

Collaborative Research Projects – 2022
Joint Usage/Research Center Research Center for Advanced Inorganic Materials
Laboratory for Materials and Structures,
Institute of Innovative Research, Tokyo Institute of Technology

Outline and Application Instructions

1. Outline of the Projects

The Collaborative Research Projects (hereafter, “CRP”) of the Laboratory for Materials and Structures (hereafter, “MSL”), Institute of Innovative Research, Tokyo Institute of Technology, include the following five different types of research and workshop to be carried out at MSL/ organized by MSL in collaboration with MSL faculties including Assistant, Associate, and Full Professors (hereafter, “MSL Faculties”).

International CRP (of Category A or B):

Research project conducted by a team consisting of MSL faculties and researchers of foreign organizations using the facilities, equipment, data, etc., available at MSL.

General CRP (of Category A, B or C):

Research project conducted by a team consisting of MSL faculties and researchers of other organizations, using the facilities, equipment, data, etc., available at MSL.

Topic-Specified CRP:

Research projects on one of the following topics coordinated by MSL faculties and conducted by a team consisting of MSL faculties and researchers of other organization, using the facilities, equipment, data, etc., available at MSL.

Specified Research Topics (Please see the abstracts of the topics on page 4.)

1. Establishment and Development of Heat Transfer Control Technology Using Phase Transition Phenomena
2. Fabrication of single-nanoscale electronic materials and development of devices
3. Seismic Design for Functional Continuity of Building Structures
4. Development of life innovation materials with assist of inverse design
5. Development of New Functionalities in Abundant Element Materials

International Workshop:

Small-scale international discussion meeting on a focused topic to promote MSL CRP, organized by MSL.

Workshop:

Small-scale discussion meeting on a focused topic to promote MSL CRP, organized by MSL.

*** Award for Outstanding Researchers**

The MSL Award for Research will be presented to the outstanding researchers.

*** Financial Support for Conferencing**

MSL provides financial support for conferencing.

2. Qualified Applicants

Researcher with a doctoral or an equivalent who reasonably approves the agreements on intellectual property rights with MSL. (Please see Appendix 1. the Regulation on Intellectual Property Right yielded from MSL CRP on page 9.)

(Technical staff and postgraduate students may be a collaborator for CRP.)

Project representative may apply once for International or General CRP, and once for International Workshop or Workshop, at most.

3. How to apply

Prior to application, applicant should consult with MSL faculties regarding research subject, period, and expenses, etc.

General information of MSL including organizations, faculty members, and research abstracts, can be obtained in MSL website (<https://www.msl.titech.ac.jp/english.html>).

International CRP, General CRP and Topic-Specified CRP:

Applicant should submit an application form (use Form 1 attached) to the office for MSL CRP by e-mail (suishin@msl.titech.ac.jp). The application form can be downloaded from MSL website (https://www.msl.titech.ac.jp/english/msl_crp_en/crp__en/application_forms_2022.html).

International Workshop and Workshop:

Applicant should submit an application form (use Form 2 attached) to the office for MSL CRP by e-mail (suishin@msl.titech.ac.jp). The application form can be downloaded from MSL website (https://www.msl.titech.ac.jp/english/msl_crp_en/crp_2022_en/application_forms_2022.html).

4. Period of Project

International CRP and General CRP:

About one year from April 10th 2022 to March 20th 2023

Research period may be extended up to a maximum of three years, provided that project representative of project should apply newly in each year.

International Workshop and Workshop:

Between April 10th 2022 to March 20th 2023

5. Research Expenses

Necessary expenses for the CRP or Workshop may be covered in accordance to the budget allocated.
(The airfare and public transportation fare are covered.)

6. Deadline of Application

January 7, 2022 (No application will be accepted later than the deadline.)

7. Selection and Notification

The decision shall be notified to each applicant (i.e. project representative) early in April, 2022.

8. Report of CRP / Workshop

After the completion of CRP or Workshop, representative of CRP or Workshop is required to submit “Report on CRP” or “Report on Workshop” to the office for CRP by e-mail (suishin@msl.titech.ac.jp).

The report should include a power point slide describing the results of CRP or Workshop.

9. Publication of Research Results and Others

In case of publishing the results of MSL CRP, please acknowledge the sponsorship for the collaborative research project provided by the Laboratory for Materials and Structures, and inform it to the office for MSL CRP.

