

G3 Life Science

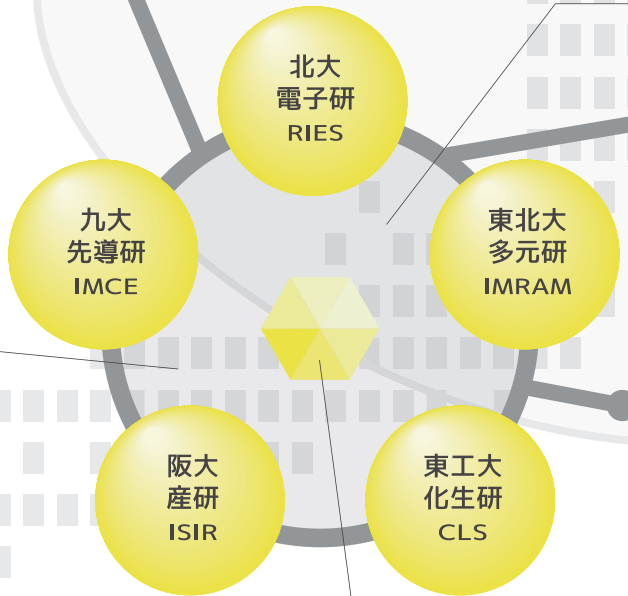
Network Joint Research Center  
for Materials and Devices

G1 Electronics

G2 Environment and Energy

CORE Lab

CORE Collaboration Center



Five-Star

## Dynamic Alliance for Open Innovation Bridging Human, Environment and Materials

人・環境と物質をつなぐイノベーション創出ダイナミック・アライアンス

Prospectus

2019

# Dynamic Alliance for Open Innovation Bridging Human, Environment and Materials

– Five-star Alliance –

## Overview

Based on the former successes of cooperative research projects between two university institutes (FY2005-FY2006) and multi-party alliance projects (Post-Silicon Alliance of FY2007-FY2009, and Nano-Macro Materials, Devices and System Research Alliance of FY2010-FY2015), “Dynamic Alliance for Open Innovation Bridging Human, Environment and Materials” (Five-star Alliance) has been started in fiscal year of 2016 as for the 6 years project to attempt strategic development of next generation “Materials, Devices, and System” for bridging human, environmental and materials as a cooperative research project with five outstanding university institutes including, Research Institute for Electronic Science (RIES) of Hokkaido University, Institute of Multidisciplinary Research for Advanced Materials (IMRAM) of Tohoku University, Laboratory for Chemistry and Life Science (CLS), Institute of Innovative Research (IIR, former Chemical Resources Laboratory) of Tokyo Institute of Technology, the Institute of Scientific and Industrial Research (ISIR) of Osaka University, and Institute for Materials Chemistry and Engineering (IMCE) of Kyushu University.

The “Five-star Alliance” project is aiming to realize true and clearly-targeted academic and industrial “innovation” through the deeper and more effective cooperation researches among the alliance members. For this purpose, the five-star alliance has strategically established three research groups covering the important topics; “Electronics materials and devices (G1)” , “Environment and energy materials, devices and process (G2)” , and “Life science materials, devices and systems (G3)” . Not only within the group but also between groups, various types of multidisciplinary collaborative researches are carried out.

In addition, the five-star alliance starts new and innovative programs; "Expanded Collaborative Research" is a public offering type program for external researcher, who enforces joint research with two or more institutions members. Of-stay type cooperative research program “CORE Lab” is presided over by a young researcher as a principal investigator for carrying out “covalent” researches. The joint research program “Next Generation Young Scientists” encourages the graduate students. Support program for networking technical staffs beyond the five institutes is also promoted. All these alliance programs are promoted under the strong and mutual correlation with the “Network Joint Research Center for Materials and Devices” project.



Director of Operations  
Katsuaki SUGANUMA  
(ISIR)



Chair  
Tohru SEKINO  
(ISIR)



Vice-Chair  
Masahiko TAKAHASHI  
(IMRAM)



G1 Leader  
Shiyoshi YOKOYAMA  
(IMCE)

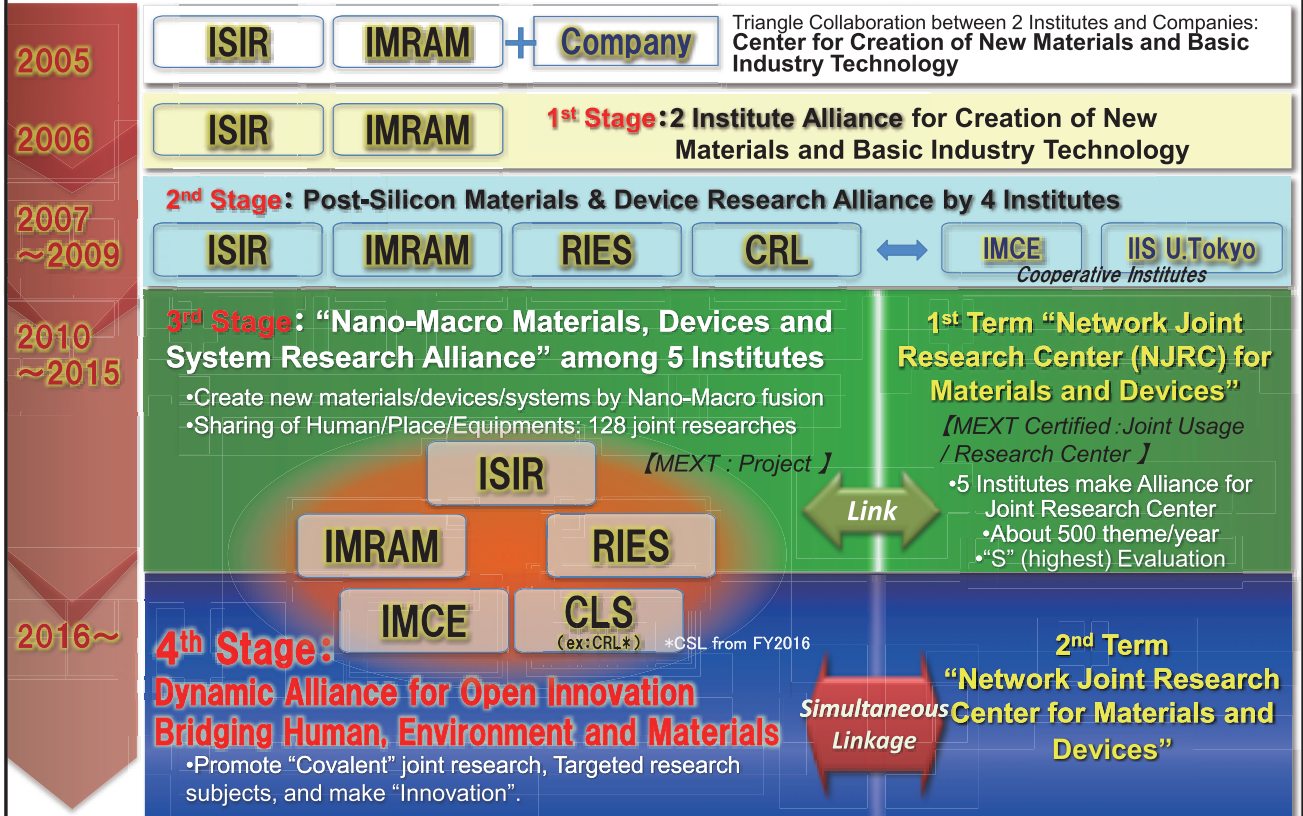


G2 Leader  
Masaaki FUJII  
(CLS)



G3 Leader  
Kuniharu IJIRO  
(RIES)

