

CORE RESEARCH
CLUSTER for



CORE
RESEARCH
CLUSTER



MATERIALS SCIENCE

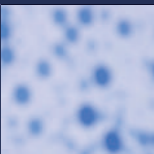
CORE RESEARCH CLUSTER for
MATERIALS SCIENCE



CORE
RESEARCH
CLUSTER



C O R E
R E S E A R C H
C L U S T E R
f o r
M A T E R I A L S
S C I E N C E



Accumulation of excellent research capabilities at Tohoku University

Core Research Cluster for Materials Science

Enhancement of strategic projects on new research objectives

INDEX

Message from the Director	02
Concept of a Designated National University	03
Projects and Leaders	07
Advanced Energy Materials Project	09
Advanced Electronic Materials Project	11
Biomaterials Project	13
Materials Development Based on Microstructure Control Project	15
High Strength Materials Project	17
Mathematical Science and Computation	19
Evaluation and Sensing	21
Processing	23
Education and Human Resources Development	25
Activities to Improve International Presence	27

MESSAGE

A focal point of Tohoku University's research excellence

Enhancing Our Capability for Strategically Tackling New Research Themes Seeking to Create World-Leading Research Results

— What is materials science?

The concept of “materials” is exceedingly broad, covering a vast diversity that includes metals, semiconductors, and insulators as well as crystal and glass materials, ceramics, polymers, and many more. These materials support technology fields in all kinds of industries, from manufacturing and construction to energy, telecommunications, medical care and welfare; moreover, each field of technology has grown along with the creation and advancement of materials. In light of this reality, it would be no exaggeration to say that today's society could not have come into being without materials. For accelerating the creation and advancement of these materials, carrying on “materials science” as an academic foundation continues to be essential.

— What is the Core Research Cluster for Materials Science?

The Core Research Cluster for Materials Science was launched in July 2017, the month after Tohoku University was named a Designated National University by Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT), an accreditation that recognizes the university's competence for providing a world-class education and research system.

With “from best in science to best in innovation” as our goal, we are bringing together researchers who have produced top-level results in materials science, physics, chemistry, mathematics and other fields in the University, transcending the boundaries of departments and research fields. Following the tradition of Research First and actively carrying on with the philosophy of Open Doors and the policy of Practice Oriented Research and Education, we are aiming to grow and strengthen our activities, based on creative research, by establishing a Core Research Cluster for Materials Science both in name and reality.

— Toward the creation of world-leading research results

The Research Center for Materials Science promotes collaboration between mathematics and materials science and other interdisciplinary fusion research and provides human resources development programs such as the International Joint Graduate Program in Materials Science to develop the next generation of global leaders. In addition, by forming global alliances with world-renowned international research centers and institutes, and serving as a brain circulation hub, we are taking on challenging research themes of growing worldwide importance and contributing to the realization of a sustainable society through innovation.

message



Director of CORE RESEARCH CLUSTER for MATERIALS SCIENCE KOTANI Motoko

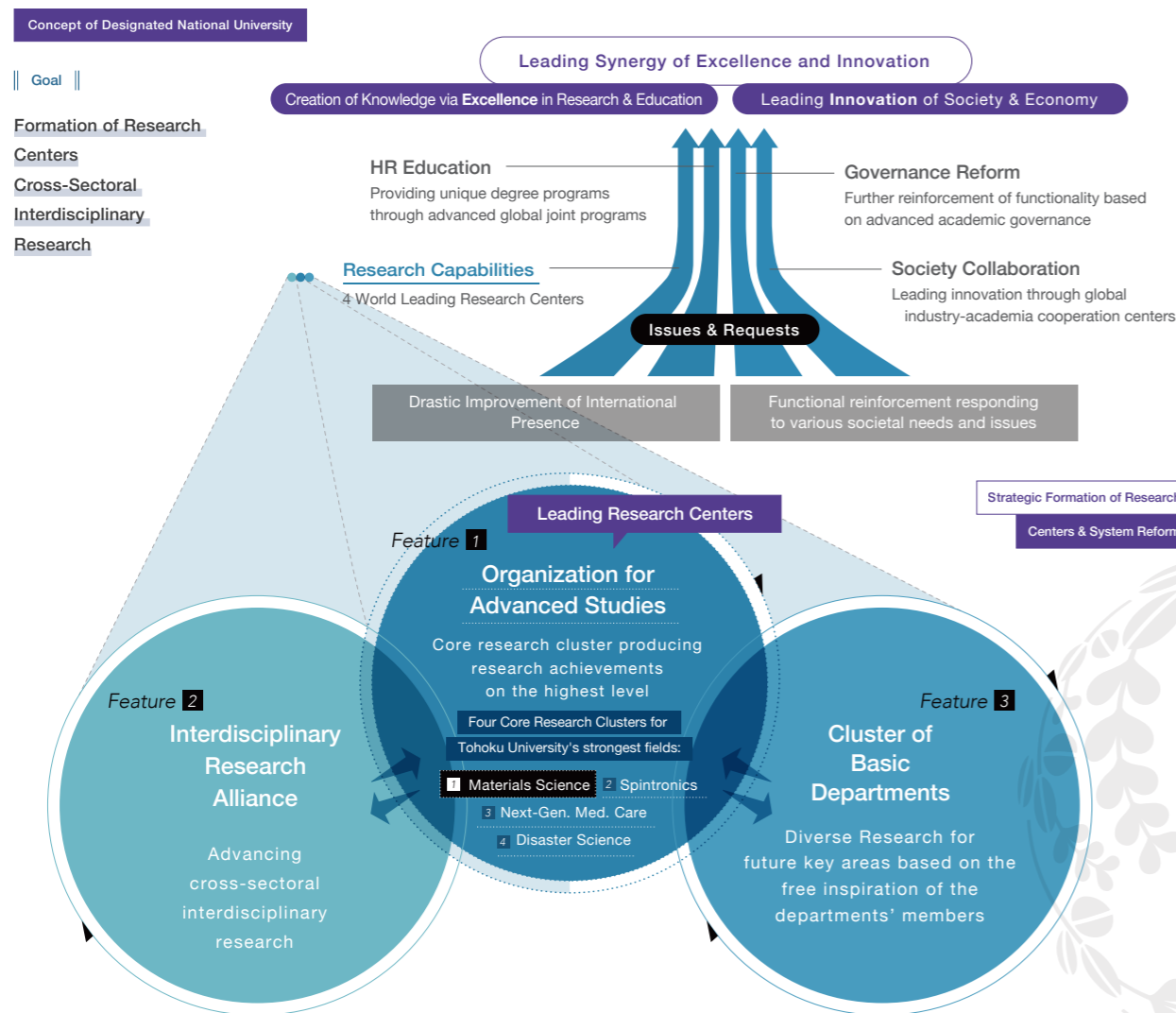
Manifesting Leading Status - A Global Top-Thirty University

Concept of a Designated National University

Construction of "Research Innovation System"

Designated National University and Core Research Cluster

In June 2017, Tohoku University was named a Designated National University by Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT), an accreditation that recognizes the university's competence for providing a world-class education and research system. As one of its efforts, the University has integrated the full scope of its outstanding institutional resources in four areas in which it has particular strengths (materials science, spintronics, next-generation medicine and disaster science) in order to establish research clusters that will generate world-class research results and create world-leading pioneering fields of research.



concept

"From Top-level Science to Innovation"

Producing Research Achievements on the Highest Level

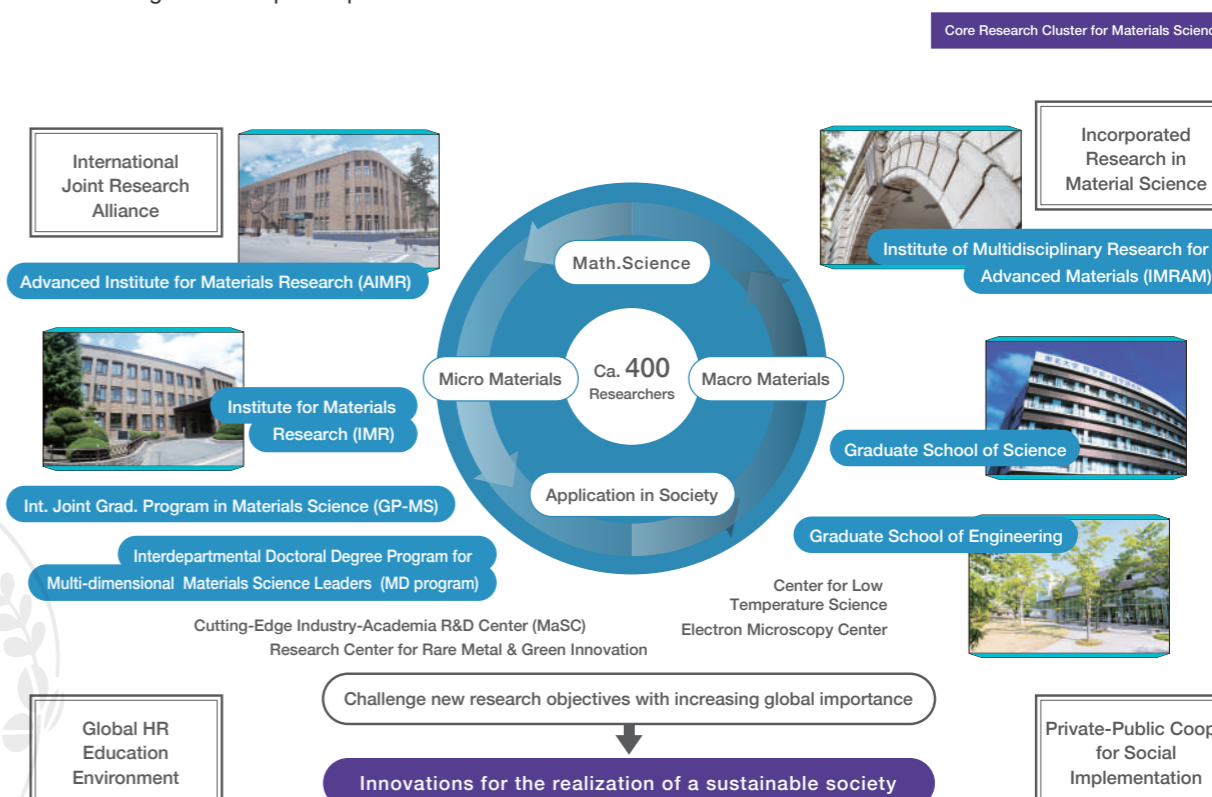
— "Top-level Science to Innovation"

The Core Research Cluster for Materials Science brings together a combination of five research institutes & graduate schools: (1) Advanced Institute for Materials Research (AIMR), established under Japan's World Premier International Research Center Program (WPI), which has an international presence through mathematics-materials science collaboration, (2) the Institute for Materials Research (IMR), which has been conducting applied research based on theories of materials science for more than 100 years, (3) the Institute of Multidisciplinary Research for Advanced Materials (IMRAM), which develops new materials science and technology research, (4) and (5) the Graduate School of Engineering and the Graduate School of Science, which have produced numerous educational and research achievements according to their founding academic philosophies.

