IMCE

Kyushu University

IMCE

Institute for Materials Chemistry and Engineering

2012

KYUSHU UNIVERSITY

Greetings from the Director

Since its establishment in 2004, the Institute for Materials Chemistry and Engineering (IMCE) has been conducting cutting-edge research in science and engineering, in areas ranging from basic chemistry to process engineering. Our focus is on the creation of highly functional substances and materials, and on the development of related engineering needed for their practical application. Our aim is to establish a global hub to help advance pioneering and comprehensive research in materials chemistry, a field that is crucial to the future foundations of nanotechnology, information sciences, environmental and energy technology, bio/life sciences and other advanced industrial technologies of the 21st century. We have three missions, and those are the pursuit of cutting-edge research, the nurturing of young talent, and the formation of partnerships and collaborations with domestic and international researchers. The IMCE comprises four divisions and research support organizations. Regarding the creation of new functional molecules and their functional chemistry, the chemistry of new molecular assemblies, the chemistry of organic-inorganic hybrid materials and the processing of advanced materials into devices, we are pursuing the basic science of materials from the atomic-, molecular-, and nano-scale to the macro-scale, and developing those materials to advance them to the stage of application. The IMCE conducts graduate school education in collaboration with the Graduate Schools of Sciences at Hakozaki Campus, Engineering at Ito Campus, and Interdisciplinary Engineering Sciences at Chikushi Campus. In terms of the characteristics of each campus, advanced basic research is conducted in basic materials chemistry at Hakozaki Campus, soft materials oriented toward life sciences are studied at Ito Campus, and new materials that support environmental and energy technologies, as well as organic/high polymers that are guiding the future of IT, are studied on Chikushi Campus. All of these programs help to nurture young researchers. In 2010, the IMCE was designated as a network-style research core for the government sponsored Joint Usage/Research Center Program. This designation is shared with other centers across Japan, including the Research Institute for Electronic Science of Hokkaido University, the Institute of Multidisciplinary Research for Advanced Materials of Tohoku University, the Chemical Resources Laboratory of Tokyo Institute of Technology and the Institute of Scientific and Industrial Research of Osaka University. The IMCE serves as a hub, where researchers in materials and devices can go beyond the framework of national, public or private universities.

In addition to the sluggish economic conditions affecting industrialized countries all over the world, Japan has experienced the Great East Japan Earthquake and a nuclear power plant disaster. The development of new science and technology is key to supporting reconstruction and to creating a future for our country. The IMCE seeks to serve as a driving force in the area of materials science. We have entered the second mid-term plan period since the national universities became independent administrative entities. By taking advantage of the features of the IMCE, namely streamlined and efficient organization and a flexible administrative approach, we have been working towards our objectives by urging constant self-assessment and inspection, external evaluations, and the promotion of a cycle of reforms based on results, as well as active interpersonal exchange both within and outside the university. We are also pursuing wide-ranging cooperative ventures led by either individual IMCE members or by groups, based on international, domestic, intra-university and industry-academic links in line with the activities of the Network Joint Research Center for Advanced Materials and Devices. We would like to ask for your continued constructive criticism and encouragement regarding the current and future directions of the IMCE as a research core for the materials chemistry field, and sincerely look forward to your warm support for the IMCE.

Hideo NAGASHIMA
Director, IMCE

History

1944	Research Institute for Wood, Kyushu Imperial University (3 divisions) founded.
April 1949	Reorganized as the Kyushu University Research Institute for Production Science (5 divisions).
May 1987	Reorganized as the Kyushu University Institute of Advanced Material Study (3 research divisions (13 research fields) + 2 temporary divisions)
April 1, 1993	Kyushu University Institute for Fundamental Research of Organic Chemistry (3 research divisions) founded.
April 1, 2003	Institute for Materials Chemistry and Engineering established following the merger and reorganization of the Kyushu University Institute of Advanced Material Study and the Kyushu University Institute for Fundamental Research of Organic Chemistry.
April 1, 2010	The IMCE has been designated as a network-style research core for the government-sponsored Joint Usage/Research Center Program.

Network Joint Research Center for Materials and Devices

The IMCE has been designated as a network-style research core for the government-sponsored Joint Usage/Research Center Program. This designation is shared with other centers located across Japan, including the RIES of Hokkaido University, the IMRAM of Tohoku University, the CRL of Tokyo Institute of Technology and the ISIR of Osaka University. The IMCE serves as a hub, where researchers in materials and devices can go beyond the framework of national, public or private universities.

Organization

Division of Fundamental Organic Chemistry

In addiion to clarifying the characteristics of organic molecules, especially substances that exhibit specific optical, magnetic, conductive or other physical properties, the aim of the Division of Fundamental Organic Chemistry is to develop molecules that exhibit distinctive functions through establishing design principles using theoretical chemistry and property analysis, and realizing empirically these principles. The division is also engaged in the development of ultra-efficient and highly-selective reactions of organic molecules, and the development of highly-controlled methods of material transformation.

Research Field	Campus	Professor	Associate Professor	Assistant Professor	Research Assistant Professor
Nanomaterials and Interfaces	Hakozaki	Kaoru TAMADA	Koichi OKAMOTO		Pangpang WANG
Theoretical Chemistry	Ito	Kazunari YOSHIZAWA		Yoshihito SHIOTA Takashi KAMACHI	
Synthetic Methodology and Catalysis	Hakozaki			Hiroshi FURUNO Satoaki ONITSUKA	
Advanced Molecular Conversion	Hakozaki	Yoshinori NARUTA	Fumito TANI Liu Jin-Gang (Research Associate Professor)	Takehiro OHTA	Liu BO
Advanced Organic Synthesis	Chikushi	Mitsuru SHINDO		Kenji MATSUMOTO Junji TANAKA	Keisuke NISHIKAWA
Chemistry of Functional Molecules					
Interdisciplinary Studies (Dynamic Chairs)					

Division of Applied Molecular Chemistry

The aim of the Division of Applied Molecular Chemistry is to establish the basic chemistry of atomic clusters, molecular clusters and supermolecules – which are unexplored areas of materials chemistry at the atomic and molecular levels – and to apply this to the design of molecular structures and electronic structures, synthesis, the development of physical properties and reactivity, and to functional molecules. Through the advanced control of physical properties and reactivity at the molecular level, the division aims to build macromolecules with higher-order structures, and to establish bottom-up nanotechnology. By creating molecules and molecular clusters that have new functional characteristics, and by evaluating the properties of these, the division aims to expand into nanomolecular materials.