## Dynamic Alliance & Network Joint Research Center (NJRC): History

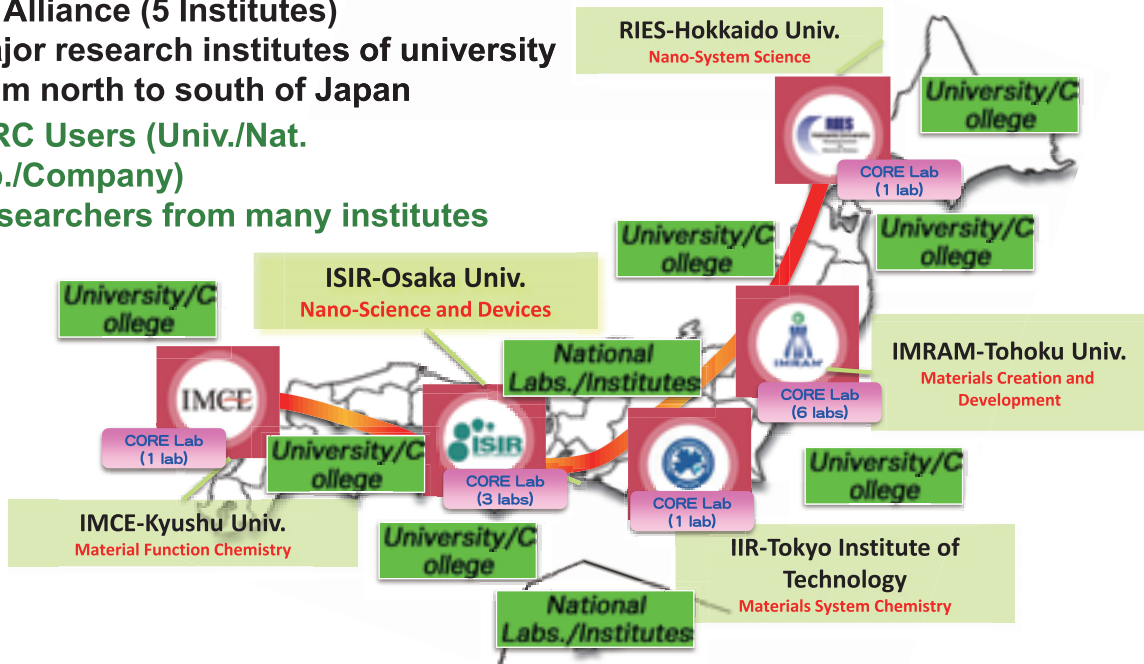


## 5 Institutes of NJRC/Dynamic Alliance

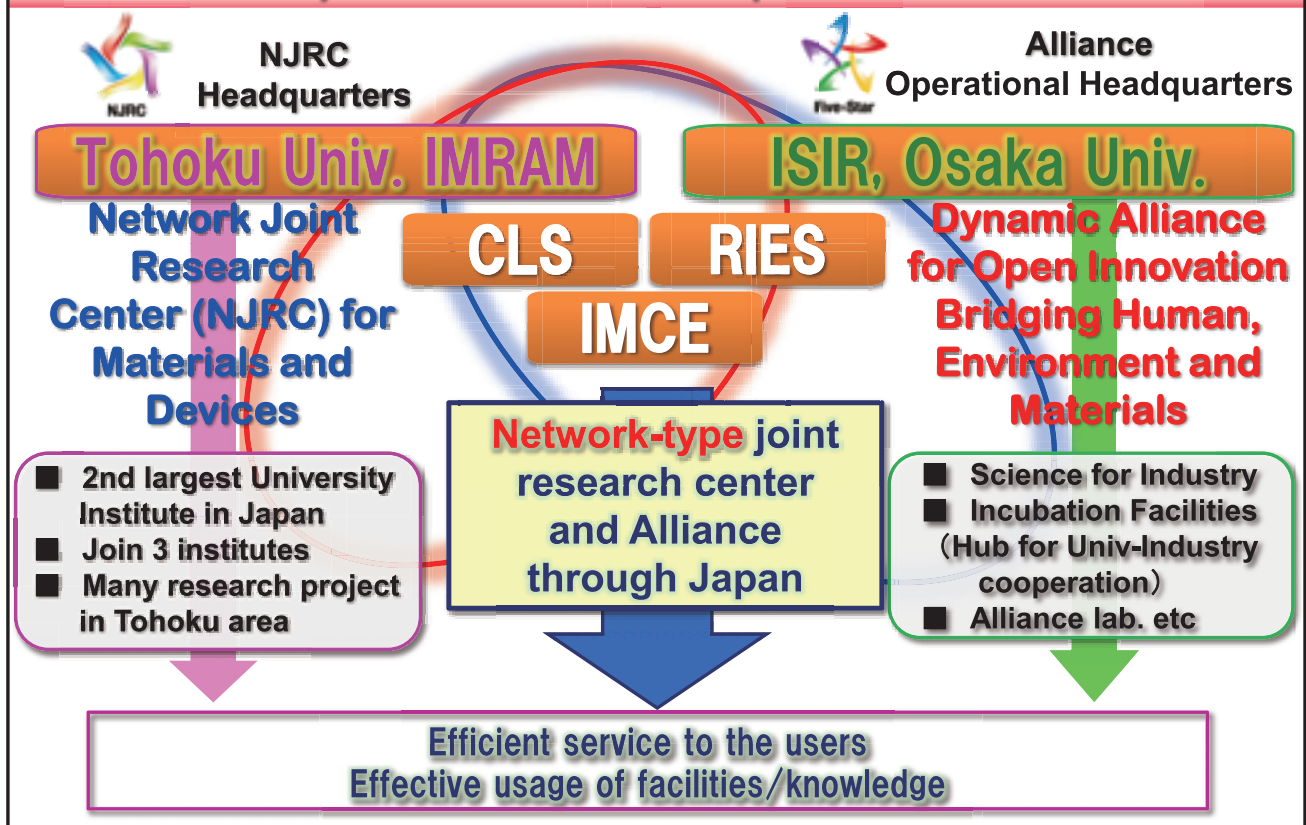


### Alliance (5 Institutes)

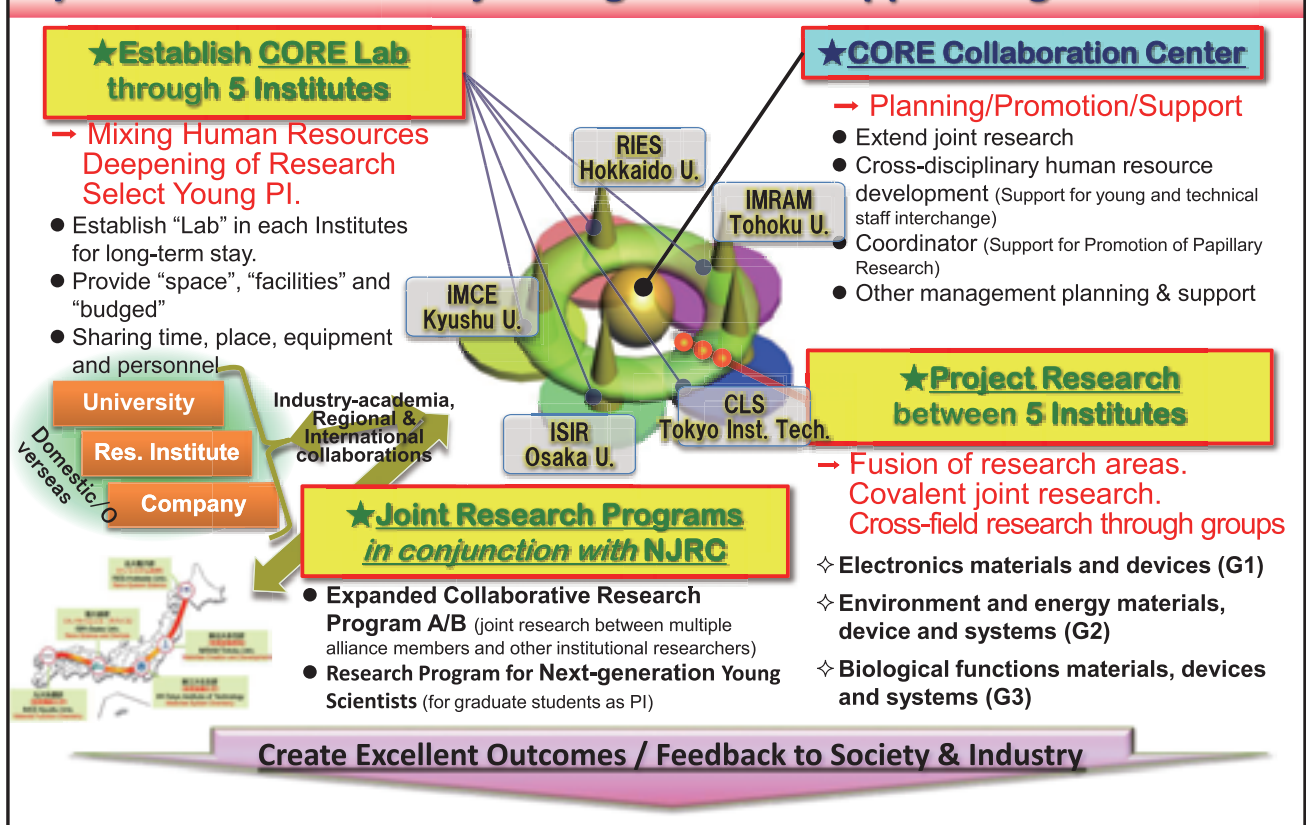
- Major research institutes of university
  - from north to south of Japan
- NJRC Users (Univ./Nat. Lab./Company)**
- researchers from many institutes



