

List of Dissertation Abstract (Department of Artificial Environment)

Name	Supervisor	Title	Abstract
OBATA Ryo	HONDO Hiroki	Evaluation of environmental and economic impacts of woody biomass district heating systems considering consumer characteristics	In recent years, climate change and population problem have become more apparent and serious. As one of the solutions to these problems, woody biomass heating has been attracting attention. The purpose of this study is to estimate the CO2 reduction costs of each woody biomass heating systems in typical consumers and to explore more effective use. The estimation results show that the CO2 reduction costs are below 30,000 yen/t-CO2 for all consumers and district heating systems are more cost-effective than individual systems for almost all the consumers. Woody biomass heating could be more cost-effective in the case of consumers with higher building density and smoother heat load patterns.
TANNO Gota	MIYAKE Atsumi	Study on thermal decomposition and hydrolysis reaction mechanism of urea	The purpose of this research is to reveal reaction mechanism of thermal decomposition and hydrolysis of urea

WANG Hang	YASUMOTO Masanori	Research in Joint Patent and The Innovation of Intellectual Property By Industry-university Collaboration - Examination by Patent Network Analysis of ICT Industry-	In this research, we focus on industry-university collaboration, which is becoming a particular topic, and consider how to improve the performance of industry-university collaboration by analyzing patent application networks of industry-university collaboration based on previous research. The results show that patent cooperation networks through industry-university collaboration is an important link on the process of innovation. In the difficult market environment, the diversity and the density of patents effectively contribute to the achievement of innovation.
WEI Chenghao	NARUMI Daisuke	Study on evaluation of energy-saving strategies in a grocery store by using cfd -interaction between space conditioners and display cases considered-	Supermarkets and grocery stores represent an important energy-intensive role in the commercial sector. It is essential to explore the energy-saving potential of grocery stores, and the impact on thermal comfort made by affording energy-saving strategies, focusing on space conditioners and display cases.

SONG Yueqi	MATSUMIYA Masahiko	Studies on extraction behaviors of rare earth elements using novel extractant ADAAM and ionic liquids	In this study, the extraction behavior of lanthanoids utilizing the novel extractant ADAAM diluted in imidazolium-based ionic liquids was investigated to achieve the mutual separation of rare earth elements. By adopting the ionic liquids with different length of side chain, the results indicated that the extractability was enhanced by the ionic liquids. Especially when the hydrophobicity was higher, the enhanced phenomenon was more obvious to be observed. Moreover, according to the result of slope analysis, the extraction mechanism was determined. Furthermore, with respect to the practicality, the multi-stage extraction process based on theoretical calculation was conducted to review the performance of mutual separation of rare earth elements.
CHEN Yilin	ENDO Akira	Study on development factors of high-tech start-up agglomeration -Focus on the formation of high-tech community in Fukuoka City-	Through empirical research, in order to explore the causes and mechanisms of the formation of agglomeration of high-tech start-up in the region, taking up the cases of public-private collaboration and private high-tech communities in Fukuoka City and its agglomerations. Taking high-tech establishments and communities in Fukuoka City as an example, research the development of accumulation of private and public-private high-tech

			industrial communities in Fukuoka City, and the relationships between high-tech start-up communities.
CHEN Shili	KUMASAKI Mieko	Analysis of factors affecting safety behavior consciousness using hierarchical analysis method (AHP)	In recent years, due to globalization in various fields, the number of fatalities and injuries to foreigners in Japan has been increasing. In order to prevent occupational accidents, it is necessary for foreign workers to take appropriate measures. Furthermore, in order to prevent occupational accidents, a positive awareness of people's safety is important, and the impact of human perception cannot be ignored. It is considered that obtaining knowledge about consciousness of safety behaviors of people of different genders, nationalities, and grades will contribute to the prevention of occupational accidents. In this study, we calculated the weights of various students' safety behavior consciousness using the hierarchical analysis method from the data obtained by the questionnaire survey for university students in three countries. We examined the differences in human safety behavior consciousness.