Please use the following name(s), if necessary, in your acknowledgment.

1. **Laboratory for Materials and Structures, Institute of Innovative Research, Tokyo Institute of Technology**
2. **Collaborative Research Project of Laboratory for Materials and Structures, Institute of Innovative Research, Tokyo Institute of Technology**

Please note that the intellectual property rights yielded from MSL CRP are under the regulation of MSL, as stated in Appendix 1. For details of the regulation, please contact the office for MSL CRP.

10. Accommodation

Accommodations in Tokyo Institute of Technology are not available.

11. Where to submit and contact

Office for MSL Collaborative Research Projects
Laboratory for Materials and Structures,
Institute of Innovative Research, Tokyo Institute of Technology
R3-27 4259 Nagatsuta-cho, Midori-ku, Yokohama 226-8503, Japan
TEL: +81-45-924-5968 FAX : +81-45-924-5978
E-mail: suishin@msl.titech.ac.jp
URL: <https://www.msl.titech.ac.jp/english.html>

Abstracts of Topic-Specified Collaborative Research Projects

Establishment and Development of Heat Transfer Control Technology Using Phase Transition Phenomena

Representative: Hitoshi Kawaji

The control of thermal conductivity is an important issue in the heat generation and dissipation of advanced electronic devices such as highly integrated circuit, and in energy and environmental technologies such as batteries, power generation, and automobile engines. The development of new functional heat conduction control materials becomes important. In materials with metal-insulator phase transitions lead to rapid changes in thermal conductivity as well as changes in electrical conductivity. We will elucidate the phase transition mechanism of such materials whose thermal conductivity changes with external field and temperature, and develop the technology to control the thermal conductivity by compositing them with various materials.

Fabrication of single-nanoscale electronic materials and development of devices

Representative: Yutaka Majima

There still exist plenty of room at the bottom. When the size of electronic materials is reduced less than 10 nm, quantum mechanical effects and various physical phenomena on a single grain start to be observed. The semiconductor chips in smartphones are now manufactured by using a semiconductor fabrication technology node less than 10 nm, however, the same operating principles of transistors and memories have been used more than 20 years. In this project, we will fabricate single-nanoscale electronic materials by using electron-beam lithography, develop nanodevices, and demonstrate novel phenomena different from bulk electronic properties and electronic properties in a single grain.

Seismic Design for Functional Continuity of Building Structures

Representative: Shoichi Kishiki

Building structures are required to perform multiple roles, and in order to reduce economic losses due to earthquakes, it is necessary to establish seismic design for functionally continuity. In addition, it is necessary to clarify the seismic performances and damage state of not only structural members, but also non-structural components and building equipment to provide better performance. In this research, we will conduct experiments using dynamic actuator or bi-directional loading system on non-structural components and building equipment. Based on these results, seismic design to mitigate damage will be discussed.

Development of life innovation materials with assist of inverse design

Representative: Toshio Kamiya

Laboratory for Materials and Structures (MSL) has conducted a trans-university joint project for developing life innovation materials, which will contribute to resolve the current social issues such as energy, resources, environment, and medical, and consequently provide sustainable and comfortable life to us. For this purpose, MSL has developed original technology and materials by utilizing unconventional structures and functions in inorganic and metal materials. In this project, we will

develop new materials and devices that will contribute to developing such life innovation materials by combining the MSL's materials & technology with other proposed ideas.

Development of New Functionalities in Abundant Element Materials

Representative: Hidenori Hiramatsu

Development of new functionalities with abundant element systems is not only important but also timely. The functionalities that should be targeted mainly include electronics device functionalities. Bulk synthesis and film growth study, structural, electronic and magnetic characterization, and theoretical study are all relevant for the present project.

MSL faculties

Name, Extension Number and E-mail Address:

For calling from outside the campus, please dial +81-45-924- (Extension Number).

(Regarding the number marked with * , please dial +81-3-5734- (Extension Number).)