## NJRC & Dynamic Alliance - Headquarters in East & West

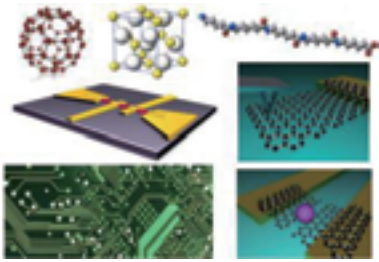


## Dynamic Alliance: 3 Major Programs and Support Organization

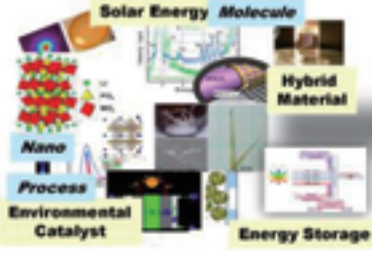


## Dynamic Alliance: Project Research (FY2019)

**G1 : Electronics Materials and Devices Group** (46 persons)



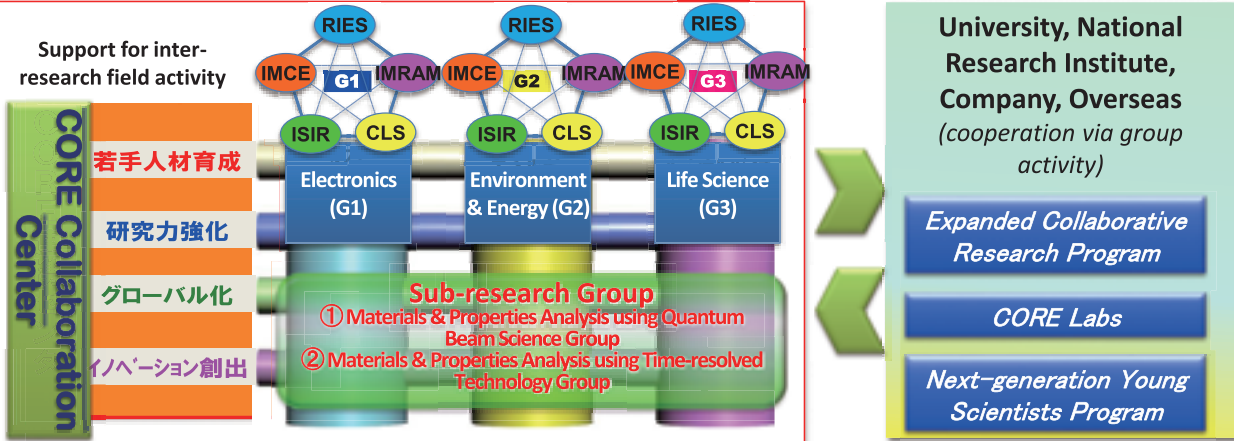
**G2 : Environment and Energy Materials, Devices, and Process Group** (46 persons)



**G3 : Life Science Materials, Devices and System Group** (59 persons)



Support for inter-research field activity



## CORE Lab: Unique Long-term Stay for Young Researchers

### [CORE Lab]

- ◆ Start from FY2015 as the special joint research program, and officially established in FY2016 in 5 Institutes. Now 12 Labs in 5 Institutes.
- ◆ Long-term Stay: PI & Member stay >60 days/year for the joint research,
- ◆ Provide Space (rooms) in each Institutes and budgeted.  
→ Share “Time”, “Place”, “Facilities/Equipment”, and “Personnel”
- ◆ Encourage & support Young Researchers: for creating world-class excellent outcomes (carrier path for young researchers)

**NJRC-type CORE Lab**

PI (External Univ.) + Alliance member (single Institute)

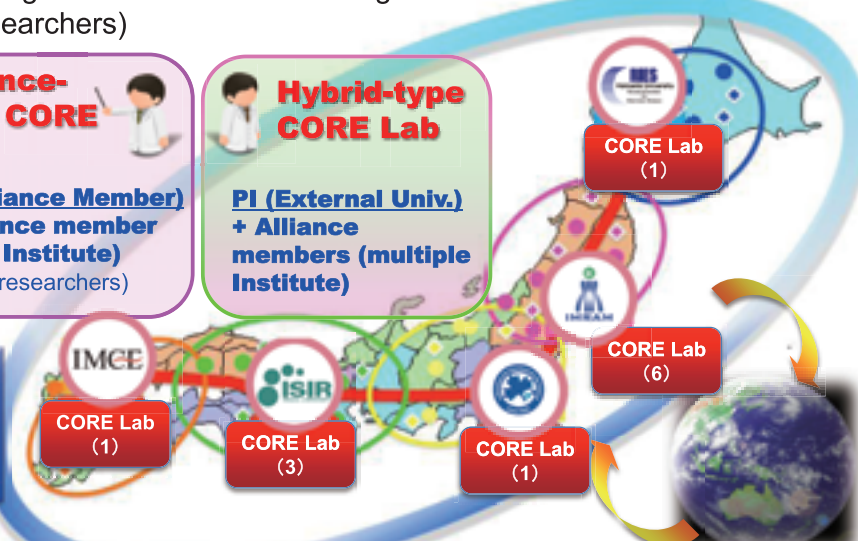
**Alliance-type CORE Lab**

PI (Alliance Member) + Alliance member (other Institute) (Young researchers)

**Hybrid-type CORE Lab**

PI (External Univ.) + Alliance members (multiple Institute)

- International CORE Lab exists (in IMRAM)
- Linked with Another Research Programs



## Dynamic Alliance: International Activity

### “International Joint Research Program”

- For Globalization, and Enhance Int'l Activity of Alliance/NJRC
  - Any research subject matching to the projects criteria
- PI = Alliance Member (5 Institutes) + Foreign Principal Researchers

		Foreign Institutes
RIES	3	KU Leuven (Belgium), Pusan Nat Univ (Korea), Sungkyunkwan Univ (Korea), Univ. of Glasgow (UK)
IMRAM	6	Sungkyunkwan Univ (Korea), National Chiao-Tung Univ. (Taiwan, Northwestern Univ. (China, Univ. of Calgary (Canada), Univ. Sci. Tech. Beijing (China), Lanzhou Univ. (China), National Chiao Tung Univ. (Taiwan)
CLS	3	TU Berlin (Germany), A. N. Nesmeyanov Inst of Organoelement Compounds (Russia), Heidelberg Univ. (Germany)
ISIR	9	Oxford Univ. (UK), Purdue Univ. (USA), Sun Moon Univ. (Korea), POSTECH (Korea), KAIST (Korea), Korea Univ. (Korea), Shanghai Normal Univ. (China), Bielefeld Univ. (Germany), Univ. of Maryland (USA), Univ. of Hng Kong (China), INRA (France)
IMCE	8	Cambridge Univ. (UK), National Tsinghua Univ. (Taiwan), Wuhan Univ. Sci. Tech. (China), NUS (Singapore), U. Glasgow (UK), UMR-CNRS (France), Heidelberg U (Germany) etc.
<b>Total</b>	<b>29</b>	



## Joint Research Programs in conjunction with NJRC

### Public Offering

#### Foundational Joint Research Program

User (PI) +  
Researcher in 5  
Institute

- : wide-range of area
- : Challenging Subject
- : Basic research
- : Use of Facilities



361 subjects  
(2019)

#### Expanded Collaborative Research Program (B):

- User (PI) + 2 or more Researchers in 5 Institutes
- : to be large joint research
  - : Expand to outstanding cross-disciplinary research



#### Expanded Collaborative Research Program (A):

- User (PI) + 1 Researcher in 5 Institutes
- : subject to be Type-B joint research



#### Research Program for Next-generation Young Scientists : Graduate Student will be PI

- : Fostering top-level researchers for the next generation
- : Developing research capabilities



### Numbers of each joint research programs in FY2019

	Joint Res. Prog.	Exp. Coll. Res. (A)	Exp. Coll. Res. (B)	Next-Gen. Young	CORE Lab	Total
RIES	65	5	9	4	1	84
IMRAM	111	6	14	6	6	143
CLS	63	5	10	7	1	86
ISIR	66	7	11	4	3	91
IMCE	56	4	6	9	1	76
<b>Total</b>	<b>361</b>	<b>27</b>	<b>50</b>	<b>30</b>	<b>12</b>	<b>480</b>

# Dynamic Alliance (Five-star Alliance) Organization Chart

Director of Operations  
Katsuaki SUGANUMA

**Steering Committee**

Chair Tohru SEKINO

Vice-Chair Masahiko TAKAHASHI

R I E S Toshiyuki NAKAGAKI, Kuniharu IJIRO

IMRAM Atsushi MURAMATSU, Masato KAKIHANA

C L S Toru HISABORI, Masaaki FUJII

I S I R Katsuaki SUGANUMA, Hidekazu TANAKA

IMCE Jun-ichiro HAYASHI, Shiyoshi YOKOYAMA

**CORE Collaboration Center**

Director Tohru SEKINO

Vice-Director Masato KAKIHANA

R I E S Kuniharu IJIRO, Nobuyuki TAMAOKI

IMRAM Masahiko TAKAHASHI, Masaru NAKAGAWA

C L S Masaaki FUJII, Nobuhiro NISHIYAMA

I S I R Hidekazu TANAKA

I M C E Shiyoshi YOKOYAMA, Takeshi YANAGIDA

Coordinator Hajime ASAHI

## G1 Electronics Materials and Devices

Leader Shiyoshi YOKOYAMA

Planning and Promotion Leader Takeshi YANAGIDA

### RIES

Prof. H. OHTA ※V

Prof. K. SASAKI

Prof. T. NAKAMURA

Assoc. Prof. H. KAIJU

Assoc. Prof. K. KONDO

Assoc. Prof. H. FUJIWARA

Assoc. Prof. A. TAGUCHI

Assoc. Prof. I. HISAKI

Assoc. Prof. M. YAMANOUCHI

### IMRAM

Prof. T. AKUTAGAWA ※V

Prof. T. J SATO※V(sub)