By bringing together these five, we aim to confront new challenges which are becoming increasingly important on a global scale and contribute to the realization of a sustainable society.

— Global Alliance & Leaders Development

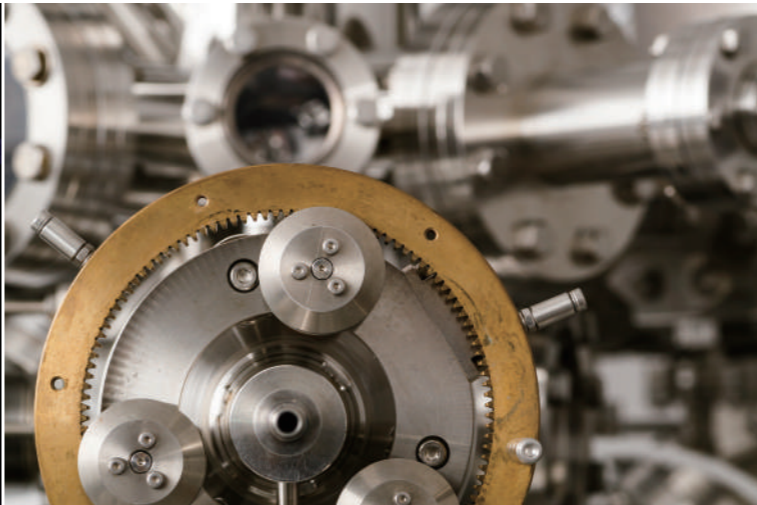
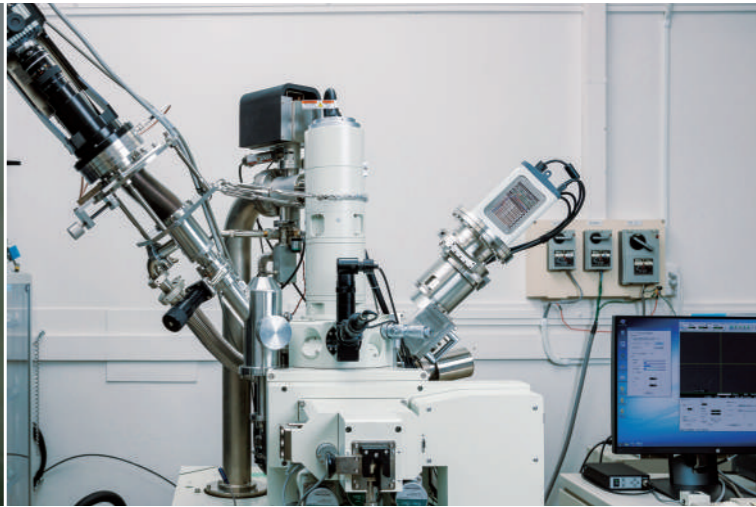
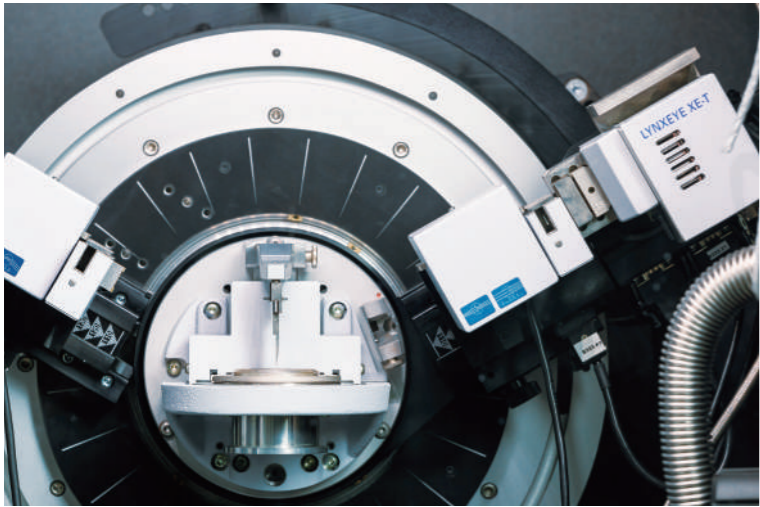
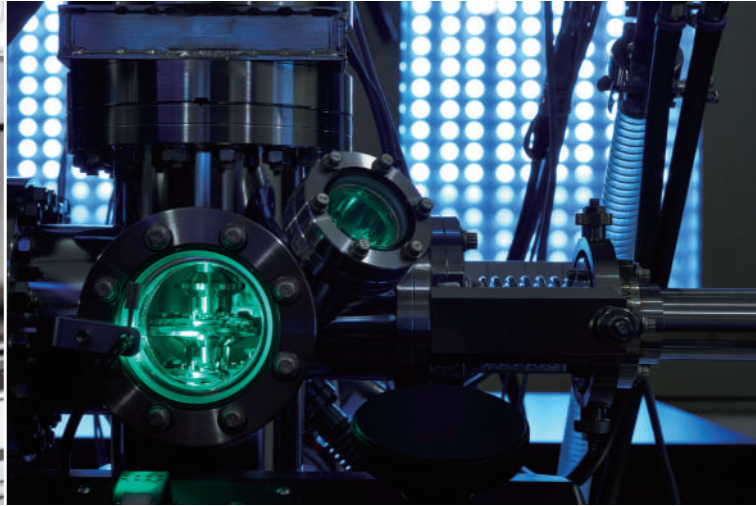
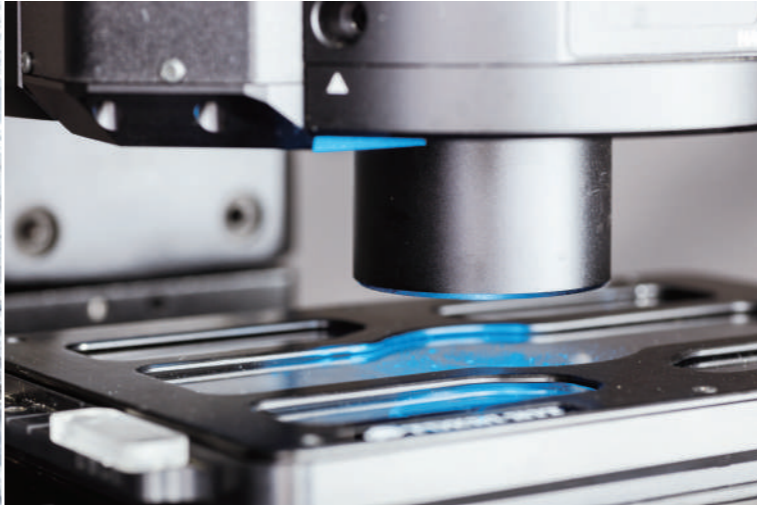
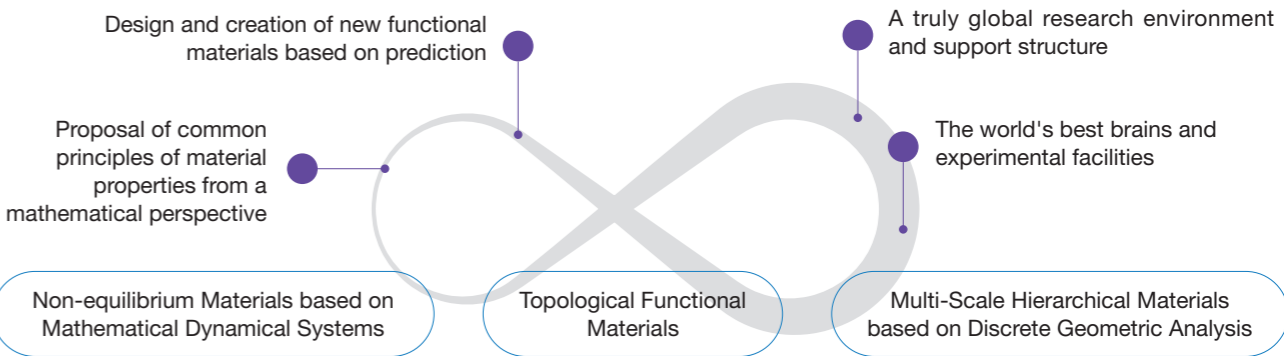
As the Core Research Cluster for Materials Science, we are building a worldwide alliance with highly renowned international research clusters to serve as a key hub for global brain circulation. Furthermore, in order to develop the global leaders, we have newly launched the International Joint Graduate Program in Materials Science and the Interdepartmental Doctoral Degree Program for Multi-dimensional Materials Science Leaders, and we are promoting the development of global leaders in collaboration with the International Joint Graduate Programs.



