ligand for metal catalysts with high stability. In this study, 1-pyrazoline, azoxy, and azodioxide compounds having a 2,2'-spirobiindane backbone were synthesized for application as a ligand. We found that azodioxide can accelerate the reaction as a ligand in the N-arylation reaction of benzylamine.
Ikumi SAKO	Hiroyuki OTANI	Synthesis and properties of giant macrocyclic 4',5'-dioctyl-4,4''-diethynyl-o-terphenyl oligomers	The novel macrocyclic 4',5'-dioctyl-o-terphenyl oligomers connected by butadiyne linkages consider to be rigid π conjugated molecules with large inner cavities. 4',5'-Dioctyl-4,4''-diethynyl-o-terphenyl was synthesized as the corresponding precursor of these macrocycle oligomers. The cyclic oligomers of 4',5'-dioctyl-4,4''-diethynyl-o-terphenyl, such as dimer, trimer, hexamer, octamer, and decamer, were synthesized by using copper(II) acetate-mediated Eglinton coupling reaction of the precursor in pyridine or pyridine-methanol. Although the cyclic dimer and the cyclic trimer were formed as major products under high dilution conditions, giant cyclic oligomers such as hexamer, octamer, and decamer were obtained under standard conditions. The reaction mechanism for the formation of these macrocycle oligomers and their optical properties were discussed in detail.
Hiroto SANO	Hiroyuki OTANI	Synthesis and Properties of novel π conjugated oligomers	The structure, optical properties, and complexation behavior of 1,8-diphenyl-10-mesitylanthracene cyclic dimer with a rigid [5,5]biphenylophane frame was investigated. The optical properties of the dimer were characterized by the UV-vis and FL spectra in solution and in the solid state. Since the cyclic dimer has a suitable inner cavity for including a small cation, it showed complexation behavior with Cu(I) cation and Ag(I) cation. In addition, a cyclic p conjugated oligomer in which benzene and naphthalene are alternately linked at the ortho position are expected to show unique physical properties. The cyclic p conjugated oligomer was synthesized by using by using Lewis acid-catalyzed benzannulation via [4+2] cycloaddition of o-alkynyl(oxo)benzene with tribenzodehydro[12]annulene.
Yoshihiro SUZUKI	Hiroyuki OTANI	Synthesis, Structure and Properties of p-Expanded Cyclic Oligo-3,4-diphenylthiophenes	Multifunctional p-expanded macrocyclic oligothiophenes are a molecule having interesting structure, unique optical behavior, and polymorphism. I have synthesized p-expanded macrocyclic oligo-3,4-diphenylthiophene 8-mer and 6-mer using McMurry coupling reaction of corresponding dialdehyde precursors. The macrocyclic oligothiophene 8-mer existed as a mixture of isomers, E / E and Z / Z and the isomers shown mutual photoisomerization, and differed in optical properties due to the photoisomerization. The macrocyclic 6-mer formed polymorphs such as single crystals, fibers, needles, and rods. Furthermore, the yellow fibers of this 6-mer showed vapochromism with vapor-induced quasi-reversible shape change, and the vapor-induced color change was repeated more than 10 times.

Takuto NAKAMURA	Hiroyuki OTANI	Synthesis and Properties of 5-Arylethyniltropolones	Tropolone is the typical example of non-benzenoid compound which possess pronounced aromatic character. The synthesis, structure, and optical properties of two 5-(4-N,N-diarylamino phenyl) tropolones extended by acetylene bond, as the novel tran type D-p-A chromophoric tropolone molecules, were investigated. Both 5-(4-N,N-diphenylamino phenyl)ethynyltropolone and 5-(4-N,N-dianisylamino phenyl)ethynyltropolone were obtained by a synthetic route with Sonogashira cross-coupling reaction as a key step. The optical properties of the tran type D-p-A tropolone molecules were characterized by the UV-Vis and fluorescence spectra in solution. I have discussed the optical properties of 4-N,N-diphenylamino phenyl derivative and 4-N,N-dianisylamino phenyl derivative in solution.