Prof. T. ABUKAWA

Prof. K. UEDA

Prof. H. OIKAWA

Prof. H. OHTANI

Prof. H. KASAI

Prof. O. KITAKAMI

Prof. H. KIMURA

Prof. H. KUMIGASHIRA

Prof. T. KOMEDA

Prof. H. JINNAI

Prof. Y. TAKAKUWA

Prof. M. TAKATA

Prof. S. CHICHIBU

Prof. M. NAKAGAWA

Prof. M. MITSUISHI

### CLS

Prof. A. SHISHIDO ※V

Prof. T. FUKUSHIMA

Assoc. Prof. T. IMAOKA

Assoc. Prof. Y. SHOJI

### ISIR

Prof. T. SEKITANI ※V

Assoc. Prof. Y. IE

Prof. A. OIWA

Prof. T. OGUCHI

Prof. T. KOZAWA

Prof. Y. SAKURAI

Prof. H. TANAKA

Prof. D. CHIBA

Prof. M. NOGI

Prof. Y. YOSHIDA

Prof. T. WASHIO

### IMCE

Prof. H. KIKUCHI ※V

Prof. K. TAMADA

Prof. T. YANAGIDA

Prof. S. YOKOYAMA

Assoc. Prof. Y. OKUMURA

Assoc. Prof. F. TANI

Assoc. Prof. K. FUJITA

※V • Vice-Leader

## G2 Environment and Energy Materials, Devices and Process

Leader Masaaki FUJII

Planning and Promotion Leader Keiji NAGAI

### RIES

Prof. A. ISHIBASHI ※V Prof. H. MISAWA

### IMRAM

Prof. S. YIN ※V Prof. T. ADSCHIRI

Prof. K. AMEZAWA Prof. T. OMATA

Prof. M. KAKIHANA Prof. K. KANIE

Prof. J. KANO Prof. S. KITAMURA

Prof. T. KYOTANI Prof. A. KIRISHIMA

Prof. A. TSAI Prof. H. SHIBATA

Prof. E. SHIBATA Prof. Y. TAKAHASHI

Prof. M. TERAUCHI Prof. H. NOGAMI

Prof. H. FUKUYAMA Prof. I. HONMA

Prof. A. MURAMATSU Prof. H. YAMANE

### CLS

Prof. T. YAMAGUCHI ※V Prof. M. AKITA

Prof. K. OSAKADA Prof. M. FUJII

Prof. K. YAMAMOTO Assoc. Prof. T. KOIZUMI

Assoc. Prof. T. TAMAKI Assoc. Prof. K. NAGAI

Assoc. Prof. J. NOMURA KONDO

### ISIR

Assoc. Prof. S. TANAKA ※V Prof. H. KOBAYASHI

Prof. K. SUGANUMA Prof. T. SEKINO

Prof. T. HOSOKAI Assoc. Prof. M. FUJITSUKA

Assoc. Prof. Y. HONDA

### IMCE

Prof. S. OKADA ※V Prof. J. HAYASHI

Prof. S. YOON Assoc. Prof. K. ALBRECHT

Assoc. Prof. M. ITO Assoc. Prof. K. KOJIO

Assoc. Prof. Y. TAKAHASHI Assoc. Prof. J. MIYAWAKI

## G3 Life Science Materials, Devices and System

Leader Kuniharu IJIRO

Planning and Promotion Leader Tomomi NEMOTO※

※10/1 ~ Change

### RIES

Prof. M. NAGAYAMA ※V Prof. K. IJIRO

Prof. H. UJII Prof. T. KOMATSUZAKI※

Prof. N. TAMAOKI Prof. T. NAKAGAKI

Prof. Y. NISHINO Prof. T. NEMOTO

Prof. V. P. BIJU Assoc. Prof. H. AONUMA

Assoc. Prof. R. ENOKI Assoc. Prof. Y. KIM

Assoc. Prof. Y. KOBAYASHI Assoc. Prof. K. SATO

Assoc. Prof. Y. SATO Assoc. Prof. Y. TAKANO

Assoc. Prof. H. TERAMOTO Assoc. Prof. K. HIRAI

Assoc. Prof. H. MITOMO

### IMRAM

Prof. A. HIBARA ※V Prof. T. WADA ※V(sub)

Prof. K. INABA Prof. S. SATO

Prof. S. TAKAHASHI Prof. M. TAKAHASHI

Prof. F. NAGATSUGI Prof. S. MIZUKAMI

Prof. A. MOMOSE

### CLS

Prof. H. UEDA ※V Prof. K. TANAKA

Prof. H. NAKAMURA Prof. N. NISHIYAMA

Prof. T. HISABORI Assoc. Prof. S. ISHIUCHI

Assoc. Prof. S. IMAMURA Assoc. Prof. T. KITAGUCHI

Assoc. Prof. S. FUSE Assoc. Prof. Y. MIURA

Assoc. Prof. M. YOSHIZAWA Assoc. Prof. K. WAKABAYASHI

### ISIR

Prof. K. NISHINO ※V Prof. S. KURODA

Prof. K. KOMATANI Prof. H. SASAI

Prof. M. TANIGUCHI Prof. T. NAGAI

Prof. K. NAKATANI Prof. M. NUMAO

Assoc. Prof. K. KAWAI Assoc. Prof. T. SUZUKI

Assoc. Prof. Y. MAKIHARA

### IMCE

Prof. M. TANAKA ※V Prof. S. KIDOAKI

Prof. M. SHINDO Prof. A. TAKAHARA

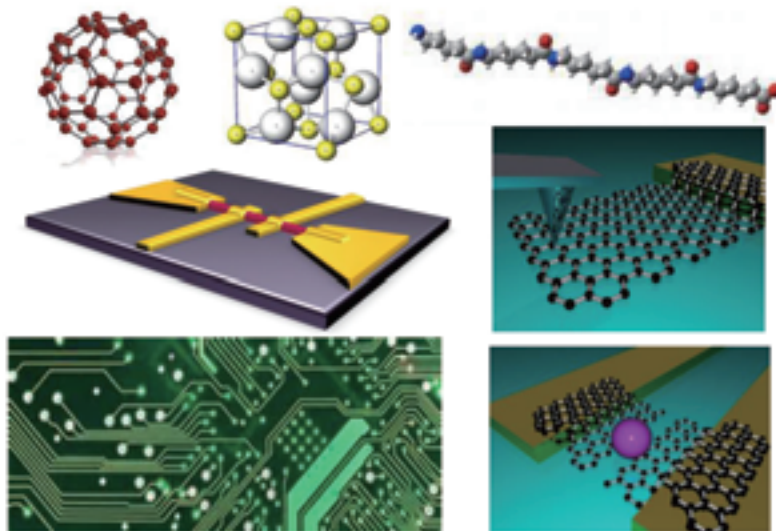
Assoc. Prof. T. ANADA Assoc. Prof. Y. ARIMA

Assoc. Prof. H. ISE Assoc. Prof. A. KANO



## Outline of G1 Research

The object of the “Electronics Materials and Devices” group (G1) is to create and control organic, inorganic, and hybrid materials for the applications of electronics, photonics, and spintronics devices. External control of materials properties and integration technique of the novel devices will be investigated to realize the new functional devices. We aim science and technological contribution to human /environmental harmony.



## Main members and their research subjects



<Group Leader>  
Prof.  
**Shiyoshi YOKOYAMA** (IMCE)  
■ Polymer photonics for highperformance optical device application  
Keywords: Nonlinear optical polymer, Nano photonics, Electro optic



<Planning and Promotion Leader>  
Prof.  
**Takeshi YANAGIDA** (IMCE)  
■ Creation of functional nanowire materials/properties/devices towards next generation electronics  
Keywords: Functional Nanodevices, Nanowires, Electronics



<Vice-Leader>  
Prof.  
**Hiromichi OHTA** (RIES)  
■ Photo-electronic-thermal transport properties of conducting oxide films  
Keywords: Thermoelectric, Superstructure, oxide electronics



Prof.  
**Keiji SASAKI** (RIES)  
■ Optical manipulation of nanomaterials and their structures  
Keywords: Optical force, Plasmonics, Nano-shaping, Optical vortex



Prof.  
**Takayoshi NAKAMURA** (RIES)  
 ■Development of novel electronic materials based on molecular rotators  
 Keywords: Molecular rotator, Supramolecules, Ferroelectrics, Multiferroics



Assoc. Prof.  
**Kenji KONDO** (RIES)  
 ■Theoretical study of spin transport and the calculation of electronic structure of low-dimensional electron gas systems  
 Keywords: Condensed matter theory, Spintronics, Semiconductor device engineering, First principle electronic structure calculation



Assoc. Prof.  
**Atsushi TAGUCHI** (RIES)  
 ■DUV plasmonics and nano-imaging  
 Keywords: Plasmonics in UV, Nano-imaging, Resonant Raman scattering, nano-fabrications



Assoc. Prof.  
**Ichiro HISAKI** (RIES)  
 ■Functional crystalline materials via programmed aggregation of molecules  
 Keywords: Supramolecular chemistry, Hydrogen bonds, Organic molecular crystal, Porous organic materials



Assoc. Prof.  
**Michihiko YAMANOUCHI** (RIES)  
 ■Study on oxide spintronics devices  
 Keywords: Pulsed laser deposition, Spintronics, Oxide halfmetal



<Vice-Leader>  
 Prof.  
**Tomoyuki AKUTAGAWA** (IMRAM)  
 ■Fabrication of new molecular devices with charge-transfer interactions  
 Keywords: Molecular crystal, Charge transfer, Ferroelectricity



<Vice-Leader(sub)>  
 Prof.  
**Taku J SATO** (IMRAM)  
 ■Spin dynamics in condensed matter by neutron inelastic scattering  
 Keywords: Neutron inelastic scattering, Unconventional superconductor, Quantum spin systems