organization

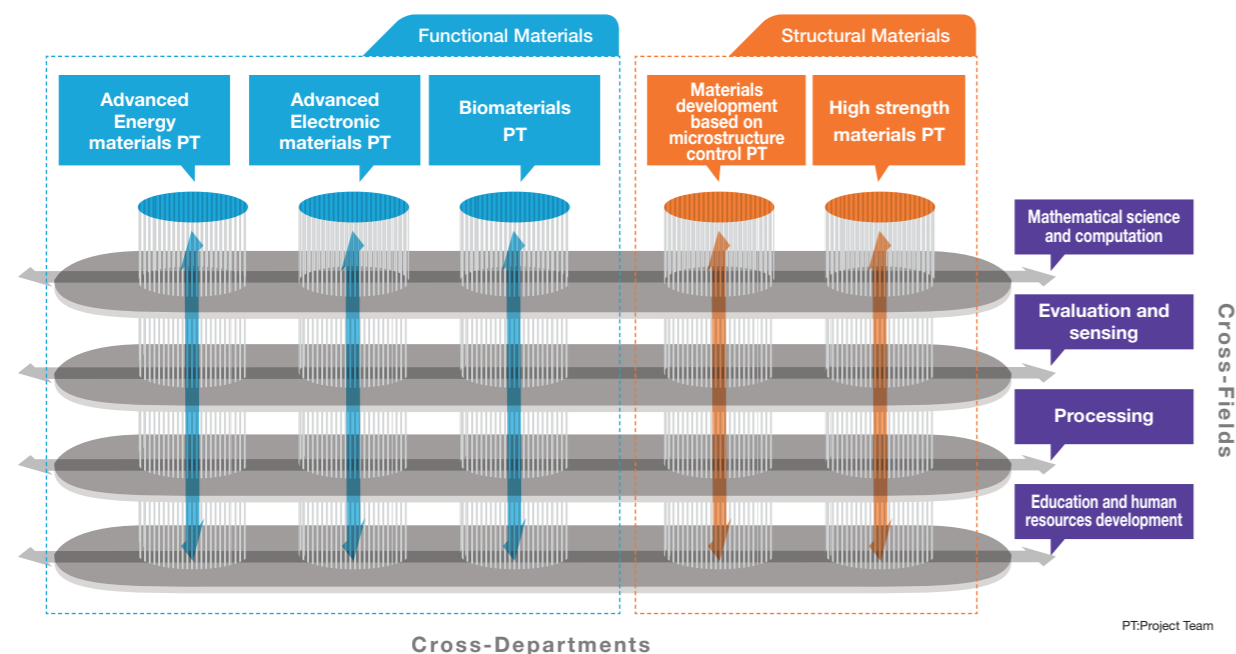
A World-First Initiative

Taking on new challenges through collaboration between materials science and mathematical science, we are seeking to create predictive materials science on the foundation of mathematical science.



Projects and Leaders

By encouraging collaboration between the cross-departmental Functional Materials Wing and Structural Materials Wing, and in cross-fields projects, we seek to take advantage of the comprehensive research strengths of Tohoku University and further enhance research and development.



Functional Materials Wing

A research pipeline strategy is concentrating and centralizing powerful existing research resources, as we wield the comprehensive research strength across the whole of Tohoku University to develop ideal energy materials going beyond traditional performance limits, and to design the necessary energy systems. By doing so, and through industry-academia collaboration and regional cooperation, we are aiming to realize an energy self-sufficient model city by 2030.

Structural Materials Wing

By creating a base for studies on atomic-level design fully guaranteed by science, multi-scale bulk structures, and structure control, we seek to accelerate research in these areas. Then by creating ultra-strong, ultra-light, and low-cost innovative structural materials, we will contribute to the realization of safe and robust urban spaces and environmentally friendly transportation and industrial equipment by 2030.

Cross-Disciplinary Projects

Through involvement of the above two wings in the following four cross-disciplinary projects, we seek to take advantage of the comprehensive research strengths of Tohoku University and further enhance research and development.

- A mathematics, mathematical science, and computational science alliance supporting the top-level core research cluster
- Research acceleration and a measurement and evaluation network transcending organizations and occupational fields, supporting formation of the Core Research Cluster for Materials Science
- Cross-organizational Evaluation and Sensing network that supports the establishment of the top-level Core Research Cluster for Materials Science
- Formation of a global human resources development cluster

project

Fusion of advanced and traditional

Cross-Organization and Fusion of Materials Research at Tohoku University

Cross department

Functional Materials
Wing Leader
Professor IMR



Cross department

Structural Materials
Wing Leader
Professor IMRAM



Advanced Energy materials PT

ORIMO Shin-ichi
Director and Principal Investigator AIMR



KISU Kazuaki
Assistant Professor



Materials development based on microstructure control PT

FUKUHARA Tadashi
Professor IMR



SUN Fei
Assistant Professor



Advanced Electronic materials PT

FUKUMURA Tomoteru
Professor Graduate school of Science/ AIMR



OKA Hirofumi
Assistant Professor



High strength materials PT

YOSHIMI Kyosuke
Professor Graduate School of Engineering



DEMIRSKYI Dmytro
Assistant Professor



Biomaterials PT

HIRANO Ayumi
Professor RIEC/ AIMR



MA Teng
Assistant Professor



Cross field

Mathematical Science and Computation

SUITO Hiroshi
Principal Investigator AIMR



Evaluation and Sensing

TERAUCHI Masami
Professor IMRAM



Processing

ADSCHIRI Tadafumi
Principal Investigator AIMR/IMRAM



Education and Human Resources Development

OIKAWA Katsunari
Professor Graduate School of Engineering



Management Research Support

KAIBE Kenji
Specially Appointed Associate Professor AIMR

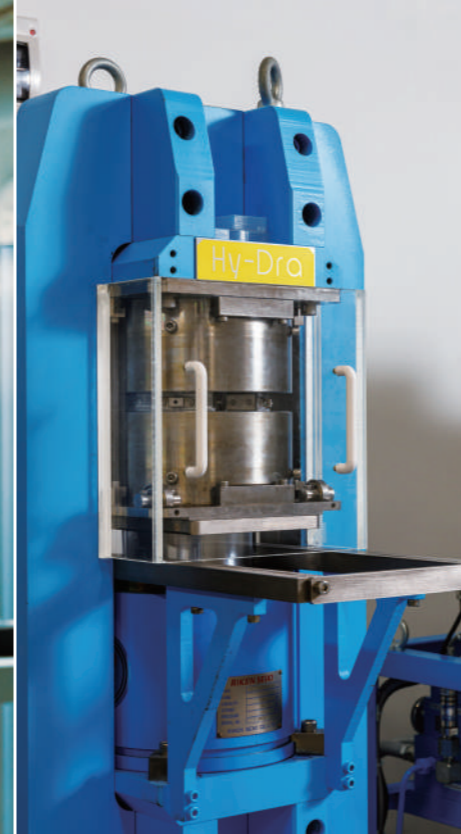


AIMR: Advanced Institute for Materials Research
IMR: Institute for Materials Research
IMRAM: Institute of Multidisciplinary Research for Advanced Materials
RIEC: Research Institute of Electrical Communication

leader



ADVANCED ENERGY MATERIALS PROJECT



Going beyond traditional performance limits

To contribute from a materials science viewpoint toward SDG No. 7 “Affordable and clean energy,” we are drawing on the top level research resources of Tohoku University, and forming alliances with institutions and researchers in Japan and overseas, to carry out research and development on advanced energy materials going beyond traditional performance limits.

Research with a broad view from basic science to social implementation

In the Advanced Energy Materials Project, research and development will be carried out from viewpoints encompassing the full range from basic research to applied research, including mathematical science, search for micro substances, creation of micro materials, and its implementation. While continuing to look at applications for practical devices and systems, we will aim to develop leading-edge energy materials for energy generation, storage, conversion, and use.

ADVANCED ENERGY MATERIALS PJ
Functional Materials

Collaboration and creation going beyond traditional limits



Core member



Project Leader

Director and Principal Investigator,
Advanced Institute for Materials
Research, Tohoku University

ORIMO Shin-ichi



Assistant Professor,
Advanced Institute for Materials
Research, Tohoku University

KISU Kazuaki



SAMUKAWA Seiji
Professor
IFS · AIMR



SUITO Hiroshi
Principal Investigator
AIMR



KONO Tatsuoki
Specially Appointed Professor
IMR



MIZUGUCHI Masaki
Associate Professor
IMR



AMEZAWA Koji
Professor
IMRAM



HONMA Itaru
Professor
IMRAM



TOKUMASU Takashi
Professor
IFS



TAKAMURA Hitoshi
Professor
Graduate School of Engineering



WADAYAMA Toshimasa
Professor
GSES

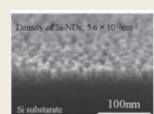


YUMOTO Michiaki
Specially Appointed Professor
IMR

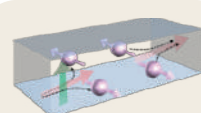
AIMR: Advanced Institute for Materials Research IMR: Institute for Materials Research
IMRAM: Institute of Multidisciplinary Research for Advanced Materials IFS: Institute of Fluid Science GSES: Graduate School of Environmental Studies

Renewable Energy

Electricity generation



High efficient solar cell
materials using quantum
dot technology

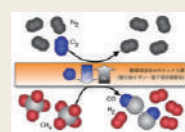


Novel materials for energy
conversion from heat
to electricity

electricity

Easy-to-use for
rechargeable
battery materials

Hydrogen
production

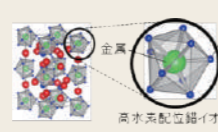


Hydrogen generation
materials from
gas and water

Electricity storage



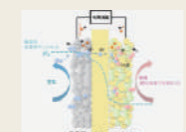
Hydrogen
storage



Hydrogen storage
materials

electricity

Electricity
generation



High performance fuel
battery materials

Sustainable Society



Hydrogen energy model city

Collaborating
with all centers
and departments
related to materials
science at
Tohoku University

ADVANCED ELECTRONIC MATERIALS PROJECT



Core member



Project Leader

Professor, Graduate School of Science and Advanced Institute for Materials Research, Tohoku University

FUKUMURA Tomoteru



Assistant Professor, Advanced Institute for Materials Research, Tohoku University

OKA Hirofumi



YAMASHITA Masahiro
Principal Investigator
AIMR · Graduate School of Science



Yong P. Chen
Principal Investigator
AIMR



SATO Takafumi
Principal Investigator
AIMR · Graduate School of Science



OHGUSHI Kenya
Professor
Graduate School of Science



TAKIMIYA Kazuo
Professor
Graduate School of Science



MATSUMOTO Yuji
Professor
Graduate School of Engineering



TSUKAZAKI Atsushi
Professor
IMR



FUJIWARA Kozo
Professor
IMR



AKUTAGAWA Tomoyuki
Professor
IMRAM



OMATA Takahisa
Professor
IMRAM



SUITO Hiroshi
Principal Investigator
AIMR

AIMR: Advanced Institute for Materials Research IMR: Institute for Materials Research IMRAM: Institute of Multidisciplinary Research for Advanced Materials

Pioneering new materials, physical properties, and functionalities

To contribute to the foundations of industry and technology innovation, and to the creation of ubiquitous clean energy and energy-saving technologies, we will build a global research network, with the outstanding research groups in the University as core, and carry out research and development on new advanced electronic materials.