Shinya Nanaumi	Shinichi Ogata	Analysis of transcription control region of AtRad51 gene	DNA double strand break (DSB) has been known as severe damage for the genetic information and the mechanisms of DSB repair have long been investigated in varieties of species. The promoter region of AtRad51 gene was analyzed in detail and the existence of element(s) responding to DSB will be discussed. The analysis of the 5' region of AtRad51 gene promoter strongly suggested that the existence of the DNA elements that respond to DSB stimuli. We will analyze these elements in detail and determine the transcription factor(s) that bind to the DSB response elements near future.
Risa HIROSAWA	Shinya MATSUMOTO	Optical properties of 2,5-diamino-3,6-dicyanopyrazine dyes having mono-substituted benzyl substituents	I studied the optical properties of pyrazine derivatives having benzyl groups substituted by a halogen atom or a methyl group in the <i>para</i> - or <i>ortho</i> - position. All derivatives showed similar optical properties in chloroform solution. However, in solid states, the absorption characteristics and maximum fluorescence depended on the geometries of amino groups in a crystalline state. The amino geometries in the red crystal forms adopted sp ² -like configuration, while the amino geometries adopted sp ³ -like configuration in the yellow crystal forms. The studied crystal forms exhibited a variety of fluorescence quantum yields depending on the species and positions of the terminal substituent.
Takeru FUJISHIMA	Shinya MATSUMOTO	Optical properties of polymorphs of diketopyrrolopyrrole derivatives having propyl and butyl substituents on amino groups	The absorption and fluorescence properties of two polymorphs of N,N'-dipropylated and N,N'-dibutylated diketopyrrolopyrrole derivatives were studied to investigate the relationship between crystal structure and optical properties. Their absorption properties were found to be influenced by molecular structure in the crystalline state. On the other hand, their fluorescence properties were suggested to be correlated with the stacking structure of the dye molecules in the crystals.

Naoki FUJIMOTO	Takashi AMEMIYA	Evaluation of the effect of copper contamination on lichen compounds	Lichen compounds which are the secondary metabolites of lichens are effective means for identification and characterization of lichens. It is known that the lichen compounds of <i>Stereocaulon sorediiferum</i> emit strong fluorescence under UV irradiation. Evaluation of copper contamination by fluorescence measurement becomes possible if the lichen compounds change concentration according to copper contamination. In this study, the larger copper concentration, the lower the fluorescence intensity. A research result was obtained as the first step of the environmental contamination evaluation method utilizing fluorescence from lichens.
Marina MUTO	Kiyoshi HONDA	Stereoselective construction of trisubstituted olefins using condensation/aza-Claisen rearrangement reaction of allylamines with carbonyl compounds	Synthesis of terpene compounds which have been used as aroma chemicals and medicines, is one of significant issues. Especially stereoselective construction of trisubstituted olefin units is important interest on the preparation of terpene compounds. [3,3]-Rearrangement reaction is one of the reaction which is used for synthesis of terpene compounds frequently. In this study, I examined the preparation of trisubstituted olefins via generation of enammonium salts from allylamines with carbonyl compounds, followed by aza-Claisen rearrangement.
Qixiao QI	Kiyoshi HONDA	Stereoselective Synthesis of Polysubstituted Indane Derivatives	The indane-based skeleton is one of the basic skeletons commonly found in natural substances having a variety of physiological activities. It has also been reported that the polysubstituted indane derivatives is used as an asymmetric catalyst in recent years. Therefore, a novel synthetic method of polysubstituted indane derivatives is desired. Herein, we would like to describe the stereoselective synthesis of polysubstituted indane derivatives via a new intramolecular skeletal transformation from 7-azabenzonorbornadienes in the presence of an acid-catalyst.