Prof.  
**Tadashi ABUKAWA** (IMRAM)  
 ■Atomic-level characterization of solid surfaces and interfaces for new surface functions  
 Keywords: Surface structure, Surface dynamics, Electron diffraction, Nano surface analysis



Prof.  
**Kiyoshi UEDA** (IMRAM)  
 ■Analysis and control of electron and molecular dynamics  
 Keywords: X-ray free electron laser, Molecular movie, Multi-dimensional spectroscopy



Prof.  
**Hidetoshi OIKAWA** (IMRAM)  
 ■Creation of organic hybridized nanocrystals for optically functional materials  
 Keywords: Organic hybridized nanocrystal, Photonic material, Reprecipitation method



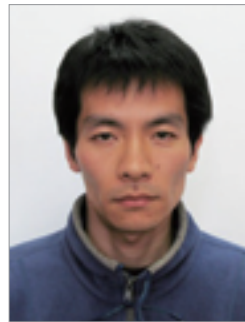
Prof.  
**Hiroshi OHTANI** (IMRAM)  
 ■ Study on materials design based on the evolutionary algorithm  
 Keywords: First-principles calculations, CALPHAD, Evolutionary algorithm



Prof.  
**Hitoshi KASAI** (IMRAM)  
 ■ Fabrication of The Novel Nanodrugs Composed of Poorly Water-Soluble Compounds  
 Keywords: Nano Drugs, Organic Nanoparticles, Anti-cancer Drugs



Prof.  
**Osamu KITAKAMI** (IMRAM)  
 ■ Study on single nanomagnet for development of future memory devices  
 Keywords: Magnetism, Spin dynamics, Nanomagnet



Prof.  
**Hiroyuki KIMURA** (IMRAM)  
 ■ Structural physics on novel condensed matter by complimentary use of SOR-X-ray- Neutron structure analysis  
 Keywords: SOR- X-ray- Neutron diffraction, Accurate magnetic and crystal structure analysis, Magnetoelectric oxides, Organic ferroelectric and magnetic materials



Prof.  
**Hiroshi KUMIGASHIRA** (IMRAM)  
 ■ Design of novel functionalities in oxide nanostructures using advanced spectroscopy  
 Keywords: Synchrotron-radiation spectroscopy, Functional nanomaterials, Oxide electronics



Prof.  
**Tadahiro KOMEDA** (IMRAM)  
 ■ Development of single molecule devices with spin degree of freedom  
 Keywords: Molecule electronic, Molecular spintronics, Scanning tunneling probes



Prof.  
**Hiroshi JINNAI** (IMRAM)  
 ■ "In-situ" 3D observations of selfassembling processes soft materials with advanced electron tomography  
 Keywords: Electron tomography, In-situ visualization, Self-assembling processes, Soft materials



Prof.  
**Yuji TAKAKUWA** (IMRAM)  
 ■ Synthesis of functional materials and development of nanoproceses  
 Keywords: Surface physics, Material science, Process engineering, Development of surface analysis methods



Prof.  
**Masaki TAKATA** (IMRAM)  
 ■ Development of materials visualization photon science  
 Keywords: Synchrotron radiation, X-ray diffraction, Maximum entropy method, Charge density study



Prof.  
**Shigefusa CHICHIBU** (IMRAM)  
 ■ Light-matter coupling and ultrafast spectroscopy in semiconductor nanostructures  
 Keywords: Femtosecond electron beam, Nitide semiconductors, Oxide semiconductors



Prof.  
**Masaru NAKAGAWA** (IMRAM)  
 ■Process/Material Science and Device Innovation in Nanoimprint Technology  
 Keywords: Print & imprint method, Lithography, Laser processing



Prof.  
**Masaya MITSUISHI** (IMRAM)  
 ■Hybrid polymer nanoassemblies for optoelectronic applications  
 Keywords: Polymer nanoassembly, Hybrid polymers, Optoelectronics



<Vice-Leader>  
 Prof.  
**Atsushi SHISHIDO** (CLS)  
 ■Development of functional soft materials and its application to optoelectronics  
 Keywords: Soft material, Liquid crystal, Photonics, Polymer



Prof.  
**Takanori FUKUSHIMA** (CLS)  
 ■Development of new soft materials using strategically designed  $\pi$ -electronic systems  
 Keywords:  $\pi$ -Electronic Materials, Self-assembly, Soft materials, Organic electronics



Assoc. Prof.  
**Takane IMAOKA** (CLS)  
 ■Functionality programming of metal clusters based on an exact atomicity control  
 Keywords: Nanoparticles, Clusters, Catalysis, Photoluminescence



Assoc. Prof.  
**Yoshiaki SHOJI** (CLS)  
 ■Development of  $\pi$ -conjugated molecules and polymers for electronics and optoelectronics  
 Keywords:  $\pi$ -Electronic Materials, Main Group Element, Organic Devices



<Vice-Leader>  
 Prof.  
**Tsuyoshi SEKITANI** (ISIR)  
 ■Flexible integrated circuits for large-area sensor applications  
 Keywords: Social devices, Flexible transistors, Integrated circuits, Large-area sensors



Prof.  
**Yutaka IE** (ISIR)  
 ■Development of functional organic materials for electronics  
 Keywords: Conjugated compounds, Molecular wires, Organic and molecular devices



Prof.  
**Akira OIWA** (ISIR)  
 ■Research on novel quantum hybrid devices based on spins and photo  
 Keywords: Low-dimensional semiconductor physics, Quantum information processing, Quantum hybrid system, Spintronics



Prof.  
**Tamio OGUCHI** (ISIR)  
 ■First-principles prediction of properties for materials design  
 Keywords: First-principles calculations, Transition metal systems, Surfaces and interfaces, Materials informatics



Prof.  
**Takahiro KOZAWA** (ISIR)  
 ■Development of lithography process and materials for semiconductor devices  
 Keywords: Quantum beam, Lithography, Biomaterials, Pulse radiolysis



Prof.  
**Yasushi SAKURAI** (ISIR)  
 ■AI Information Extraction for Nano-electronics Devices  
 Keywords: Big Data Mining, Time-Series Analysis, Nano-electronics Devices



Prof.  
**Hidekazu TANAKA** (ISIR)  
 ■Development of 3 dimensional oxide nano-structured electronics  
 Keywords: Nanostructures, Functional Oxide, Nano/Spin-electronics



Prof.  
**Daichi CHIBA** (ISIR)  
 ■Development of flexible spintronics sensors  
 Keywords: Spintronics, Flexible sensors, Magneto-electronics



Prof.  
**Masaya NOGI** (ISIR)  
 ■Nanocellulose materials for flexible electronics  
 Keywords: Nanocellulose, Transparent nanopaper, Flexible substrate



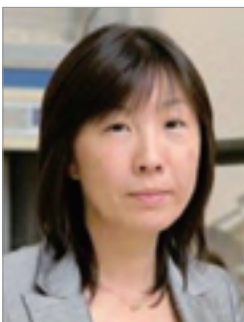
Prof.  
**Yoichi YOSHIDA** (ISIR)  
 ■Research of the radiation induced chemical reactions by using the atto-second electron beam  
 Keywords: Atto-second electron beam, Atto-second pulse radiolysis, Radiation chemistry



Prof.  
**Takashi WASHIO** (ISIR)  
 ■Measurement and Control Oriented Machine Learning for Advanced Applications  
 Keywords: Machine Learning, Statistical Estimation, Optimization, Advanced Sensing, Advanced Control



<Vice-Leader>  
 Prof.  
**Hirotsugu KIKUCHI** (IMCE)  
 ■Three dimensional lattice structure and Kerr effect of liquid crystal blue phases  
 Keywords: Liquid crystal blue phase, Electro-optic Kerr effect, Soft matter



Prof.  
**Kaoru TAMADA** (IMCE)  
 ■Innovative nanobio detection with plasmon nanoantenna  
 Keywords: Plasmonics, Nanomaterials Bioimaging



Assoc. Prof.  
**Yasushi OKUMURA** (IMCE)  
 ■Development of functional soft matter based on microscopic observation  
 Keywords: Soft matter, Liquid crystal, Confocal microscope



Assoc. Prof.  
**Fumito TANI** (IMCE)

■Development of functional organic compounds based on unique pi-electron structures

Keywords: Organic pi-compounds  
NIR-dye  
Redox  
Semiconductivity



Assoc. Prof.  
**Katsuhiko FUJITA** (IMCE)

■Development of fabrication process and materials for organic electronic devices

Keywords: Organic electronics, Organic photovoltaic cells, OLED

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### About Logo:

The Dynamic Alliance (Five-Star Alliance) has established a logo mark consisting of five colored-parts, which is based on "dynamic research collaboration and dissemination" as a motif. Four patterns of simple logos (color and monochrome with and without abbreviations "Five-Star") and corresponding four sets of mark and a name have been prepared. The NJRC has also established consistent logo marks at the same time.