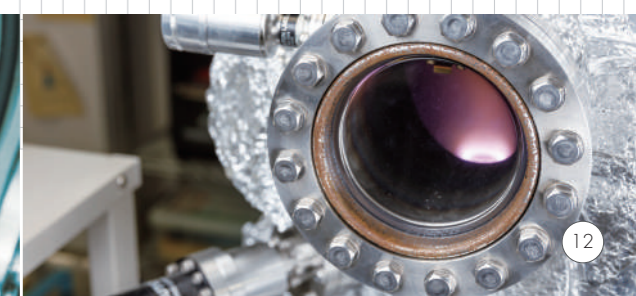
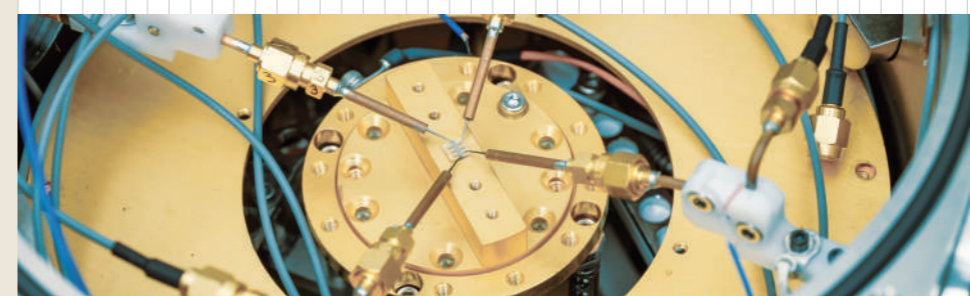
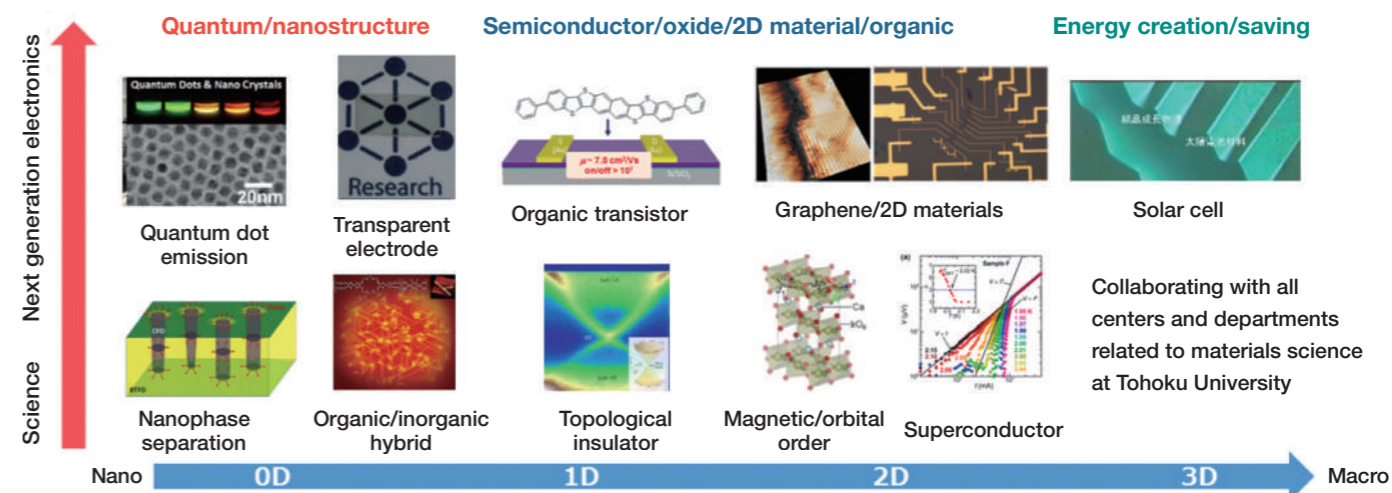
Fusion of materials synthesis technologies and physical properties research

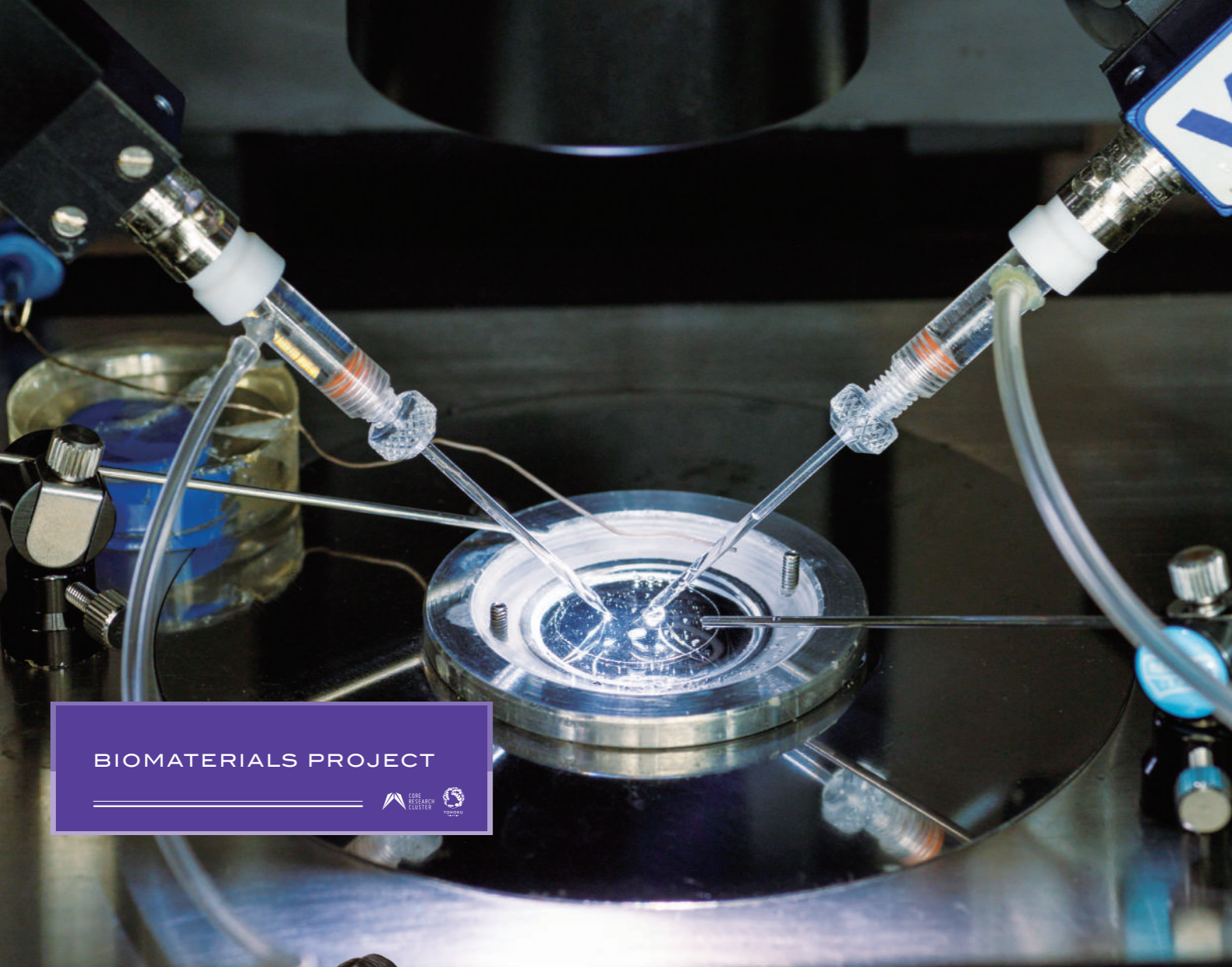
In the Advanced Electronic Materials Projects, we seek to establish new scientific principles in advanced electronic materials and to develop new materials, physical properties, and functionalities, by fusing the forefront of materials synthesis technologies and physical properties research to develop organic and inorganic electronic materials in bulk crystal, thin film, nano-structure, hetero-structure and other forms. In the future, we will aim to establish new research fields and to apply new matter, properties and functional materials to technologies for saving, creating, and storing energy.