LI Jing	KOBAYASHI Takeshi	Prediction Method for Thermal Enhanced Bioremediation of Soil Contamination with Chlorinated Volatile Organic Compounds	Thermal enhanced bioremediation is a new remediation method for soil contamination by chlorinated volatile organic compounds (CVOC), and a predicting method for the remediation effect is required. In this study, the desorption and degradation behaviors of CVOC in soil columns were measured and analyzed, and thermally enhanced effects were confirmed and the remediation period was reduced by half. A predicting model was developed that consider the microbial growth and the delay time, and the predicted value could be fitted to the measured value. Moreover, the approach for the prediction method in the field could be proposed.
ASADA Yosuke	HONDA Kiyoshi	Green-light-driven [4+2] and [6+4] cycloaddition of pentafulvenes by organic photoredox catalysis	Pentafulvenes are one of the useful compounds for synthesis of bioactive molecules. Representative reaction conditions for [4+2] and [6+4] cycloaddition of pentafulvenes require high-temperature or transition metal catalysts. Recently, visible light photoredox catalysis turned out to become a powerful ally to drive ion-radical redox reaction under mild condition. Our laboratory developed new organic photoredox catalyst based on thioxanthylum (TXT), which can operate under irradiation with green light. In this study, I would like to report

			<p>selective [4+2] and [6+4] cycloaddition of pentafulvenes using TXT under green light irradiation. Selectivity of cycloaddition depend on the substituent of pentafulvenes at C6 position and reaction solvent.</p>
UENO Maiko	NAKAI Satoshi	<p>Estimation of chemical exposure from consumer products based on time-activity-pattern data with missing data imputation</p>	<p>Based on a questionnaire survey on lifestyle patterns at home of National Institute of Technology and Evaluation, I estimated chemical substance exposure from consumer products that may have health effects and risks. However, there are many missing data in the survey data. It is considered that the estimation using only non-missing data may not reflect the information of all data. Therefore, missing data on the size of rooms and staying times were imputed by an imputation method. Exposure distributions from consumer products were estimated based on the complete dataset of exposure factors and several exposure scenarios.</p>

KAMIYAMA Yusuke	HONDA Kiyoshi	Generation and addition reaction of orthoquinone methide by one-electron oxidation using organic photoredox catalyst.	o-Quinone methides (o-QMs) are high reactive intermediates of wide utility in organic synthesis. Therefore, a number of methods for the generation of o-QMs have been developed so far. However, most of the generation methods mainly of o-QMs use acid, ultraviolet light, heat, etc., it is desired to develop a generation method under mild conditions. Photoredox catalysts are the synthesis tools to promote the chemical reaction using visible-light, which is a renewable, abundant and clean “reagent”. In this study, I would like to report an exchange of alcohols via o-QMs using organic photoredox catalysts under green light.
KIMURA Masahiro	ARAMAKI Kenji	Organogel formation by using amino acid gelators and the structure	Gels consist of a solvent and a small amount of gelator, and are applied in various fields because they exhibit intermediate properties between solids and liquids. Amino acid gelators are synthesized from naturally occurring amino acids, have strong gelling ability, and have features such as low toxicity and good degradability. Therefore, in this study, organogels were formed by using two types of glutamic acid-derived gelators and various organic solvent. We examined organic solvents that can be gelled by

			glutamic acid-derived gelators and examined the structure and properties of organogels.
KOYANO Kota	KASAI Naoya	Study of AE measurement technology using propagation of elastic wave with Non-FBG optical fiber	AE(Acoustic emission) is a phenomenon in which part of the energy stored inside is released as elastic waves when fracture or deformation occurs. The AE method is a non-destructive inspection method that evaluates the inside state by detecting the AE.
SATO Katsuya	SHIRAIISHI Toshihiko	A Study of Measurement of Cellular Deformation under Mechanical Vibration for its Mechanosensing Mechanisms	Applying mechanical vibration to cultured cells gives cellular biochemical responses activated so that it can be applied to medical fields such as regenerative medicine. However, the cellular mechanisms of sensing mechanical vibration and transducing into the biochemical responses have not been clarified. In this study, we experimentally measured deformations of intracellular structures using the experimental setup consisting of the exciter, the fluorescent microscope and the high sensitivity and high speed camera to contribute to clarifying the mechanisms.