### ロゴマークについて

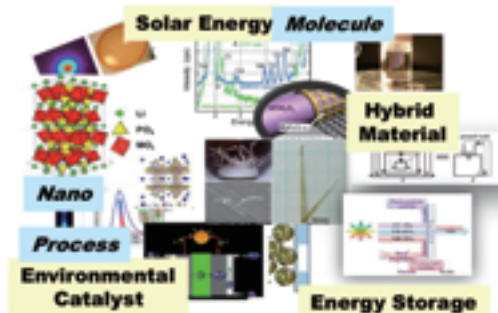
全国に跨る大学5附置研究所がネットワークを構築して実施している「人・環境と物質をつなぐイノベーション創出ダイナミック・アライアンス」では、「ダイナミックな研究連携とその発信」をモチーフとして、5色のパーツからなる一貫性のある図形で表現したロゴマークを制定した。シンプルな図形および略語（Five-Star）からなるパターン（カラーおよびモノクロ）と、名称（文字）との組み合わせからなるものであり、同時に「物質・デバイス領域共同研究拠点」でも一貫性のあるロゴマークを制定している。



# G2 Environment and Energy Materials, Devices and Process Research Project Group

## Outline of G2 Research

The activity of the “Environment and Energy Materials, Devices and Process” group (G2) covers promotion of the studies to design environmental catalysts for industry, to realize ecological processing for a low carbon society, and to create new hybrid substances for environmental and energy issues. The studies will contribute to make new environmentally benign materials and devices as well as ubiquitous system integration.



## Main members and their research subjects



<Group Leader>  
Prof.  
**Masaaki FUJII** (CLS)  
■ Functional Analysis of Molecular Building Blocks by Advanced Laser Spectroscopy  
Keywords: Molecular Recognition, Laser Spectroscopy, Intermolecular Interaction



<Planning and Promotion Leader>  
Assoc. Prof.  
**Keiji NAGAI** (CLS)  
■ Photoenergy conversion materials -Organophotocatalyst & Quantum beam source-  
Keywords: Photocatalyst, Photo-energy conversion, Water purification



<Vice-Leader>  
Prof.  
**Akira ISHIBASHI** (RIES)  
■ High efficiency solar cells and clean systems  
Keywords: Solar cell, High efficiency, Clean system



Prof.  
**Hiroaki MISAWA** (RIES)  
■ Development of artificial photosynthesis systems using plasmonic antennae  
Keywords: Localized plasmon, Nanomaterials, Plasmonic chemistry



<Vice-Leader>  
Prof.  
**Shu YIN** (IMRAM)  
■ Creation of multi-functional environmental responsive nanomaterials  
Keywords: Multi-functional, Environmental response, Eco-materials



Prof.  
**Tadafumi ADSCHIRI** (IMRAM)  
■ Supercritical hydrothermal synthesis of organic-inorganic hybrid nanoparticles  
Keywords: Supercritical fluid, Organic inorganic hybrid materials, Nanoparticles



Prof.  
**Koji AMEZAWA** (IMRAM)  
 ■Development of environmentally-friendly energy conversion devices based on solid state ionics  
 Keywords: Solid state ionics, Energy conversion, Fuel cells Batteries

■Development of inorganic energy



Prof.  
**Takahisa OMATA** (IMRAM)  
 conversion materials using ion-exchange  
 Keywords: Material Design, Topotactic Ion-Exchange, Proton Conductor, Solar Cell Absorber



Prof.  
**Masato KAKIHANA** (IMRAM)  
 ■Construction of high-performance photoceramics  
 Keywords: Photocatalyst, Phosphor, Exploration of new materials



Prof.  
**Kiyoshi KANIE** (IMRAM)  
 ■Development of Hybrid Materials based on Precise Liquid Phase Synthesis of Nanoparticles  
 Keywords: Nanoparticle, Organic-Inorganic Hybrid, Self-Organization



Prof.  
**Junya KANO** (IMRAM)  
 ■Novel powder processing for renewable energy and its efficiency improvement  
 Keywords: Biomass, Mechanochemical processing, DEM simulation



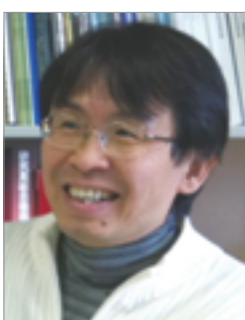
Prof.  
**Shin-ya KITAMURA** (IMRAM)  
 ■Study on valorization of steelmaking slag as ecofriendly material  
 Keywords: Steelmaking slag, Fertilizer, Leaching, Recycle



Prof.  
**Takashi KYOTANI** (IMRAM)  
 ■Synthesis and design of novel nanocarbon materials and their nanohybrids  
 Keywords: Energy storage media, Bio-application of nanocarbons, Graphene



Prof.  
**Akira KIRISHIMA** (IMRAM)  
 ■Radiochemistry in Nuclear Waste Management and Nuclear Facility Decommissioning  
 Keywords: Radioactive waste management, Naturally Occurring Radioactive Materials



Prof.  
**An-Pang TSAI** (IMRAM)  
 ■Studies on formation of quasicrystal and catalysts in terms of metallurgy  
 Keywords: Quasicrystal, Intermetallic compound, Electron compound, Catalysts



Prof.  
**Etsuro SHIBATA** (IMRAM)  
 ■Establishment of metal resource circulation engineering  
 Keywords: Non-ferrous metallurgy, Recycling, Waste treatment





Prof.  
**Hiroyuki SHIBATA** (IMRAM)  
 ■Thermal properties of molten silicates and solution growth of SiC  
 Keywords: Thermal property, Molten silicates, Silicon carbide, Solution growth



Prof.  
**Yukio TAKAHASHI** (IMRAM)  
 ■Multi-scale structure analysis of functional materials by X-ray ptychography  
 Keywords: X-ray ptychography, synchrotron radiation, functional materials, structure analysis



Prof.  
**Masami TERAUCHI** (IMRAM)  
 ■Electron crystallography & spectroscopy based on electron microscopy  
 Keywords: Convergent-beam electron diffraction, Electron energy-loss spectroscopy, Soft-X-ray emission spectroscopy



Prof.  
**Hiroshi NOGAMI** (IMRAM)  
 ■Development of novel material processing through kinetic based reaction analysis  
 Keywords: Process analysis, Thermal fluid analysis, Reaction kinetics



Prof.  
**Hiroyuki FUKUYAMA** (IMRAM)  
 ■High-temperature physical chemistry of materials  
 Keywords: Chemical thermodynamics, Thermophysical properties of high-temperature melts, Crystal growth



Prof.  
**Itaru HONMA** (IMRAM)  
 ■Advanced nanotechnologies for energy conversion devices  
 Keywords: Lithium ion batteries, Supercapacitor, Solar cells/Fuel cells, Nanomaterials/Nanoprocessing



Prof.  
**Atsushi MURAMATSU** (IMRAM)  
 ■Synthesis processing of nanoparticulate functional materials in liquid-phase  
 Keywords: Nanoparticles, Synthesis process, Hybrid materials



Prof.  
**Hisanori YAMANE** (IMRAM)  
 ■Synthesis and crystal structure analysis of new ceramic materials  
 Keywords: Multinary nitrides and oxides, X-ray diffraction, Flux growth



<Vice-Leader>  
 Prof.  
**Takeo YAMAGUCHI** (CLS)  
 ■Design and development for fuel cell materials and devices  
 Keywords: Electrolyte membrane, Catalysts, Polymer electrolyte fuel cell, Solid alkaline fuel cell



Prof.  
**Munetaka AKITA** (CLS)  
 ■Visible light-driven organic synthesis by photoredox catalysis  
 Keywords: Visible light, Photoredox catalysis, Organic synthesis



Prof.  
**Kohtaro OSAKADA** (CLS)  
 ■Structure and Properties of Organometallic Middle-Molecule Compounds  
 Keywords: silane, organometallics, oligomer, optical properties



Prof.  
**Kimihisa YAMAMOTO** (CLS)  
 ■Development of Subnano Hybrid Materials  
 Keywords: Subnano Particles, Dendrimer, Hybrid Materials



Assoc. Prof.  
**Take-aki KOIZUMI** (CLS)  
 ■Development of transition metal complexes bearing functional ligands  
 Keywords: Transition metal complexes, Low Environmental load type reaction, Dynamic behavior



Assoc. Prof.  
**Takanori TAMAKI** (CLS)  
 ■Development of High-Performance Enzymatic Biofuel Cells  
 Keywords: Bioelectrochemistry, Enzyme, Systematic material design



Assoc. Prof.  
**Junko NOMURA KONDO** (CLS)  
 ■Preparation of mesoporous metal oxides and IR characterization of solid catalyst surfaces  
 Keywords: Porous material, Metal oxide, IR, Catalyst



<Vice-Leader>  
 Assoc. Prof.  
**Shin-ichiro TANAKA** (ISIR)  
 ■Electron dynamics in the solid and on the solid surface by means of the electron spectroscopies  
 Keywords: Time-resolved two-photon photoelectron spectroscopy, High-resolution angle-resolved photoelectron spectroscopy, High-resolution electron-energy loss spectroscopy.