Manipulating crystal atoms to create new matter

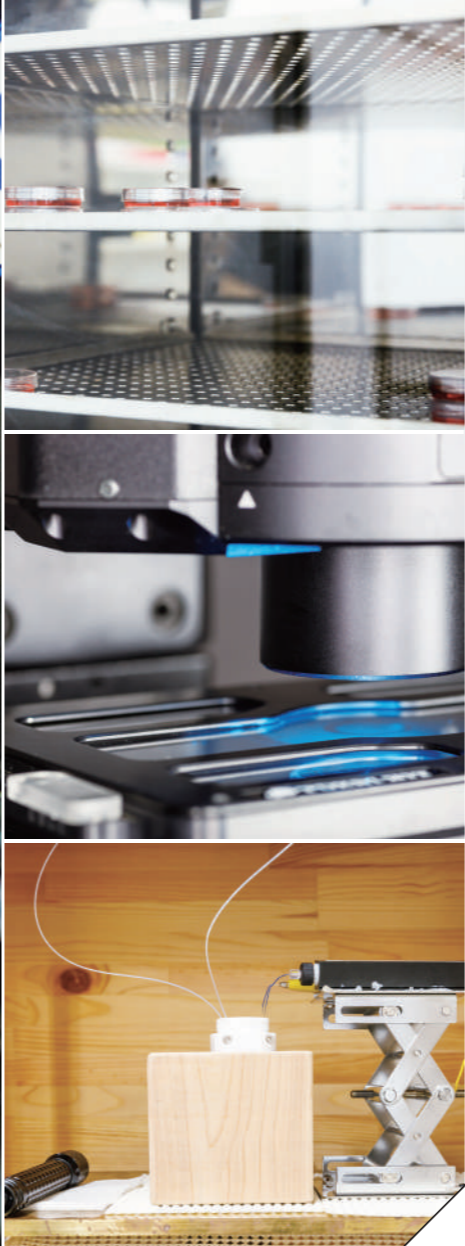
ADVANCED ELECTRONIC MATERIALS PJ

Functional Materials





BIOMATERIALS PROJECT



Creation of highly functional biomaterials and devices

We seek to create new functional biomaterials for future medical care with the aim of realizing SDG No. 3 “Good health and well-being,” as well as to contribute to SDG No. 9 “Industry, innovation and infrastructure,” and by making use of the characteristics of biomaterials with high bio-affinity, to SDG No. 12 “Responsible consumption and production.” Toward these ends, we are marshaling the comprehensive research capability of Tohoku University as a whole to develop unprecedented highly functional biomaterials.

Aiming to achieve basic technologies in support of leading-edge medical care

By fusing biomaterials and nanotechnology, we seek to create bio-hybrid materials and devices equipped with advanced functions not possible with biomaterials or artificial materials on their own—and to extend these to technologies for diagnosis and treatment. We will contribute to the realization of future medical care from the viewpoint of materials science by forming alliances with researchers in related areas in Japan and abroad, and through collaboration with mathematical science.

BIOMATERIALS PROJECT
Functional Materials
Realizing the next-generation medicine



Core member



Project Leader

Professor, Research Institute of Electrical Communication and Advanced Institute for Materials Research, Tohoku University

HIRANO-IWATA Ayumi



Assistant Professor, Advanced Institute for Materials Research, Tohoku University

MA Teng



YABU Hiroshi
Junior Principal Investigator
AIMR



HIBARA Akihito
Professor
IMRAM



KASAI Hitoshi
Professor
IMRAM



NISHIZAWA Seiichi
Professor
Graduate School of Science



IMAI Masayuki
Professor
Graduate School of Science



SHIKU Hitoshi
Professor
Graduate School of Engineering



NISHIZAWA Matsuhiko
Professor
Graduate School of Engineering



UMEZU Mitsuo
Professor
Graduate School of Engineering



YAMAMOTO Masaya
Professor
Graduate School of Engineering

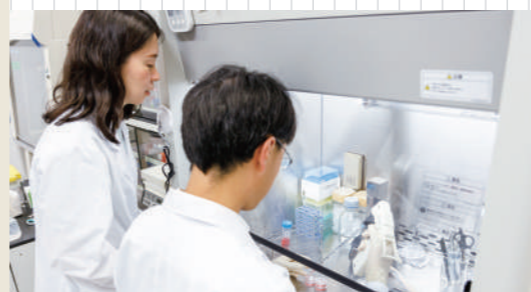
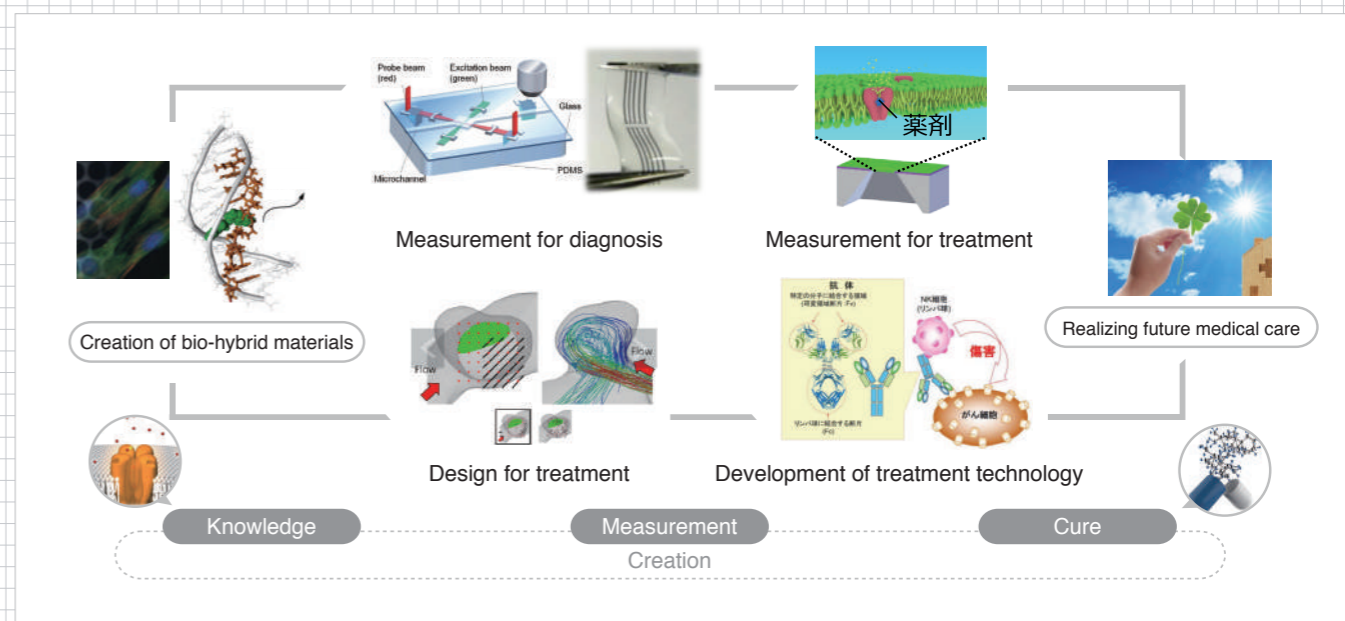


OHTA Makoto
Professor
IFS



SUITO Hiroshi
Principal Investigator
AIMR

AIMR: Advanced Institute for Materials Research IMRAM: Institute of Multidisciplinary Research for Advanced Materials IFS: Institute of Fluid Science



MATERIALS DEVELOPMENT BASED ON MICROSTRUCTURE CONTROL PROJECT



Toward the establishment of principles for leading-edge microstructure control of materials

The key to material properties is the establishment of principles for leading-edge microstructure control of materials. For this purpose, we will form alliances bringing together the top leaders at the University, and accelerate research and development on innovative structural materials that will contribute to a wide range of fields, including a safe and secure society, high energy efficiency, and bio-applications.

From improvement of materials properties to creation of innovative functions in a broad range of structural materials

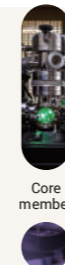
Through multi-scale application of computational science, microstructure analysis, and process design, we seek to extend the basic principles of microstructure control of materials and accelerate research and development on a wide range of innovative structural materials, from improvement of properties demanded in structural materials such as high strength and toughness, high heat resistance, and high corrosion resistance, to the expression of functions derived from the structures such as shape memory, super elasticity, and modulus design. We will aim to establish new principles of microstructure control for materials design supporting Japan's manufacturing technology.



Establishment of new materials design principles

MATERIALS DEVELOPMENT BASED ON MICROSTRUCTURE CONTROL PROJECT

Structural Materials



Core member



Project Leader
Professor, Institute for Materials Research,
Tohoku University

FURUHARA Tadashi



Assistant Professor,
Advanced Institute for Materials
Research, Tohoku University

SUN Fei



ICHITSUBO Tetsu
Professor
IMR



KAINUMA Ryosuke
Professor
Graduate School of Engineering



OIKAWA Katsunari
Professor
Graduate School of Engineering



OHTANI Hiroshi
Professor
IMRAM



CHIBA Akihiko
Professor
IMR



KATO Hidemi
Professor
IMR

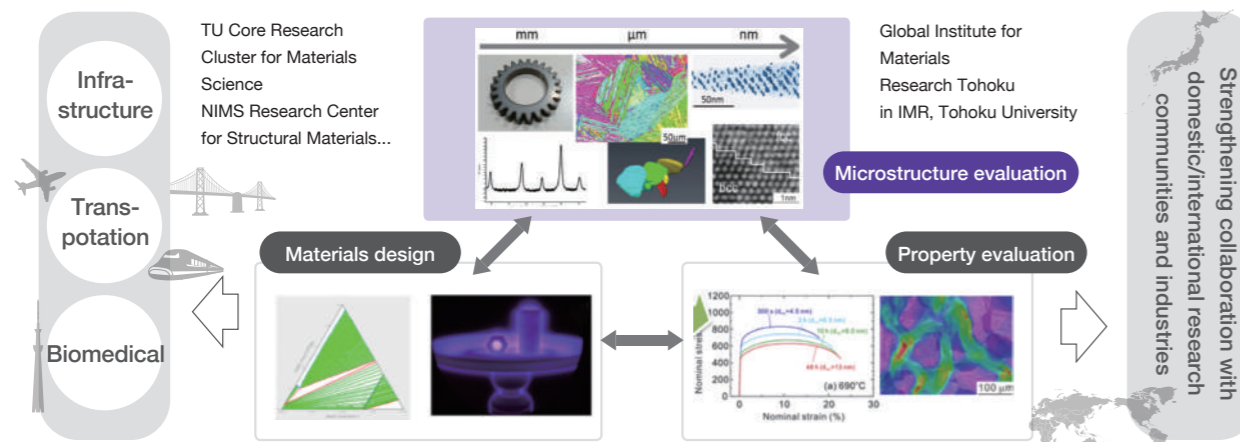


NARUSHIMA Takayuki
Professor
Graduate School of Engineering

IMR: Institute for Materials Research IMRAM: Institute of Multidisciplinary Research for Advanced Materials

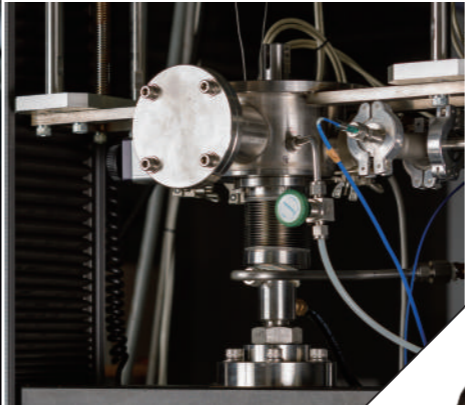
Microstructure & Processing Control by Integration of Theoretical and Experimental Researches

Realization of Superior Properties and New Functions in Structural Materials (high strength/toughness, high heat/corrosion resistance...)