Research Field	Campus	Professor	Associate Professor	Assistant Professor	Research Assistant Professor
Cluster Chemistry	Chikushi	Hideo NAGASHIMA		Yusuke SUNADA	
Chemistry of Molecular Assembly	Hakozaki	Teruo SHINMYOZU		Kenta GOTO	
System of Functional Molecules	Chikushi	Katsuhiko TOMOOKA	Masato ITO	Kazunobu IGAWA	
Biomolecules Chemistry	Ito	Satoru KIDOAKI		Tatsuya OKUDA	Thasaneeya KUBOKI
Hybrid Molecular Assemblies	Ito	Atsushi TAKAHARA	Hideyuki OTSUKA	Yuji HIGAKI	Ryohei ISHIGE Tomoyuki OHISHI
Soft Interfaces (Dynamic Chairs)	Ito	Hiroshi JINNAI (Research Professor)	Motoyasu KOBAYASHI (Research Associate Professor) Hirohmi WATANABE (Research Associate Professor)		Yuki Norizoe Jin Nishida Takeshi Higuchi Taiki Hoshino Daiki Murakami
Characterization of Functional Molecules					

Division of Integrated Materials

By freely using such techniques as molecular nanotechnology, the microfabrication of bulk materials and self-organization, the Division of Integrated Materials aims to create and apply hybrid materials that are positioned on the edge of conventional academic fields, such as organic-inorganic-bio and carbon-organic materials. In particular, the aim of the division is to develop new functional materials by blending dissimilar functions such as electronic functions and bio functions, and to establish a base for practical application. In addition to using the fusion of various types of materials to promote the development of physical/chemical/bio functional materials that are also biocompatible and compatible with the environment, the division is also engaged in the careful evaluation of the physical properties of each material.

Research Field	Campus	Professor	Associate Professor	Assistant Professor	Research Assistant Professor
Integrated Bio-materials	Ito	Astushi MARUYAMA	Arihiro KANO		Naohiko SHIMADA
Design of Nano-systems	Chikushi	Hirotsugu KIKUCHI	Yasushi OKUMURA	Hiroki HIGUCHI	Kosuke KANEKO
Heterogeneous Integrated Materials	Chikushi	Masaharu TSUJI	Hiroki AGO	Takeshi TSUJI	
Nanostructured Integrated Materials	Chikushi	Osamu SATO		Shinji KANEGAWA	Kang Soonchul
Measurement Technology of Physical Properties					

Division of Advanced Device Materials

The Division of Advanced Device Materials aims to realize nanostructured bulk materials and to realize advanced devices through the measurement and functional analysis of the microstructures of precisely built molecular and atomic clusters, and through the development of processes to realize ordered arrays. In particular, with a focus on inorganic nanomaterials, the aim of the division is the clarification of the correlation between structure and function, the development of new optical materials that use nanoparticles , and the establishment of a fundamental engineering for the process design and controls that are necessary for the achievement of large-scale ordered arrays of nanostructures.

Research Field	Campus	Professor	Associate Professor	Assistant Professor	Research Assistant Professor
Nano Scale Evaluation	Chikushi	Shiyoshi YOKOYAMA	Yoshiaki TAKAHASHI	Kazuhiro YAMAMOTO Akihiko TAKADA Andrew M. Spring (Research Associate)	
Photonic Materials	Chikushi		Katsuhiko FUJITA		Kenichi MATSUOKA
Processes in Extreme Conditions	Chikushi	Seong-Ho YOON		Jin MIYAWAKI	
Energy Storage Materials	Chikushi		Shigeto OKADA	Eiji KOBAYASHI (Research Associate)	
Microprocess Control	Chikushi	Jun-ichiro HAYASHI	Koyo NORINAGA	Shinji KUDO	

Evaluation Center of Materials Properties and Function

Center Director	Katsuhiko TOMOOKA	
Evaluation Office of Materials Properties and Function	Chief	Staff
	Yoshiaki TAKAHASHI	Takaaki SONODA (Associate Professor), Yozo KORAI, Akihiko TAKADA
Office of Research Support	Chief	Technical Staff
	Junji TANAKA	Mitsutaka UMEDU, Keiko IDETA, Taisuke MATSUMOTO, Takeshi TANAKA, Satoko GONDO

Visiting Professor 2012

Division of Fundamental Organic Chemistry	Munetaka AKITA	Tokyo Institute of Technology, Chemical Resources Laboratory, Professor
	Masahide TERAZIMA	Graduate School of Science, Kyoto University, Professor
	Masahiko HARA	Tokyo Institute of Technology, Interdisciplinary Graduate School of Science and Engineering, Professor
	Kentaro OKUMA	Fukuoka University, Faculty of Science, Professor
	Koji TANAKA	Institute for Molecular Science, Professor emeritus
	Ryozo SAKODA	
Division of Applied Molecular Chemistry	Takeharu NAGAI	The Institute of Scientific and Industrial Research, Osaka University, Professor
	Hidetoshi YAMANO	Sumitomo Metal Mining CO., LTD
	Chisato NOJIRI	Terumo Corporation
Division of Integrated Materials	Ikuo FUJII	School of Science, Graduate School of Science, Osaka Prefecture University, Professor
	Shin MUKAI	Faculty of Engineering, Hokkaido University, Professor
	Masaki MITO	Kyushu Institute of Technology, Faculty of Engineering, Professor
	Tetsuro MAJIMA	The Institute of Scientific and Industrial Research, Osaka University, Professor