Prof.  
**Hikaru KOBAYASHI** (ISIR)  
 ■New chemical methods to fabricate highly efficient Si solar cells, and fabrication and application of Si nanopowder  
 Keywords: silicon, surface control, hydrogen generation, Li ion battery



Prof.  
**Katsuaki SUGANUMA** (ISIR)  
 ■Wearable stretchable and WBG power interconnections  
 Keywords: Printed electronics, Stretchable wiring, WBG Power interconnection



Prof.  
**Tohru SEKINO** (ISIR)  
 ■Creation of multifunctional materials via low-dimensional nano-macro structure and function tuning  
 Keywords: Nanocomposite, Low-dimensional nanomaterials, Functional Structure Ceramics



Prof.  
**Tomonao HOSOKAI** (ISIR)  
 ■Study on interaction between intense laser pulse and plasmas/beams  
 Keywords: Laser plasma interaction, laser-driven particle acceleration



Assoc. Prof.  
**Mamoru FUJITSUKA** (ISIR)  
 ■Chemistry of highly activated species generated by photo- and electron beam irradiation  
 Keywords: Excited intermediate, super oxidant, super reductant, photocatalyst



Assoc. Prof.  
**Yoshihide HONDA** (ISIR)  
 ■Development of diagnostic methods for materials based on radiation-related technology  
 Keywords: Polymer, Clay, Positron, Electron beam



<Vice-Leader>  
 Prof.  
**Shigeto OKADA** (IMCE)  
 ■Development of post lithium-ion batteries  
 Keywords: Sodium-ion battery, Cathode active material, Intercalation, Conversion reaction



Prof.  
**Jun-ichiro HAYASHI** (IMCE)  
 ■Carbon resources conversion for carbon-recycling industries  
 Keywords: carbon-neutral/negative conversion, fossil fuel, biomass



Prof.  
**Seong-Ho YOON** (IMCE)  
 ■Development of high anti-oxidative carbon supporting material and its application to PEMFC catalyst  
 Keywords: Fuel Cell  
 Carbon black  
 Anti-oxidative



Assoc. Prof.  
**Ken ALBRECHT** (IMCE)  
 ■Development of new electrostatic catalysis reaction  
 Keywords: Electrostatic catalysis



Assoc. Prof.  
**Masato ITO** (IMCE)  
 ■Molecular design for energy saving  
 Keywords: Electrode active material, Gas barrier material, Molecular catalyst



Assoc. Prof.  
**Ken KOJIO** (IMCE)  
 ■Development of recyclable tough elastomers  
 Keywords: Thermoplastic elastomers  
 Recycle  
 Tough



Assoc. Prof.  
**Yoshiaki TAKAHASHI** (IMCE)  
 ■Hierarchical structure and physical properties of polymers  
 Keywords: Natural polymers, Ionic liquids, Rheology



Assoc. Prof.  
**Jin MIYAWAKI** (IMCE)  
 ■Design and development of high-performance porous adsorbent materials  
 Keywords: Porous materials, Adsorption, Heat pump

# G3 Life Science Materials, Devices and System Research Project Group

## Outline of G3 Research

The objective of the “Life Science Materials, Devices and System” group(G3) is to create cutting-edge technologies for the elucidation of biological functions by advanced optical imaging, molecular structural analyses, and utilizing mathematical and information sciences. By the harmonized developments in information of both biomolecules and biological functions and the synthesis of molecules, we provide novel functional materials and devices that contribute to life-innovation in the 21st century.



## Main members and their research subjects



<Group Leader>

Prof.

**Kuniharu IJIRO** (RIES)

■Development of biomimetic nanofabrication method using molecular self-assembly

Keywords: Biomimetics, Nanomaterial, Self-assembly



<Planning and Promotion Leader>※

Prof.

**Tomomi NEMOTO** (RIES)

■Cutting-edge optical imaging and cell physiology of neural and secretory activities

Keywords: Two-photon microscopy, Super-resolution microscopy, Molecular and cellular physiology



<Vice-Leader>

Prof.

**Masaharu NAGAYAMA** (RIES)

■Understanding of nonlinear phenomena using mathematical modeling

Keywords: Mathematical modeling, Reaction-diffusion system, Numerical simulation



Prof.

**Hiroshi UJI-I** (RIES)

■Investigations of heterogeneous dynamics at mesoscopic scale using super-resolution fluorescence (single molecule) and Raman microscopy, particularly, biological issues.

Keywords: Single molecule, Heterogeneous dynamics, Nanoscopy



※10/1-Planning and Promotion Leader

Prof.

**Tamiki KOMATSUZAKI** (RIES)

■Developments of data-driven mathematics and concepts in single molecule biology

Keywords: Single molecule biology, Multiscale dynamics in complex systems, Molecular data science



Prof.

**Nobuyuki TAMAOKI** (RIES)

■Synthesis of light-driven molecular machines

Keywords: Motor protein, Photochromic compound, Liquid crystal



Prof.  
**Toshiyuki NAKAGAKI** (RIES)  
 ■Ethology of single celled organism viewed from physical equation of motion  
 Keywords: Mathematical modeling, Protozoa, Nonlinear dynamics, Biomechanics



Prof.  
**Yoshinori NISHINO** (RIES)  
 ■Deep Nano-Imaging using synchrotron radiation and X-ray free-electron lasers  
 Keywords: Phase imaging, Controlled environment imaging, Coherent X-rays



Prof.  
**Vasudevan P. BIJU** (RIES)  
 ■Photonic molecules and nanomaterials for single-molecule detections, bio-imaging, and optical displays  
 Keywords: photonic molecules, nanomaterials, single molecule fluorescence, fluorescence sensors



Assoc. Prof.  
**Hitoshi AONUMA** (RIES)  
 ■Understanding real time adaptability of animal behavior  
 Keywords: Neurobiology, Synthetic neuroethology, Neuro-robotics



Assoc. Prof.  
**Ryosuke ENOKI** (RIES)  
 ■Optical Monitoring of Neuronal Network in the Master Circadian Clock  
 Keywords: Circadian Rhythm, Optical Imaging, Neuronal Network



Assoc. Prof.  
**Yuna KIM** (RIES)  
 ■External stimuli-responsive molecules for advanced optical and mechanical functions  
 Keywords: photoresponsive chiral switch, electrochromism, liquid crystal, conjugated polymer



Assoc. Prof.  
**Yasuaki KOBAYASHI** (RIES)  
 ■Study of collective oscillations in biological systems  
 Keywords: collective oscillations, nonlinear dynamics



Assoc. Prof.  
**Katsuhiko SATO** (RIES)  
 ■Role of mechanical forces in complex phenomena in biological systems  
 Keywords: Mechanical models, Morphogenesis, Rheology



Assoc. Prof.  
**Yuzuru SATO** (RIES)  
 ■Random dynamical systems approaches to nonlinear complex phenomena  
 Keywords: complex systems, chaos, random dynamical systems, time series analysis



Assoc. Prof.  
**Yuta TAKANO** (RIES)  
 ■Development of photofunctional molecular tools for understanding and controlling biological functions  
 Keywords: Photoinduced electron transfer, Luminescence sensor, Phototherapy, Carbon nanomaterials



Assoc. Prof.  
**Hiroshi TERAMOTO** (RIES)  
 ■Application of Singularity Theory to Material Science  
 Keywords: Singularity Theory, Topological Insulator, Non-adiabatic Transition



Assoc. Prof.  
**Kenji HIRAI** (RIES)  
 ■Light-assisted Synthesis of Functional Nanomaterials  
 Keywords: Coordination Polymers, Nanomaterials, Plasmonics



Assoc. Prof.  
**Hideyuki MITOMO** (IMRAM)  
 ■Development of functional devices using metal nanoparticles and soft matter  
 Keywords: Soft matter, Metal nanoparticles assemblies, Plasmonic devices



<Vice-Leader>  
 Prof.  
**Akihito HIBARA** (IMRAM)  
 ■Nano-microfluidic analytical devices and microscopy  
 Keywords: Nanofluidics, Microfluidics, Light scattering, Liquid interfaces



<Vice-Leader(sub)>  
 Prof.  
**Takehiko WADA** (IMRAM)  
 ■Novel strategy for ischemia cell specific oligonucleotide therapeutics with intracellular environmental condition responsible artificial nucleic acid  
 Keywords: Oligonucleotide therapeutics, Active Control



Prof.  
**Kenji INABA** (IMRAM)  
 ■Structural and mechanistic basis of cellular systems involved in protein quality control  
 Keywords: Protein quality control, Redox, Molecular chaperone, X-ray crystal structure analysis



Prof.  
**Shunichi SATO** (IMRAM)  
 ■Laser application for material science  
 Keywords: Photonics, Vector beam, Intense laser



Prof.  
**Satoshi TAKAHASHI** (IMRAM)  
 ■Dynamics of protein folding and function based on single molecule fluorescence spectroscopy  
 Keywords: Dynamics, Protein folding, Single Molecule Spectroscopy



Prof.  
**Masahiko TAKAHASHI** (IMRAM)  
 ■Towards investigation of the origins of molecular functions by developing methods to visualize electron motion in matter  
 Keywords: Electron Compton scattering, Electron momentum spectroscopy, Momentum space wave function



Prof.  
**Fumi NAGATSUGI** (IMRAM)  
 ■Development of the functional molecules for regulation of gene expression  
 Keywords: Antisense, Reactive oligonucleotide, miR



Prof.  
**Shin MIZUKAMI** (IMRAM)

■Development of bioanalytical technology based on functional molecular probe design

Keywords: Bioimaging probes, Chemical biology, Photofunctional molecules



Prof.  
**Atsushi MOMOSE** (IMRAM)