HIGH STRENGTH MATERIALS PROJECT



Pioneering of high-strength, heat-resistant materials

A High-Strength Materials Synergy Science & Engineering (SS&E) laboratory will be organized as an interdisciplinary unit in Tohoku University, aimed to invent "Tohoku University brand high-strength materials" with unique heat-resistant properties, and to disseminate their information to the world.

Advanced synthesis, evaluation and testing technology, and their fusion with theory, modeling and simulation

Research and development will be carried out in accordance with materials science principles, universal to different kinds of high-strength materials. By developing an interdisciplinary graduate school education system in cooperation with the high-strength materials SSE laboratory, we will develop human resources utilizing the history and tradition of Tohoku University. On research aspect, we sophisticate (A) manufacturing and process technology including interfacial control and (B) analysis, evaluation and testing methods under extreme environments. Furthermore, by the fusion of these advanced technologies with theory, modeling and simulation, we will drive forward the establishment of a world's highest-class research and education hub for high-strength materials.



Ultra-high temperature materials with ultimate heat-resistant properties

HIGH STRENGTH MATERIALS PROJECT

Structural Materials



Core member



Project Leader

Professor, Graduate School of Engineering, Tohoku University

YOSHIMI Kyosuke



Assistant Professor, Advanced Institute for Materials Research, Tohoku University

DEMIRSKYI Dmytro



FUKUYAMA Hiroyuki
Professor
IMRAM



KATO Hidemi
Professor
IMR



KUBO Momoji
Professor
IMR



OKABE Tomonaga
Professor
Graduate School of Engineering



SHIBATA Hiroyuki
Professor
IMRAM



OGAWA Kazuhiro
Professor
Graduate School of Engineering



MIHARA Tsuyoshi
Professor
Graduate School of Engineering



ZHU Hongmin
Professor
Graduate School of Engineering



NARITA Fumio
Professor
Graduate School of Engineering



NOMURA Naoyuki
Professor
Graduate School of Engineering



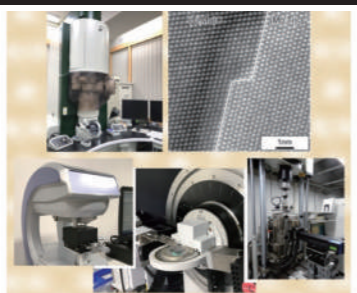
TERADA Kenjiro
Professor
IRIDeS

Synthesis and hybrid integration with interfacial control



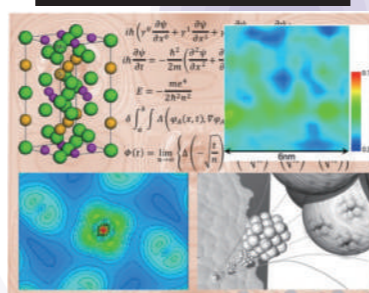
Sophistication of manufacturing technology

Analysis, evaluation and testing under extreme environments



Sophistication of analysis and testing technology

Advanced technology and theory



Modeling and simulation

Fusion

Driving the establishment of a world's highest-class research and education hub for high-strength materials



MATHEMATICAL SCIENCE AND COMPUTATION *Cross-Fields*

Common language mathematical science approach



MATHEMATICAL SCIENCE AND COMPUTATION

A mathematics, mathematical science, and computational science alliance comprehensively supporting a top-level research center



Project Leader

Principal Investigator, Advanced Institute for Materials Research, Tohoku University

SUITO Hiroshi



OHTA Makoto
Professor

IFS



KUBO Momoji
Professor

IMR



SAITO Kuniyasu
Associate Professor

RACMaS



TATE Tatsuya
Professor

Graduate School of Science



HAYASE Toshiyuki
Professor

IFS



HARADA Masaaki
Professor

GSIS

I M R : Institute for Materials Research
I F S : Institute of Fluid Science
RACMaS: Research Alliance Center for Mathematical Sciences
G S I S s : Graduate School of Information Sciences

Mathematical sciences as a common language and tool for materials research

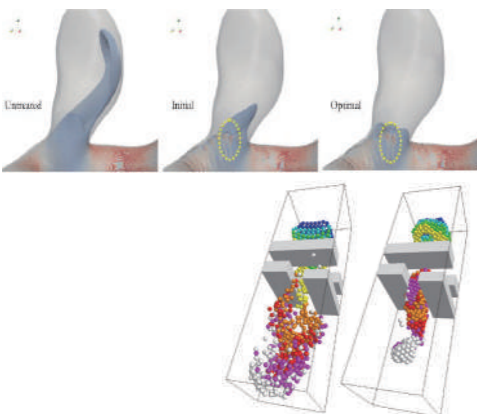
Mathematical science has been serving as a common language for a wide range of scientific fields. A methodology once known to be effective in one scientific field is applicable to other scientific fields under the comprehensive and abstract overview of mathematical sciences. Encouraging researchers involved in mathematical and computational sciences to share and exchange information can engender the development of new methodologies and common concepts. This interdisciplinary collaboration is expected to contribute to strengthen the materials science research center. Moreover, it will lead to fundamental advances in the fields of mathematical and computational sciences themselves.

By forming a cross-sectional cluster for alliance among researchers in mathematical and computational sciences at Tohoku University, we provide materials science researchers with a common language consisting of mathematical and computational tools. This cluster is expected to bridge different fields in the materials science research center, develop useful mathematical tools and viewpoints, and create new common scientific principles leading to innovation. Additionally, we expect to devise a mechanism for feeding back the results of these studies to each specialized field.



Advanced simulation

- Guaranteed high speed and reliability
- Visualization and virtual reality

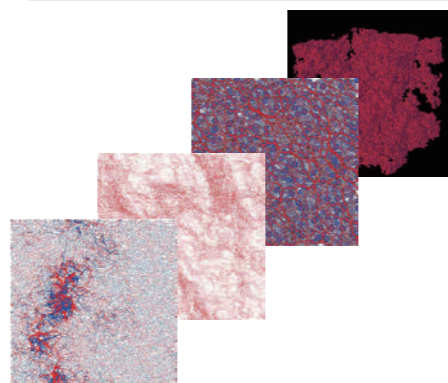


Machine learning

Data assimilation

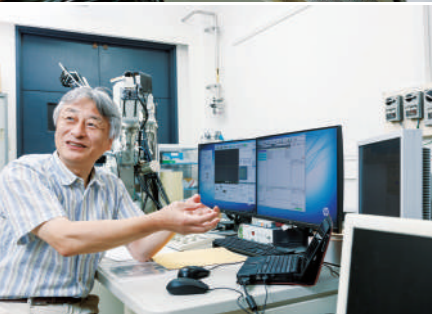
Mathematical modeling

- New mathematical models emerging from the application field
- Multi-physics/multi-scale coupled models



Mathematics and mathematical science

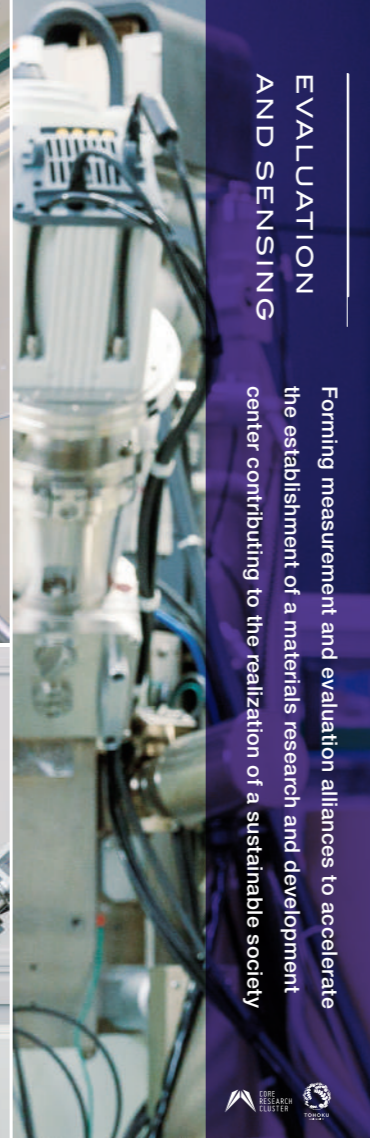
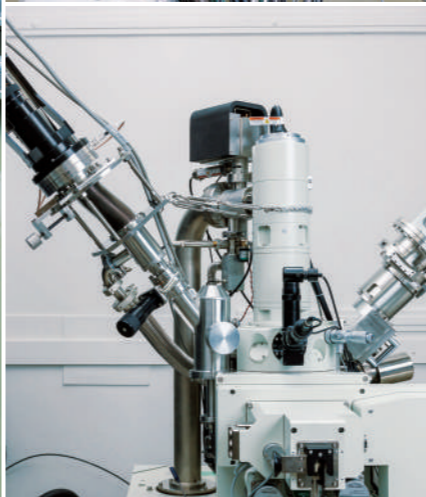
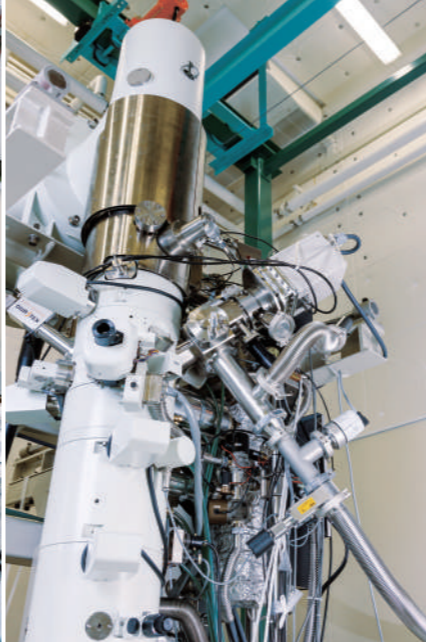
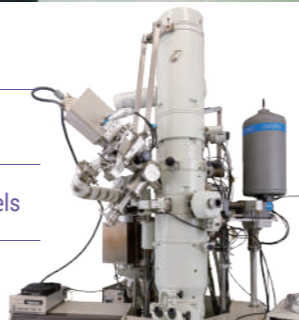
- Pure mathematics/applied mathematics
- Statistical mathematics