As of October 1, 2012

Nanomaterials and Interfaces

Hakozaki Campus

Professor
Kaoru TAMADA

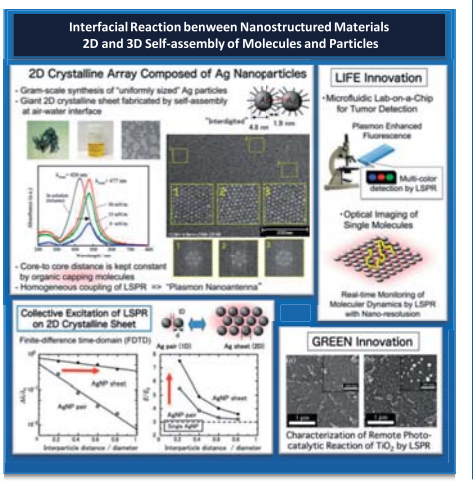
Associate Professor
Koichi OKAMOTO

Research Assistant Professor
Pangpang WANG

Our group is studying about the interfacial phenomena between metals, metal oxides, semiconductors and soft materials in nanoscale. Our research target is not only to investigate new physicochemical phenomena on cutting edge of interdisciplinary field of science, but also to develop the new concept for future green and bio technologies. Our topics include (1) Collective plasmon excitation on 2D crystalline sheets composed of Au and Ag nanoparticles, (2) Surface plasmon enhanced optoelectric devices for green and bio-innovations, and (3) Characterization of remote photocatalytic activity of TiO_2.

Graduate School of Sciences
Department of Chemistry

Interfacial Science, Nanomaterials, Plasmonics



Theoretical Chemistry

Ito Campus

Professor
Kazunari YOSHIZAWA

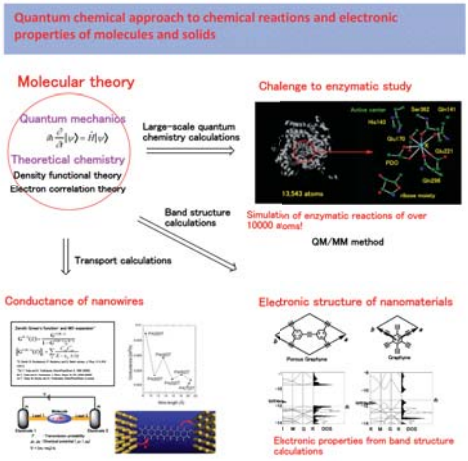
Assistant Professor
Yoshihito SHIOTA

Assistant Professor
Takashi KAMACHI

Our research group uses quantum mechanics to look at the electronic properties and reactivity of molecules and molecular assemblies. We are interested in a detailed understanding of structure-function relationships in a wide range of subjects in chemistry, material science, and biochemistry. The creation of new concepts and findings based on quantum chemistry is our main interest.

Graduate School of Engineering
Department of Chemistry and Biochemistry

Theoretical Chemistry, Enzyme Chemistry, Material Chemistry



Synthetic Methodology and Catalysis

Hakozaki Campus

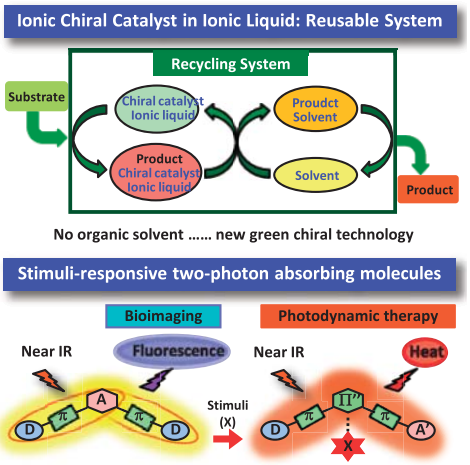
Assistant Professor
Hiroshi FURUNO

Assistant Professor
Satoaki ONITSUKA

The emerging utility of chiral and non-racemic organic compounds, e.g., as pharmaceuticals and liquid crystals, strongly requires the development of new and highly efficient methods that can afford them in a really practical way to benefit human life. Thus, our current research in this area focuses on the development of "environmentally friendly" methods for asymmetric catalysis. Development of novel functional molecules is also our current interest.

Graduate School of Sciences
Department of Chemistry

Organic Chemistry, Synthetic Chemistry, Environmentally-Benign Asymmetric Catalyst



Advanced Molecular Conversion

Hakozaki Campus

Professor
Yoshinori NARUTA

Associate Professor
Fumito TANI

Research Associate Professor
Liu Jin-Gang

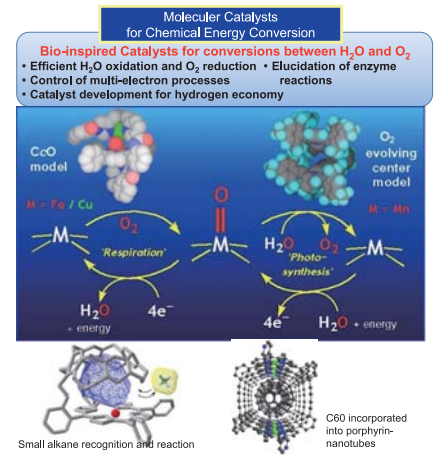
Assistant Professor
Takehiro OHTA

Research Assistant Professor **Liu BO**

Highly efficient energy conversions in photosynthesis and respiration are realized by chemical/physical energy conversions between water and oxygen and they offer fundamentals for hydrogen economy. We aim the elucidation of reaction mechanism of enzymes (cytochrome c oxidase in respiration and oxygen evolving center in photosynthesis), with use of chemical models and extend them to molecular catalysts for artificial photosynthesis and a fuel cell. Further, we target the creation of new self-assembled molecular systems showing photo-electrochemical conversion.