■Visualization of biomedical materials with X-ray phase imaging

Keywords: X-ray, Phase contrast, Tomography



<Vice-Leader>  
Prof.  
**Hiroshi UEDA** (CLS)

■Developing novel diagnostic systems by protein modification and split reactions

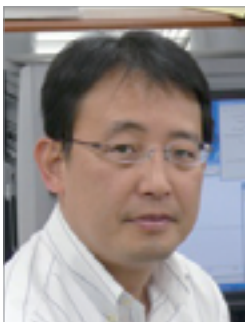
Keywords: Fluorescence Quenching, Luciferase, Protein-Protein Interaction



Prof.  
**Kan TANAKA** (CLS)

■Development of tetrapyrrole sensory devices toward the control of cell processes

Keywords: Tetrapyrrole, Organelle, Cell proliferation



Prof.  
**Hiroyuki NAKAMURA** (CLS)

■Control of Biofunctions Using Photosensitizing Molecules and Application to Medicinal Chemistry

Keywords: Protein modification, Photosensitizer, Anticancer drug design



Prof.  
**Nobuhiro NISHIYAMA** (CLS)

■Development of smart diagnostic and therapeutic systems based on synthetic functional polymers

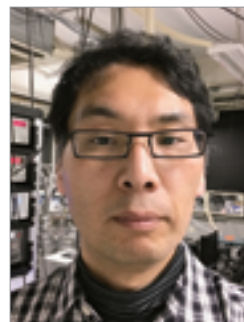
Keywords: DDS, Nanomedicine, Functional polymer, Imaging



Prof.  
**Toru HISABORI** (CLS)

■Functional Analysis of Redox-Regulated Biological Systems

Keywords: Photosynthesis, Redox regulation, Bioenergetics, ATP synthase



Assoc. Prof.  
**Shun-ichi ISHIUCHI** (CLS)

■Elucidation of molecular recognition mechanism by bottom-up approach

Keywords: Molecular Recognition, Laser Spectroscopy, Mass spectrometry



Assoc. Prof.  
**Sousuke IMAMURA** (CLS)

■Biofuel production using microalgae

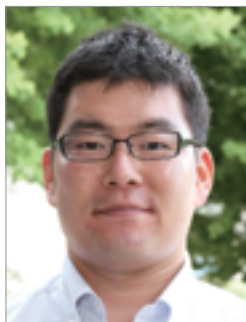
Keywords: biofuel production, microalga, nitrogen signaling



Assoc. Prof.  
**Tetsuya KITAGUCHI** (CLS)

■Development of biosensors based on fluorescent proteins

Keywords: Fluorescent protein, Cell Signaling, Biosensor



Assoc. Prof.  
**Shinichiro FUSE** (CLS)  
 ■ Natural product science based on micro-flow synthesis  
 Keywords: Micro-flow, Natural product, Medicinal Chemistry



Assoc. Prof.  
**Yutaka MIURA** (CLS)  
 ■ Development of novel biomaterials by using well-defined macromolecules  
 Keywords: polymer, nano-biotechnology, polymer-drug discovery, controlled release



Assoc. Prof.  
**Michito YOSHIZAWA** (CLS)  
 ■ Functional molecular capsules with polyaromatic panels  
 Keywords: Assembly, Capsule, Polyaromatic, Recognition



Assoc. Prof.  
**Ken-ichi WAKABAYASHI** (CLS)  
 ■ Photomovement in the green algae: from photoreception to flagellar regulation  
 Keywords: Chlamydomonas, Volvox, Flagella, Channelrhopsin



<Vice-Leader>  
 Prof.  
**Kunihiko NISHINO** (ISIR)  
 ■ Development of new strategies to tackle infectious diseases  
 Keywords: Multidrug resistance, Antimicrobial chemotherapy, Systems biology



Prof.  
**Shun'ichi KURODA** (ISIR)  
 ■ Development of In Vivo Pinpoint Drug Delivery System Inspired by the Viral Infection Machinery  
 Keywords: Virus, Nanocarrier, DDS



Prof.  
**Kazunori KOMATANI** (ISIR)  
 ■ Robot dialogue system based on speech information processing technology  
 Keywords: Speech recognition, Dialogue system, Humanoid robot, Ontology



Prof.  
**Hiroaki SASAI** (ISIR)  
 ■ Development of Novel Enantioselective Reactions  
 Keywords: Multi-functional Catalyst, Enantioselective Catalyst, Domino Reaction, Helicenes



Prof.  
**Masateru TANIGUCHI** (ISIR)  
 ■ Development of bio-nanodevices using single-molecule analysis  
 Keywords: Single Molecular Science, Single Molecule Analysis, Biomolecules



Prof.  
**Takeharu NAGAI** (ISIR)  
 ■ Development and application of fluorescent and chemiluminescent protein for bioscience research  
 Keywords: Fluorescent protein, Chemiluminescent protein Bioimaging



Prof.  
**Kazuhiko NAKATANI** (ISIR)  
 ■ Studies on interaction of small molecules to nucleic acids  
 Keywords: Micro RNA, Riboswitch, Regulation of gene expression



Prof.  
**Masayuki NUMAO** (ISIR)  
 ■ Artificial intelligence and visualization for the diagnosis of fuel cells and rechargeable batteries  
 Keywords: Machine learning, Acoustic emission, Fuel cell





Assoc. Prof.  
Kiyohiko KAWAI (ISIR)

■ Single molecule fluorescence measurement for analytical/diagnostic applications

Keywords: Fluorescence, Blinking, Single molecule



Assoc. Prof.  
Takeyuki SUZUKI (ISIR)

■ Development of environmentally benign oxidation for the catalytic asymmetric synthesis

Keywords: Iridium catalyst, Hydrogen transfer, Oxidation



Assoc. Prof.  
Yasushi MAKIHARA (ISIR)

■ iNPH diagnosis support based on gait image analysis

Keywords: Gait, Computer vision, iNPH



<Vice-Leader>  
Prof.  
Masaru TANAKA (IMCE)

■ Design of biocompatible soft-biomaterials for medical devices

Keywords: Biocompatibility, Cell adhesion, Bio-interfaces, Water structure



Prof.  
Satoru KIDOAKI (IMCE)

■ Development of mechanobio-materials for cell manipulation

Keywords: Mechanobio-materials, Cell machanotaxis, Microelasticity patterning



Prof.  
Mitsuru SHINDO (IMCE)

■ Design and synthesis of useful organic molecules for life science

Keywords: Organic synthesis, Chemical biology, Bioactive compounds



Prof.  
Atsushi TAKAHARA (IMCE)

■ Precise structure control of soft interfaces for biomedical applications

Keywords: Soft Interfaces, Biointerface, Soft material



Assoc. Prof.  
Takahisa ANADA (IMCE)

■ Design of biocompatible soft-biomaterials for medical devices

Keywords: Biocompatibility  
Cell adhesion  
Bio-interfaces  
Water structure



Assoc. Prof.  
Yusuke ARIMA (IMCE)

■ Surface design of materials and living cells for biomedical applications

Keywords: Surface modification / Cell-material interaction / Cell-cell interaction



Assoc. Prof.  
Hirohiko ISE (IMCE)

■ Development of medical devices using carbohydrate-bearing polymers

Keywords: Carbohydrates, Biomaterials, Cell biology



Assoc. Prof.  
Arihiro KANO (IMCE)

■ New strategy for cancer treatment based on the metabolic abnormalities

Keywords: Cancer, Glycolysis, Warburg Effect

## Five-star Alliance-5 University Institutes



Director  
Toshiyuki NAKAGAKI

北海道大学電子科学研究所 (RIES)

〒001-0020 札幌市北区北 20 条西 10 丁目  
TEL 011-706-9202 FAX 011-706-9110

Research Institute for Electronic Science,  
Hokkaido University.  
Kita 20 Nishi 10, Kita-ku, Sapporo 001-0020



Director  
Atsushi MURAMATSU

東北大学多元物質科学研究所 (IMRAM)

〒980-8577 仙台市青葉区片平 2-1-1  
TEL 022-217-5203 FAX 022-217-5211

Institute of Multidisciplinary Research for Advanced  
Materials, Tohoku University.  
Katahira 2-1-1, Aoba-ku, Sendai 980-8577



Director  
Toru HISABORI

東京工業大学化学生命科学研究所 (CLS)

〒226-8503 横浜市緑区長津田町 4259  
TEL 045-924-5961 FAX 045-924-5976

Laboratory for Chemistry and Life Science,  
Tokyo Institute of Technology  
4259 Nagatsuta, Midori-ku, Yokohama 226-8503



Director  
Katsuaki SUGANUMA

大阪大学産業科学研究所 (ISIR) アライアンス事業本部

〒567-0047 大阪府茨木市美穂ヶ丘 8-1  
TEL 06-6879-8384 FAX 06-6879-8509

The Institute of Scientific and Industrial Research,  
Osaka University.  
8-1, Mihogaoka, Ibaraki, Osaka 567-0047



Director  
Jun-ichiro HAYASHI

九州大学先導物質化学研究所 (IMCE)

〒816-8580 春日市春日公園 6-1  
TEL & FAX 092-583-7839

Institute for Materials Chemistry and Engineering,  
Kyushu University.  
6-1 Kasuga-koen, Kasuga 816-8580