EVALUATION AND SENSING

Cross-Fields

Development of advanced materials with unprecedented performance levels



Core member

Project Leader

Professor, Institute of Multidisciplinary Research for Advanced Materials, Tohoku University

TERAUCHI Masami



IGARI Yoshiyuki
Head of Technical Service Section
IMRAM



KONNO Toyohiko
Professor
IMR



JINNAI Hiroshi
Professor
IMRAM



TSUDA Kenji
Professor
FRIS



MOMOSE Atsushi
Professor
IMRAM



KIMURA Hiroyuki
Professor
IMRAM



SUGIYAMA Kazumasa
Professor
IMR



SATO Yohei
Associate Professor
IMRAM

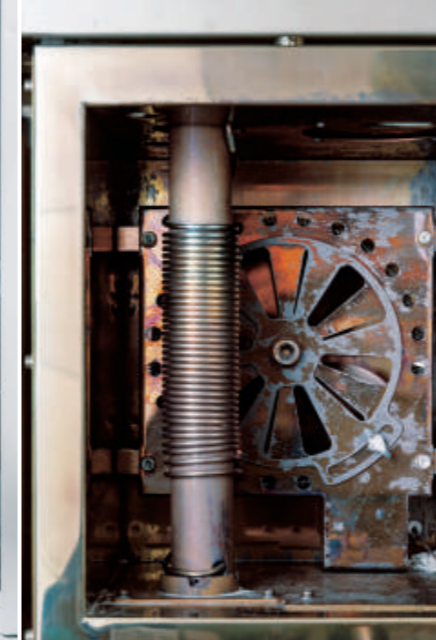
I M R : Institute for Materials Research
IMRAM: Institute of Multidisciplinary Research for Advanced Materials
F R I S : Frontier Research Institute for Interdisciplinary Sciences

Support through collaboration between microscopic analysis, measurement and evaluation infrastructure

To aid development of advanced materials going beyond traditional performance limits, we are aiming to form a measurement and evaluation infrastructure network around the core technologies of microscopic analysis and three-dimensional visualization.

In support of effective and efficient materials development, we will facilitate collaboration between researchers involved in development and application of analysis technologies, with microscopic analysis as core, and technical staff managing the shared equipment infrastructure for measurement and evaluation, while having coordinators match measurement and analysis technologies to the needs of those engaged in development of materials. Briefing sessions on analysis techniques and matching consultations will be held regularly, and collections of papers on analysis and technology applications, based on actual cases, will be prepared and made public.

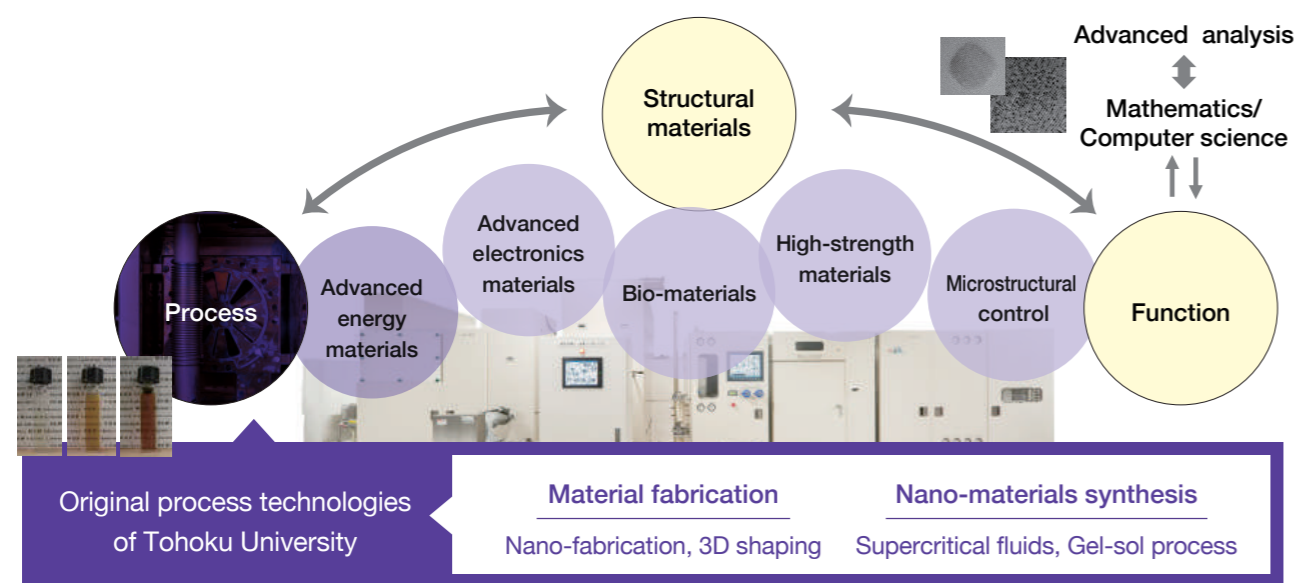




PROCESSING

Cross-Fields

Linking from structure to function



Network toward creation of innovative materials process

To contribute to SDG No. 9 “Establishment of technological innovation in the industry” from the viewpoint of materials production, we are aiming to establish a network of materials science and fundamentals that accelerate the creation of innovative and sustainable materials process.

We will promote to establish scientific fundamentals for the design and control of new materials based on the understanding of relations amongst Process—Structure—Functions of materials by organizing a network of top researchers in our university, who have their original outstanding materials processes, and by making fusion with a variety of different research fields including advanced analysis, mathematics, and computer science.



Core member

Project Leader

Principal Investigator, Advanced Institute for Materials Research, Tohoku University

ADSCHIRI Tadafumi



TSUKADA Takao
Professor
Graduate School of Engineering



INOMATA Hiroshi
Professor
Graduate School of Engineering



NAGAO Daisuke
Professor
Graduate School of Engineering



FUKUSHIMA Yasuhiro
Principal Investigator
Graduate School of Engineering



MURAMATSU Atsushi
Professor
IMRAM



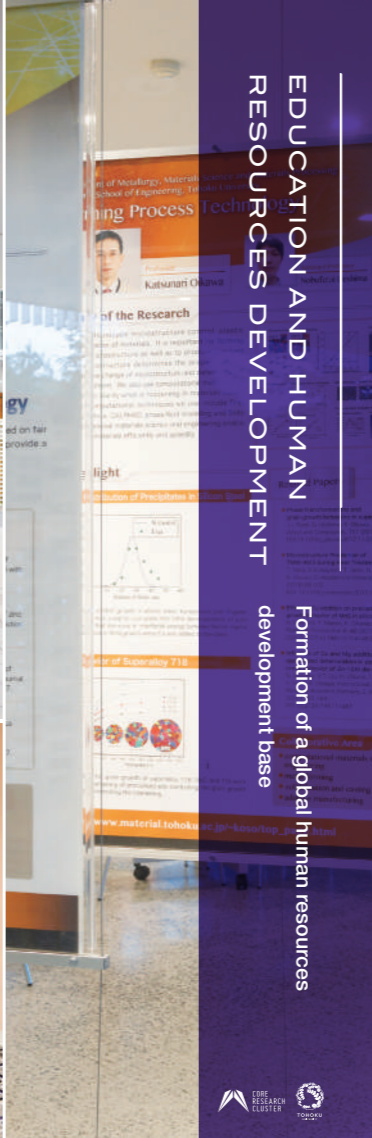
KUBO Momiji
Professor
IMR



KURIYAGAWA Tsunemoto
Professor
BME

A I M R : Advanced Institute for Materials Research
I M R A M : Institute of Multidisciplinary Research for Advanced Materials
B M E : Graduate School of Biomedical Engineering





Project Leader

Professor, Graduate School of Engineering, Tohoku University

OIKAWA Katsunari



The International Joint Graduate Program in Materials Science aims to develop global leaders in the materials science field, who possess high creativity and international capabilities for carrying on with the advancement and innovation of future science and technology.

Basic knowledge

In addition to specialized knowledge of materials science and engineering, basic related knowledge in general science

Comprehensive thinking ability

The ability to think from an overall perspective encompassing a broad range of materials science areas including diverse raw materials, invention and discovery of materials, and materials analysis and evaluation technologies

Problem discovery and solution ability

The ability to come up with suitable research themes independently and carry out research plans

Outreach skills

The capability of adequately communicating with others on a global stage by expressing, arguing and exchanging views, and by communicating research results to the public

Pioneering research capability

The capability of applying the above learned skills to play a leading role in international research projects