Graduate School of Sciences
Department of Chemistry

Organic Chemistry, Functional Materials Chemistry, Energy-conversion Catalysts and Materials



Advanced Organic Synthesis

Chikushi Campus

Professor
Mitsuru SHINDO

Assistant Professor
Kenji MATSUMOTO

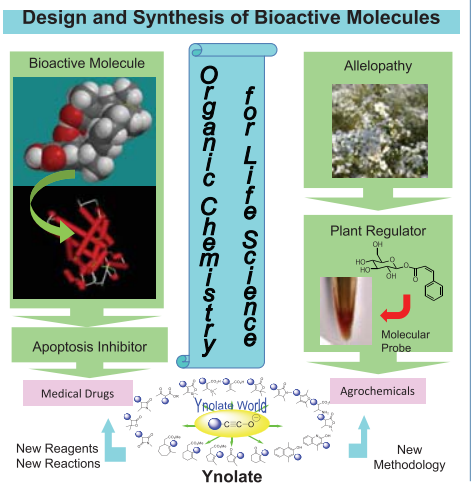
Assistant Professor
Junji TANAKA

Research Assistant Professor
Keisuke NISHIKAWA

This research group is working to design and synthesize useful bioactive organic molecules based on synthetic organic chemistry and to develop new and effective synthetic methodologies. For examples, natural and unnatural membrane protein inhibitors and allelochemicals are efficiently synthesized, and these products are modified and hybridized with biomolecules. New synthetic reactions of functional reactive species, total synthesis of bioactive natural products, reaction control with flow micro reactors are also investigated.

Interdisciplinary Graduate School of Engineering Sciences
Department of Molecular and Material Sciences

Organic Chemistry, Life Science, Medicine/Agrochemical



Cluster Chemistry

Chikushi Campus

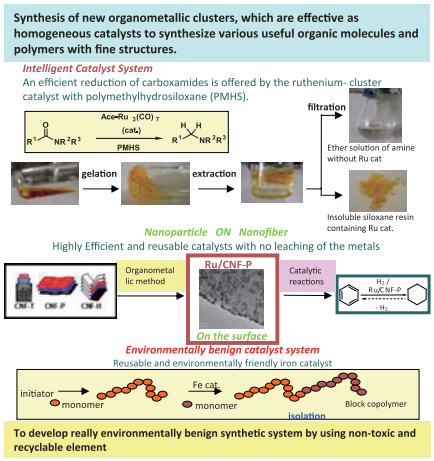
Professor
Hideo NAGASHIMA

Assistant Professor
Yusuke SUNADA

Our research focuses on fundamental chemistry of "highly reactive" metal cluster molecules (atomic conglomerates) and its application to new molecular catalysts and catalytic processes. The processes bring about the development of efficient and selective preparative methods for organic and polymer molecules having fine structures, which are good precursors for fine chemicals and materials.

Interdisciplinary Graduate School of Engineering Sciences
Department of Molecular and Material Sciences

Organic Chemistry, Organometallic Chemistry, Environmentally Friendly Catalysis



Chemistry of Molecular Assembly

Hakozaki Campus

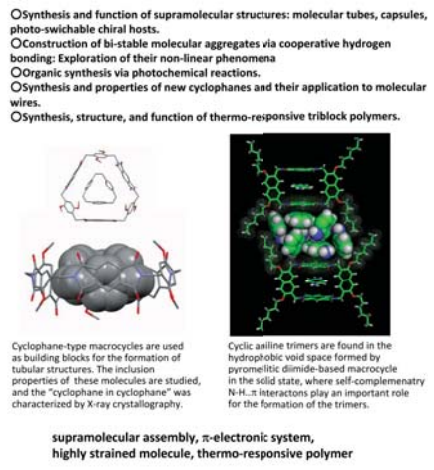
Professor
Teruo SHINMYOZU

Assistant Professor
Kenta GOTO

- Synthesis and function of supramolecular structures: molecular tubes, capsules, photo-swichable chiral hosts.
- Construction of bi-stable molecular aggregates via cooperative hydrogen bonding: Exploration of their non-linear phenomena.
- Organic synthesis via photochemical reactions.
- Synthesis and properties of new cyclophanes and their application to molecular wires.
- Synthesis, structure, and function of thermo-responsive triblock polymers.

Graduate School of Sciences
Department of Chemistry

Organic Chemistry, Structural Organic Chemistry, π -Electronic Systems



System of Functional Molecules

Chikushi Campus

Professor
Katsuhiko TOMOOKA

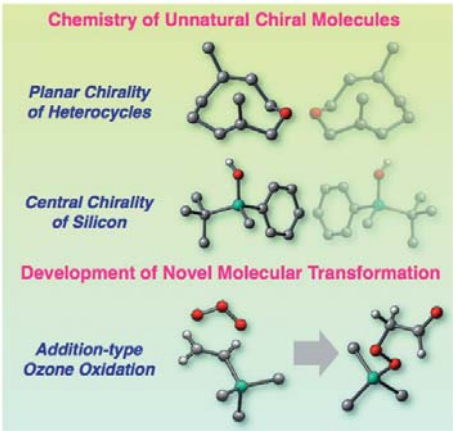
Associate Professor
Masato ITO

Assistant Professor
Kazunobu IGAWA

Three-dimensional molecular design is important for creation of novel molecular functionality. We are focusing on the design of unique chiral molecules and the construction of novel chiral architecture based on these. Our recent works are 1) asymmetric synthesis of chiral organosilicon compounds and creation of novel chiral material based on this, 2) Creation of planar chiral heterocylic compounds and development of novel chiral-technology based on this.