SHIRAHATA Keigo	OTANI Hiroyuki	Synthesis and Properties of Novel Cyclic Thiophene 6-Mers Using Reduction of Etynylenes to Vinylenes	I synthesized novel π -extended cyclic thiophene 6-mer Z,Z,Z,Z-6T2A and E,Z,Z,Z-6T2A by McMurry coupling accompanied with reduction of ethynylenes to vinylenes. I considered that this unique reaction proceeded due to reduction of strain C-C triple bonds at the reaction intermediates. Moreover, I synthesized E,Z,E,Z-6T2A by photoisomerization of Z,Z,Z,Z-6T2A. Single crystals of novel three π -extended cyclic thiophene 6-mers were obtained. In the Result of X-ray analysis, characteristic structure of three π -extended cyclic thiophene 6-mers were determined. I investigated properties of three π -extended cyclic thiophene 6-mers, and as the result these new 6-mers showed OFET properties.
SUGIMOTO Masato	OHTANI Hideo	Preparation and fire suppression capability of aqueous dispersions of submicron ferrocene particles	In order to develop a new high-performance fire extinguishing agent, a liquid fire extinguishing agent consisting of submicron ferrocene particles dispersed in water was prepared. The fire extinguishing performance was evaluated by the time required to extinguish an n-heptane pool fire. We found that aqueous submicron ferrocene dispersions with high fire extinguishing performance can be prepared by using a poor solvent precipitation method with organic solvent as the good

			<p>solvent and water as the poor solvent, and the initial concentration of ferrocene is more than 1000 ppm, the final concentration is more than 100 ppm, and the concentration of organic solvent is less than 10 vol%. It is also possible to combine the positive effect of submicron ferrocene particles on the fire extinguishing performance, with the positive effect of aqueous organic solvent solutions which form an azeotropic mixture with water.</p>
SUNAGA Shuto	HONDA Kiyoshi	<p>Synthesis of Polysubstituted phthalates via Inverse Electron-demand [4+2] cycloaddition of α-Pyrone and 3,3'-substituted 1,1'-spirobiindane-based bishydroxamic acids (spiro-BHA)</p>	<p>1) Phthalic acid and its derivatives are important compounds in pharmaceutical and materials chemistry. In this work, a facile and efficient synthesis of 4,5-disubstituted phthalates through the inverse electron-demand [4+2] cycloaddition of 2-pyrone-4,5-dicarboxylate with various dienophiles has been developed.</p> <p>2) Hydroxamic acids have been used as chiral ligands because of their relatively high metal-binding ability. In this work, we synthesized enantiopure 1,1'-spirobiindane-based bishydroxamic acid, (R)-spiro-BHA derivatives from dibenzosuberone which is commercially available compound. We reported electronic effects of substituents on aromatic groups of spiro-BHA on the 3,3'-positions.</p>

TAKAOKA Hiyori	ARAMAKI Kenji	Thickening behavior of aqueous solution by wormlike micelle of potassium acyl glycolate	Wormlike micelles are used for viscosity control in detergents (e.g. shampoo) and fluid transport by drag reduction effect. Petroleum-based surfactants are conventionally used in these applications, but the surfactants derived from renewable resources are demanded from the viewpoint of appeal to consumers and environmental problems. The purpose of this study was to form wormlike micelles by combining potassium N-lauroyl glycolate (C12GlyK), a N-acyl amino acid salt derived from renewable resources, and electrolyte or cationic surfactant. It was found that spherical micelles grew into wormlike micelles by mixing electrolyte or cationic surfactant with C12GlyK aqueous solution.
TAKIMOTO Eriko	ARAMAKI Kenji	Hydrogels formed by surfactant mediated gelation (SMG) method using nonionic surfactant and low molecular weight organogelator	Gels are used in various fields such as foods, cosmetics, and medicines. Self assemblies of surfactants have functions such as solubilization, and the gel networks formed by gelators make gelled solution. A hydrogel can be obtained by solubilizing a water-insoluble organogelator in a surfactant molecular assembly at a high temperature and then cooling it. This "surfactant-mediated gelling (SMG) method" has been studied in cationic surfactant systems. In this study, a gelled micelle aqueous solution and a