Development of highly creative global leaders

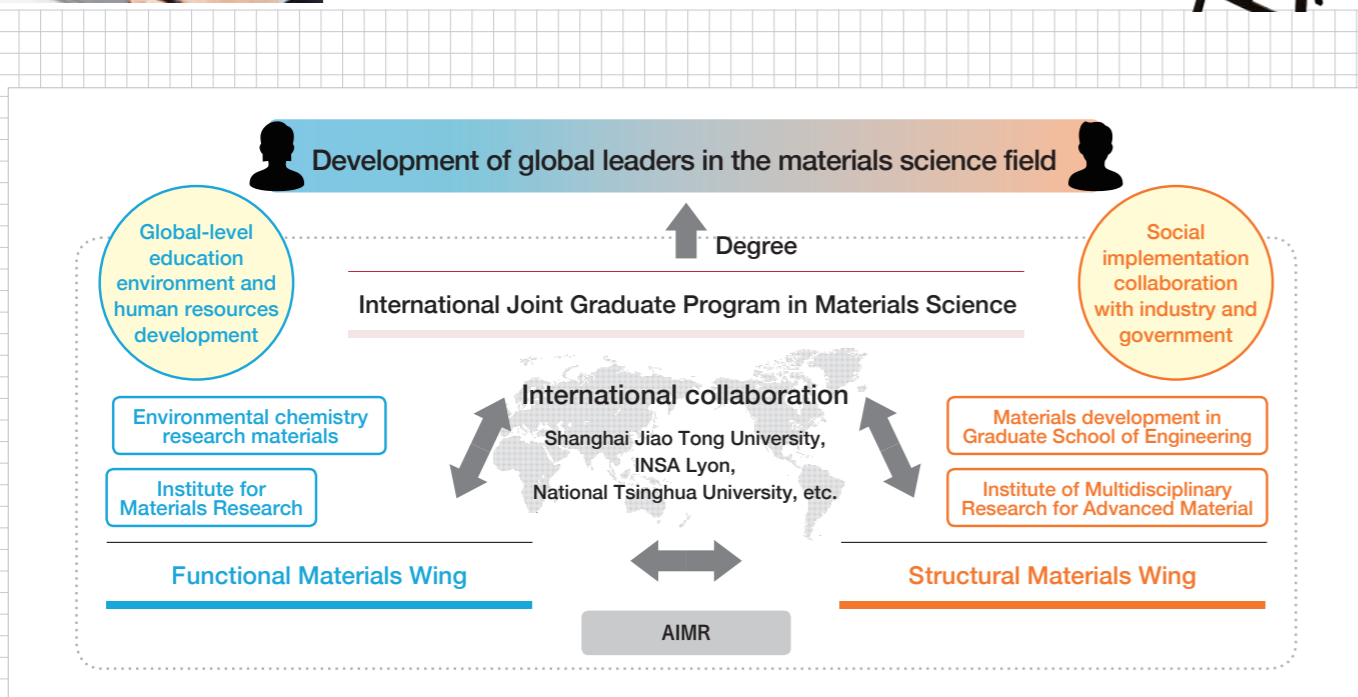
By establishing a new doctoral program with strong ties to overseas education institutions and industry-academia collaboration with private companies in the materials science area, we aim to develop internationally minded global leaders full of creativity, able to carry on with science and technology advancement and innovation.

Based on international joint educational alliances, the program will develop doctoral-level talents able to carry out pioneering research. To this end, it will include education and research initiatives across departments, in collaboration with the Functional Materials Wing and Structural Materials Wing as well as interdisciplinary projects, seeking to foster—through materials science—such capabilities as basis knowledge, comprehensive thinking ability, problem discovery and solution ability, and outreach skills.



EDUCATION AND HUMAN RESOURCES DEVELOPMENT *Cross-Fields*

Global leaders responsible for the next generation



Active promotion of fusion, collaboration, and joint research with overseas research institutions

Activities to Improve International Presence

GLOBALIZATION

Bringing together the world's top research resources and building alliances of international research centers

As a Premier Research Center for Materials Science, we are forming global alliances with world-renowned international research centers and institutes, thereby playing a role in international brain circulation as well as opening diverse research frontiers from basic science to social implementation, contributing to the realization of a future sustainable society made possible by materials science.

Promotion of international joint research and development of global resources by building global alliances, on the foundation of center formation by means of the Tohoku University Research Innovation System



Enhancement of overseas joint research laboratories and satellites



Alternate holding of regular international research symposiums



Strengthening of individual-level networks for young human resource exchanges and deepening of international cooperation

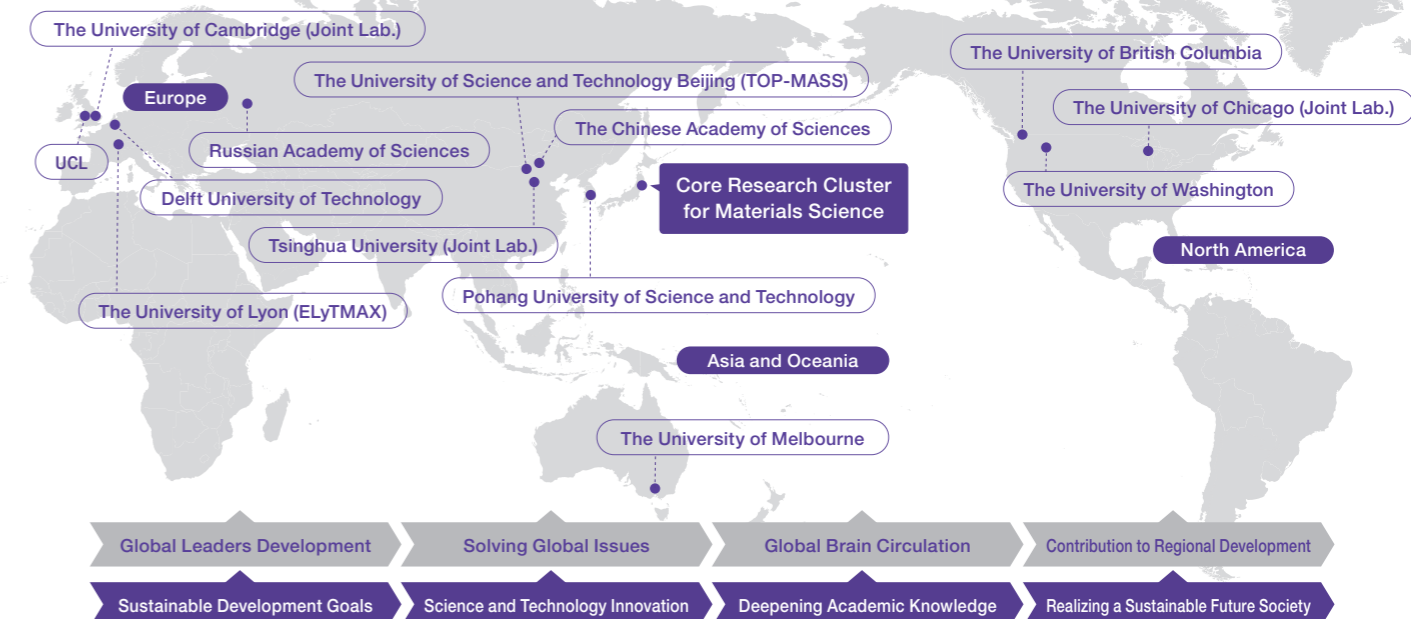


Contributing to the global society through worldwide circulation of foreign instructors and exchange students (international joint graduate programs)



ALLIANCE

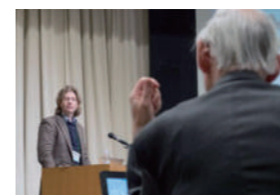
Collaboration with world-renowned international research centers Global Alliances of International Research Centers



International Symposiums / Workshops

International Symposiums

Kick-off symposium for the Core Research Clusters for Materials Science and Spintronics at Sendai International Center



Plenary Speakers
 •David Awschalom, Professor, The University of Chicago
 •Alfio Quareroni, Professor, The University of Milan, Swiss Federal Institute of Technology Lausanne
 •TSURUMARU Tetsuya, Representative Director, Chairman, Renesas Electronics Corporation
 •SAGAWA Masato, the inventor of sintered permanent magnet NdFeB
Sendai Kokusai center, Sendai

February 2018

International Symposiums

The 2nd symposium for the Core Research Clusters for Materials Science and Spintronics at Sendai International Center



Plenary Speakers
 •A. Lindsay Greer, Professor, The University of Cambridge
 •Kang L. Wang, Professor, UCLA
Sendai Kokusai center, Sendai

February 2019

Joint Workshop

Tsinghua University – Tohoku University Joint Workshop

Tsinghua University, Beijing

Started collaboration through Vice President of Tsinghua University and AIMR Principal Investigator of Tohoku University, Qi-kun Xue, and Installed a joint laboratory.



December 2017

July 2018

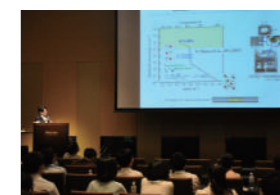


Joint Workshop

UCL – Tohoku University Joint Workshop

UCL, London

Started collaboration through AIMR Principal Investigator, Alexander Shluger



October 2018



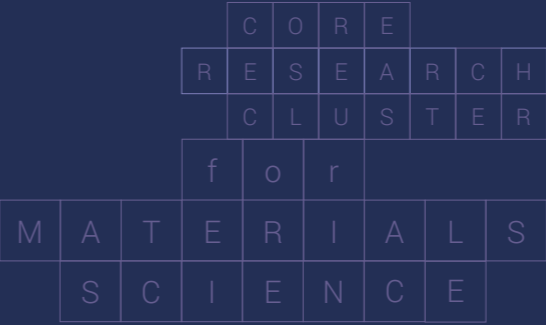
global

Accumulation of excellent research capabilities at Tohoku University

Core Research Cluster for Materials Science

Enhancement of strategic projects on new research objectives

- Advanced Institute for Materials Research
- Institute for Materials Research
- Institute of Multidisciplinary Research for Advanced Materials
- School of Engineering
- Graduate School of Science



PARTICIPATING DEPARTMENTS

- Advanced Institute for Materials Research <https://www.wpi-aimr.tohoku.ac.jp/en/index.html>
- Institute for Materials Research <http://www.imr.tohoku.ac.jp/en/>
- Institute of Multidisciplinary Research for Advanced Materials <http://www2.tagen.tohoku.ac.jp/en/outline/index.html>
- Graduate School of Engineering
 - Department of Metallurgy, Materials Science and Materials Processing <http://www.material.tohoku.ac.jp/english/>
 - Department of Applied Chemistry, Chemical Engineering and Biomolecular Engineering <http://www.che.tohoku.ac.jp/english/>
- Graduate School of Science and Faculty of Science <https://www.sci.tohoku.ac.jp/english/>

CORE RESEARCH CLUSTER for MATERIALS SCIENCE

2-1-1 Katahira, Aoba-ku, Sendai, Miyagi 980-8577 E-mail:wrc-material@grp.tohoku.ac.jp