Interdisciplinary Graduate School of Engineering Sciences
Department of Molecular and Material Sciences

Organic Chemistry, Synthetic Chemistry • Structural Chemistry, Medicine • Chiral Material



Biomolecules Chemistry

Ito Campus

Professor
Satoru KIDOAKI

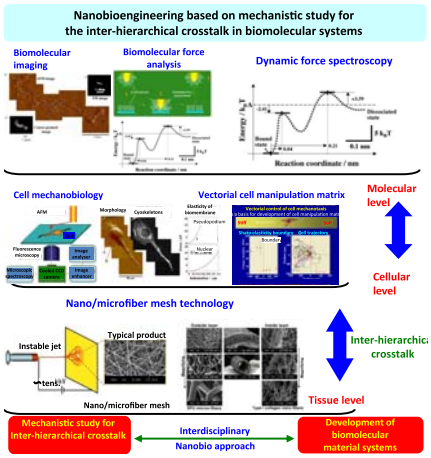
Assistant Professor
Tatsuya OKUDA

Research Assistant Professor
Tassaneeya KUBOKI

Our lab works for the development of high-functional biomaterials/biomolecular systems such as cell manipulation matrices. To effectively design such the systems, deep understandings for the biophysical principles on various aspects of the biosystems are required. We are trying to elucidate the inter-hierarchical crosstalk mechanisms in the biosystems, and to apply those to develop the novel nanobiotechnology.

Graduate School of Engineering
Department of Chemistry and Biochemistry

Bioengineering, Biophysical Chemistry, Cell Manipulation Engineering



Hybrid Molecular Assemblies

Ito Campus

Professor
Atsushi TAKAHARA

Associate Professor
Hideyuki OTSUKA

Assistant Professor
Yuji HIGAKI

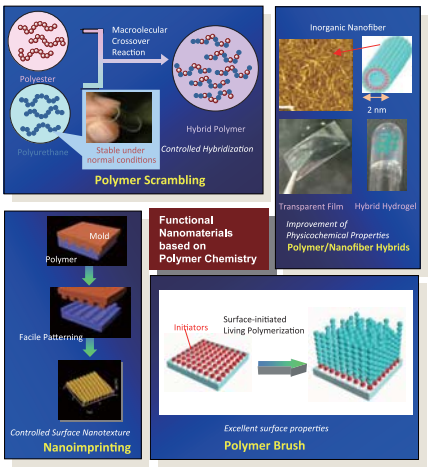
Research Assistant Professor
Ryohei ISHIGE

Research Assistant Professorr
Tomoyuki OHISHI

In order to realize novel functional polymeric materials, precise control of structures and properties at nano- to meso-scopic scale is important. Researches on (1) precise polymer reaction based on dynamic covalent chemistry, (2) (polymer/inorganic) hybrids from inorganic nanostructures, (3) nano-structure control and fabrication of polymeric materials, and (4) control of surface properties by polymer brushes, are in progress.

Graduate School of Engineering
Department of Chemistry and Biochemistry

Polymer Chemistry, Surface Chemistry, Soft Materials



Soft interfaces

Ito Campus

Research Professor
Hiroshi JINNAI

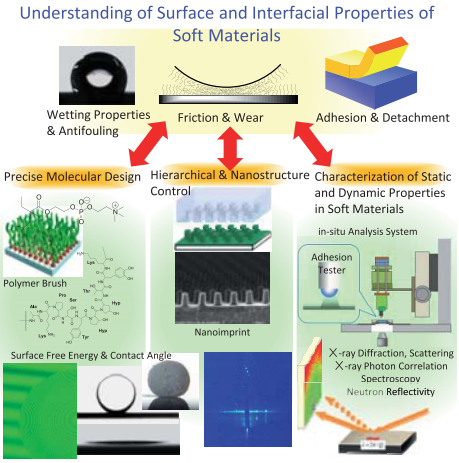
Research Associate Professor
Motoyasu KOBAYASHI

Research Associate Professor
Hirohmi WATANABE

Research Assistant Professor
Yuki Norizoe, Jin Nishida Takeshi Higuchi, Taiki Hoshino, Daiki Murakami

Our research focuses on the development of methods to control and characterize physical properties of interfaces presented by soft materials such as polymers. We unravel the underlying mechanisms of interfacial phenomena such as friction, wettability, and adhesion by examining the molecular design, hierarchical structures, and molecular dynamics. The following topics are currently in progress: (1) synthesis and analysis of surface-tethered polymer brushes, (2) fabrication of hierarchical structures of polymer films, (3) X-ray photon correlation spectroscopy and (4) neutron reflectivity studies.

Polymer Science, Soft Materials, Medical Materials



Integrated Bio-materials

Ito Campus

Professor
Astushi MARUYAMA

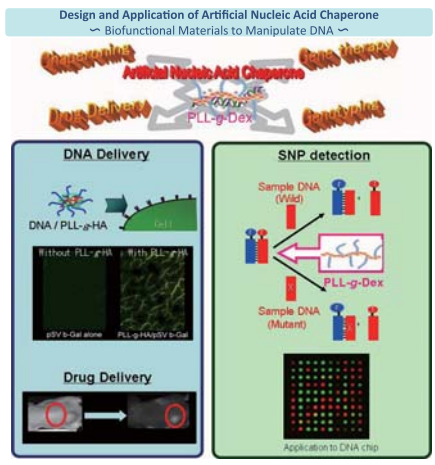
Associate Professor
Arihiro KANO

Research Assistant Professor
Naohiko SHIMADA

Biomaterials, which function in contact with living system and its components, are indispensable for development and improvement of diagnostic, therapeutic and medicinal technologies. Several properties are required for biomaterials. We have studied interactions between artificial materials and biological components to create biomaterials with integrated functions and biocompatibility. Biomaterials that help understandings of biomolecular functions are also involved in our interests.