			gelled cubic phase could be obtained by using a nonionic surfactant (C16EO20) and a low-molecular organogelator (12-HOA) by the SMG method.
NAGAMATSU Shuto	SHIRAISHI Toshihiko	A study of Semi-active Vibration Suppression by a Shear-Type Damper Using Magnetorheological Grease	In this study, the dispersion stability and the dynamic range of a shear-type damper using magnetorheological (MR) grease are investigated through the performance test of the damper. Furthermore, the semi-active vibration suppression performance of a structure equipped with the damper is investigated through the vibration suppression test using a small single-degree-of-freedom model structure. The experimental results indicate that the proposed damper can achieve the desired performance by applying the proposed control law taking full advantage of the high dynamic range of the damper. Furthermore, the results demonstrate that the high performance can be kept for a long time due to the high dispersion stability of the MR grease.

<p>NISHIKAWA Shintaro</p>	<p>KUMASAKI Mieko</p>	<p>A study of the machine learning approach for the early detection of abnormal trends using CFD data</p>	<p>In chemical plants, various types of chemical reactions have been used. Chemical plants using exothermic reaction is controlled by cooling and stirring system. But, there is in danger of happening accidents due to equipment failure and runaway reaction and so on. To prevent such accidents, abnormality detection as soon as possible is required. In my study, I got temperature data using CFD, and I examined whether it is possible to predict temperature at a certain time later using current temperature by machine learning.</p>
<p>HASEGAWA Tatsuya</p>	<p>TANAKA Yoshimi</p>	<p>Wetting Morphology Diagram of Helical Filaments under Pressure Control</p>	<p>The wetting morphology of an object varies depending on the shape of the object, as well the interfacial property. In this experiment, we aim to construct wetting morphology diagram of the helical filaments (or coil) under pressure control condition. Based on the observation of wetting the morphologies at different coil pitch p and different pressure difference ΔP between the inside and outside of the liquid, a coil wetting morphology diagram was created in which the vertical axis is ΔP and the horizontal axis is p. In the p range from 2 to 7 mm, two wetting</p>

			morphologies is realized, and there is a critical pressure difference between 10 and 20 Pa.
MATSUSHITA Kazuki	MIYAKE Atsumi	The reaction analysis of electrolysis for ammonium dinitramide toward the development of electrolysis ignition system	The aim of this study is to analyze the electrolytic reaction of ammonium dinitramide (ADN). ADN-based ionic liquid propellants (EILPs) have low vapor pressure and can reduce suction exposure of workers. However, thermal stability causes the difficulty of ignition and need a large amount of thermal energy for decomposition and combustion. Therefore, in this study, we devised an electrolytic ignition different from pyrolysis ignition and then verified the ignition possibility of ADN-based EILPs after selected a fuel suitable for electrolytic ignition. In addition, the electrolytic reaction of ADN was estimated from the electrochemical properties and the electrolytic product.

MIZUNO Saori	OTANI Hiroyuki	Formation, Structure, and Properties of π -Extended 3,4-diphenylthiophene Cyclic Hexamer Fibers	It has been researched that π -extended 3,4-diphenylthiophene cyclic hexamer (6T4A-Ph) fiber from CS ₂ /Acetone show reversible vapochromism and shape change by organic vapor. In this study, I estimated the structure of 6T4A-Ph fiber from CS ₂ /Acetone by XRD and crystal structure of 6T4A-Ph to clarify the mechanism of shape change. As a result, the change of 6T4A-Ph intermolecular distance leads to expansion and contract of fiber length. It is suggested that the difference of density in the fibers causes the bending of the fiber. In addition, I investigated vapochromism and shape change of 6T4A-Ph fiber from various solvents.
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