Graduate School of Engineering
Department of Chemistry and Biochemistry

Polymer Chemistry, Biomaterial, Gene Analysis



Design of Nano-systems

Chikushi Campus

Professor
Hirotsugu KIKUCHI

Associate Professor
Yasushi OKUMURA

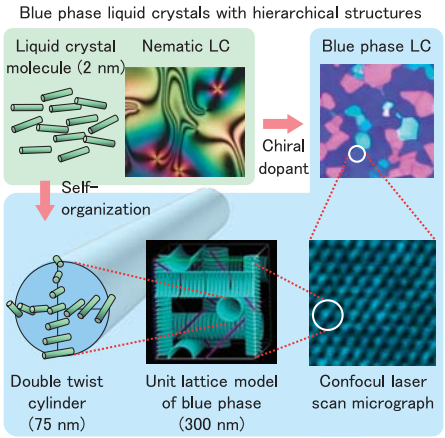
Assistant Professor
Hiroki HIGUCHI

Research Assistant Professor
Kosuke KANEKO

Molecular self-assembly, which is an interdisciplinary subject extending over chemistry, physics and biology, derives the spontaneous nano-ordering being able to contribute much to key technologies of the bottom-up type electric and photonic devices. The focus of our studies is creating novel soft-matter with unique photonic structures and functionality through chemical and physical programming of topological frustration for the molecular assembling geometry of liquid crystals and polymers. We have developed novel functional materials showing fast electro-optics and photo-controllable photonic band.

Interdisciplinary Graduate School of Engineering Sciences
Department of Applied Science for Electronics and Materials

Soft Matter Science (liquid crystal, polymer), Self-organization, Next-generation LCD



Heterogeneous Integrated Materials

Chikushi Campus

Professor
Masaharu TSUJI

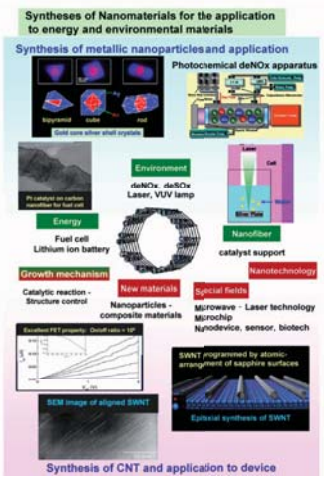
Associate Professor
Hiroki AGO

Assistant Professor
Takeshi TSUJI

Nanoparticles, nanowires, and nanocarbon materials are key materials in nanotechnology. This research section studies preparation of these nanomaterials using laser ablation in liquid phase, microwave heating, and thermal methods. In the nanocarbon research, graphene and carbon nanotubes are studied in terms of their growth mechanisms, structure control, and electronic applications. Application of photochemical process to NOx removal is also in progress to develop new techniques for conservation of atmospheric environment.

Interdisciplinary Graduate School of Engineering Sciences
Department of Applied Science for Electronics and Materials

Inorganic Material, Nanomaterial, Nanodevice



Nanostructured Integrated Materials

Chikushi Campus

Professor
Osamu SATO

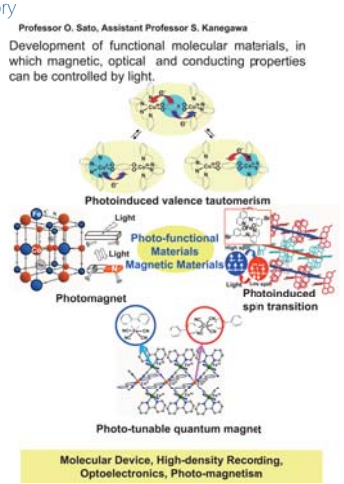
Assistant Professor
Shinji KANEGAWA

Research Assistant Professor
Kang Soonchul

A reversible tuning and a persistent modification of physical properties by external stimuli are one of the main challenges in materials science. Especially, photo-control over the physical properties is important from the viewpoint of the practical application as well as the basic science. The photo-tunable compounds can be used future memory devices, optical switches and so on. Along this line, we are currently studying photo-tunable molecular magnets, valence tautomeric compounds, spin-crossover complexes and photonic crystals.

Interdisciplinary Graduate School of Engineering Sciences
Department of Molecular and Material Sciences

Photochrmistry, Materials Chemistry, Photomagnetic Memory



Nano Scale Evaluation

Chikushi Campus

Professor
Shiyoshi YOKOYAMA

Assistant Professor
Kazuhiro YAMAMOTO

Associate Professor
Yoshiaki TAKAHASHI

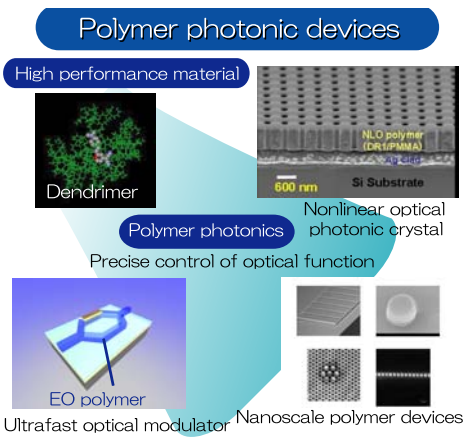
Assistant Professor
Akihiko TAKADA

Research Associate
Andrew M. Spring

Our research project is focused on creation of organic and polymer photonic materials and devices based on molecular building blocks and nano-micro-scale device fabrications. Research interest is in the demonstrating the potential of high-performance polymer materials for revolutionary components and devices. These include polymer photonic crystal devices leading to a large reduction in operating energies.

Interdisciplinary Graduate School of Engineering Sciences
Department of Molecular and Material Sciences

Polymer Chemistry, Nanotechnology, Optoelectronics



Photonic Materials

Chikushi Campus

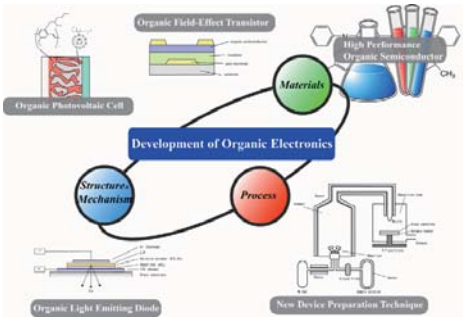
Associate Professor
Katsuhiko FUJITA

Research Assistant Professor
Kenichi MATSUOKA

This research section has been pioneering the R&D of organic electronics including organic electroluminescence (EL) devices, organic solar cells, organic transistors and organic memories. The R&D activity is divided to three groups, device structure, high performance materials and fabrication processes to understand comprehensive organic electronics. Organic semiconductors have significant advantages, ex. flexibility and printability. Utilizing the advantages, new classes of electronic devices are being developed.

Interdisciplinary Graduate School of Engineering Sciences
Department of Applied Science for Electronics and Materials

Organic Materials Chemistry, Organic Electronics, Organic Device



Processes in Extreme Conditions

Chikushi Campus

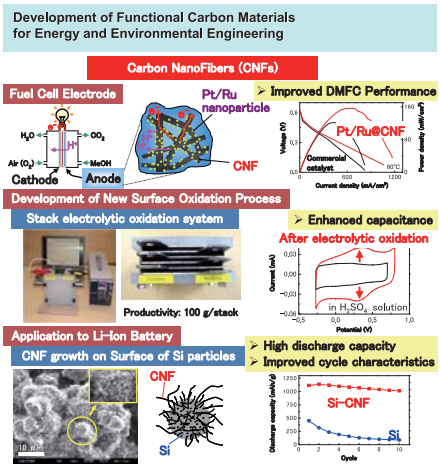
Professor
Seong-Ho YOON

Assistant Professor
Jin MIYAWAKI

We develop new functional carbon materials for effective usages of energy resources and study their industrial applications. For example, we fabricate carbon nano-fibers (CNFs) having different shape, size, and surface properties, and optimize them for applications such as FC, LIB, and capacitor. We have found remarkably improved performance and durability for systems using our newly developed carbon materials, and have presented many patents and scientific papers. We are actively collaborating with various companies, and working on commercialization of our products.

Interdisciplinary Graduate School of Engineering Sciences
Department of Applied Science for Electronics and Materials

Material Science, Functional Carbon Materials, Energy & Environment



Energy Storage Materials

Chikushi Campus

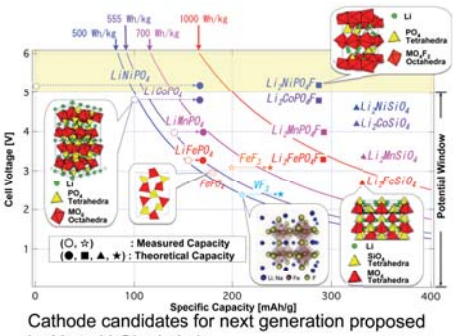
Associate Professor
Shigeto OKADA

Research Associate
Eiji KOBAYASHI

To create high-performance electrochemical energy conversion devices, our laboratory covers fundamental studies as well as the foundation for practical applications. From the viewpoint of materials chemistry and electrochemistry, we create novel battery materials, which are based on the understanding of physicochemical phenomena, in order to improve the performance of power storage devices. In particular, we focus on high-power lithium ion batteries for use in hybrid vehicles, which will reduce environmental burdens. In addition, we fundamentally study on the design of electrode reactions for innovative energy conversion devices with high environmental compatibility for next generation.

Interdisciplinary Graduate School of Engineering Sciences
Department of Applied Science for Electronics and Materials
Graduate School of Integrated Frontier Sciences
Department of Automotive Science

Electrochemistry, Material Science, Secondary Battery



Cathode candidates for next generation proposed by Yamaki-Okada Lab.

Li_2CoPO_4F : JP3624205 (2004. 12. 10)
$LiCoPO_4$: JP3523397 (2004. 2. 20)
$FePO_4$: JP3126007 (2000. 11. 2)
Na_xFeF_3 : JP2008-243646A
Li_2FeSiO_4 : JP2007-335325A

Microprocess Control

Chikushi Campus

Professor
Junichiro HAYASHI

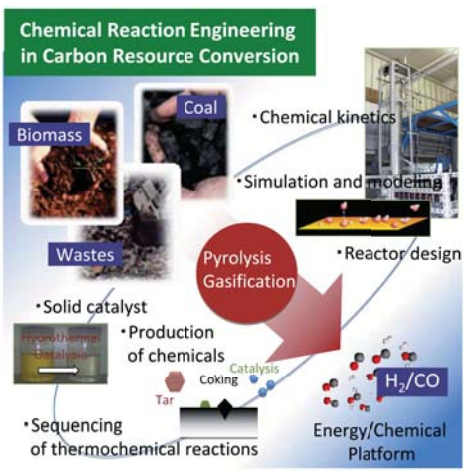
Associate Professor
Koyo NORINAGA

Assistant Professor
Shinji KUDO

Main purpose: development of reaction systems for converting carbonaceous resources such as coal, biomass and wastes into H_2/CO that is to be the only energy/material common platform in future sustainable carbon cycle chemistry (SC^3) systems.
Current topics: pyrolysis and gasification, co-production of iron-carbon composite and syngas, rearrangement of parallel/consecutive thermochemical reactions during gasification, detailed chemical kinetic analysis and modeling of gas-phase pyrolysis/reforming, direct production of chemicals from biomass pyrolysis and catalytic hydrothermal reforming, and co-upgrading of biomass and brown-coal

Interdisciplinary Graduate School of Engineering Sciences
Department of Applied Science for Electronics and Materials

Chemical Reaction Engineering, Chemical Energy Conversion, Carbonaceous Resource Conversion



Evaluation Center of Materials Properties and Function

Chikushi Campus

Center Director
Katsuhiko TOMOOKA

The center is engaged in the management and operation of large equipment for shared use, with an intensive allocation of technical staff with advanced expertise. This allows the implementation of advanced analysis of molecules and materials, as well as related education and instructions. The center also carries out diverse activities pertaining to the environmental and safety management of the institute.
This center comprises the Evaluation Office of Materials Properties and Function and the Office of Research Support. The Office of Research Support in particular plays a central role in joint research and shared usage, and serves as the Network Joint Research Center for Molecules and Devices Fields Project. The Evaluation Office of Materials Properties and Function also offers consultations on research related to advanced analyses to external researchers. The main activities of the Office of Research Support are related to environmental and safety management of the institute as well as analysis support for internal and external researchers and students.

Evaluation Office of Materials Properties and Function

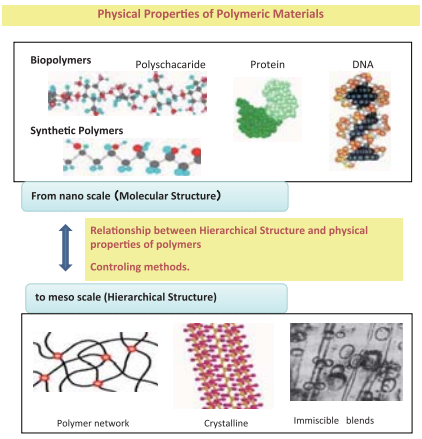
Chief
Associate Professor
Yoshiaki TAKAHASHI

Assistant Professor
Akihiko TAKADA

Hierachical structures and physical properties of polymers as well as those of analogous soft matters are studied by microscopic observations, thermal analysis, rheological and scattering experiments. Solution Properties of natural polymers in ionic liquids is also studied in our group.

Interdisciplinary Graduate School of Engineering Sciences
Department of Molecular and Material Sciences

Polymer Science, Soft Matter Physics, Environment-conscious Polymers



Associate Professor
Takaaki SONODA

Associate Professor
Yozo KORAI

Study on Designing Functional Materials with Polyfluorinated Organic Compounds
1) Study on Cluster Structures of Fluorinated Organic Molecules in Gas, Liquid, and Solid Phases
2) Study on Super-acidity of Fluorinated Organic Molecules in Gas, Liquid, and Solid Phases
3) Molecular Designing of Weakly Coordinating Fluorinated Anions and Their Applications for Lithium Battery Electrolytes

Office of Research Support

Chief
Associate Professor
Junji TANAKA

Technical staff
Mitsutaka UMEDU
Keiko IDETA
Taisuke MATSUMOTO
Takeshi TANAKA
Satoko GONDO

NMR spectrometers
(JEOL ECA600)

Transmission Electron Microscope
(JEOL JEM-2100XS)

Magnetic sector mass spectrometer
(JEOL JMS-700)

Crystal structure analysis system
(Rigaku FR-E+ SuperBright)

Research

Education

The IMCE conducts education in collaboration.
Interdisciplinary Graduate School of Engineering Sciences(Chikushi)
Department of Applied Science for Electronics and Materials, Department of Molecular and Material Sciences
Graduate School of Engineering(Ito)
Department of Chemistry and Biochemistry
Graduate School of Sciences(Hakozaki)
Department of Chemistry
Graduate School of Integrated Frontier Sciences
Department of Automotive Science

Major Research Projects

Research and Education Funding for Inter- University Research Project

Network Joint Research Center for Materials and Devices

A network-style research core for the government-sponsored Joint Usage/ Research Center Program.

MEXT Project of Integrated Research on Chemical Synthesis

Nano-Macro Materials, Devices and System Research Alliance

Inter-University Network for Efficient Utilization of Chemical Research Equipments

Global COE Program

Novel Carbon Resource Sciences

Other Major Projects

JST Basic Research Programs
ERATO Atsushi Takahara
PREST Satoru Kidoaki
PREST Koichi Okamoto
ALCA Seong-Ho Yoon
CREST Hideo Nagashima
ACT-C Yoshinori Naruta

Development of Systems and Technology for Advanced Measurement and Analysis
Astushi Maruyama

Elements Science and Technology Project
Yoshinori Naruta
Shigeto Okada

NEDO
Seong-Ho Yoon
Hiroshi Jinnai

Funding Program for Next Generation World-Leading Researchers (NEXT Program)
Kaoru Tamada
Jun-ichiro Hayashi
Hiroki Ago
Hideyuki Otsuka

Institute for Materials Chemistry and Engineering, Kyushu University

IMCE

http://www.cm.kyushu-u.ac.jp/

■Chikushi Campus

6-1 Kasuga-koen, Kasuga-city, Fukuoka
816-8580
Fukuoka Airport→(Subway Kuko Line)→Hakata St. → (Transfer to the JR Kagoshima Line)→Onojo St. →Chikushi Campus

■Hakozaki Campus

6-10-1 Hakozaki, Higashi-ku, Fukuoka
812-8581
Fukuoka Airport→(Subway Kuko Line)→Nakasu-Kawabata St. → (Transfer to the Subaway Hakozaki Line)→Hakozaki-Kyudaimae St.
→Hakozaki Campus

■Ito Campus

744 Motooka, Nishi-ku, Fukuoka
819-0395
Fukuoka Airport→(Subway Kuko Line)→Meinohama St. → (Transfer to the JR Chikuhi Line)→Kyudai-Gakkentoshi St.
→(Transfer to the Showa bus)→Ito Campus