MSL Faculties	Extension	e-mail address
AZUMA Masaki	5315	mazuma@mssl.titech.ac.jp
AZUMA Yasuo	5341	azuma@mssl.titech.ac.jp
HANZAWA Kota	5134	K-hanzawa@mces.titech.ac.jp
HARA Michikazu	5311	mhara@mssl.titech.ac.jp
HIRAMATSU Hidenori	5855	h-hirama@mces.titech.ac.jp
IDE Keisuke	5855/5325	keisuke@mces.titech.ac.jp
KAMATA Keigo	5338	kamata.k.ac@m.titech.ac.jp
KAMIYA Toshio	5357	tkamiya@mssl.titech.ac.jp
KATASE Takayoshi	5855/5314	katase@mces.titech.ac.jp
KAWAJI Hitoshi	5313	kawaji@mssl.titech.ac.jp
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KITA Yusuke	5312	kita.y.ad@m.titech.ac.jp
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TATSUMI Nobuhiko	5351	tatsumi.n.aa@m.titech.ac.jp
YAMAMOTO Takafumi	5360	yama@mssl.titech.ac.jp
YASUI Shintaro	* 2906	yasui@lane.iir.titech.ac.jp

**(Excerpt) Equipment Available for Collaborative Research
at the Laboratory for Materials and Structures
[MSL Faculties to contact]**

Equipment	Staff
High-pressure synthesis apparatus SQUID Magnetometer (MPMS ; Quantum Design) High pressure synthesis apparatus (250 ton-press) Physical Property Measurement System Under High Magnetic Field Atomic Force Microscopy System X-RAY DIFFRACTOMETER	AZUMA Masaki YAMAMOTO Takafumi
Capillary gas chromatography High performance liquid chromatography Electron Spectroscopy for Chemical Analysis Infrared Spectrometer	HARA Michikazu KAMATA Keigo
SQUID Magnetometer (MPMS ; Quantum Design) High-Resolution Solid-State NMR Spectrometer (BRUKER AVANCE III HD) Single-Crystal Four-Circle Diffractometer X-ray Powder Diffractometer ³ He- ⁴ He Dilution Refrigerator	KAWAJI Hitoshi
2000kN Dynamic Loading Actuator 200tf Universal Testing Machine 500kN Temperature Variable High Rigidity Material Testing Machine Multi-Dimensional Long Stroke Loading System Reaction Frame (1000kN and 500kN Oil Jacks) Load & Displacement Control System for Structural Experiments	KISHIKI Shoichi
DATA LOGGER TDS630, Tokyo Sokki Kenkyujo Servo controlled static hydraulic pump and controlling units 4MN hydraulic jacks	KONO Susumu
”Scanning Electron Microscope” Hitachi Regulus8230	MAJIMA Yutaka
Sub-10-fs time domain spectroscopy system Femtosecond time-domain spectroscopy system	NAKAMURA Kazutaka
Equipment for single crystals growth Equipment for physical properties evaluation under extreme conditions	SASAGAWA Takao

* There is other equipment available for CRP.

Maximum budget for individual grants

Type of CRP	Category	Maximum Allocation	
		Travel	Materials and Supplies
International CRP	*A	¥ 1,000,000	¥ 400,000
	B	¥310,000	¥ 40,000
General CRP	*A	¥ 650,000	¥ 400,000
	B	¥200,000	¥ 40,000
	C	¥ 100,000	¥ 30,000
International Workshop, Workshop		¥ 600,000	¥ 120,000

* Project representative may apply once for International or General CRP, and once for International Workshop or Workshop, at most.

Appendix 1: Regulation on Intellectual Property Right Yielded From MSL CRP

•Case of researchers who belong to universities

In general, the yielded right shall belong to the researcher or his/her institute/university. In case when the contributions from researchers of Tokyo Tech to the invention you are to file as an intellectual property are recognized to be significant, Tokyo Tech shall discuss with you the property right.

When you file patents and/or intellectual property rights yielded from MSL CRP, you shall provide us at the office for MSL CRP with a copy of the filing/filed documents. (The office for MSL CRP shall strictly storage the copy and keep the secrecy of your filing.)

•Case of those other than afore-defined

In general, the yielded right shall belong to the researcher (of this category) or his/her institute/company. In case when the contributions from researchers of Tokyo Tech to the invention you are to file as an intellectual property are recognized to be significant, Tokyo Tech shall discuss with you the property right.

When you file patents and/or intellectual property rights yielded from MSL CRP, you shall provide us at the office for MSL CRP with a copy of the filing/filed documents. Moreover, in case when profits from the utilization of the filing/filed intellectual properties are anticipated, Tokyo Tech shall discuss with the right holder the consideration of the utilized facility at Tokyo Tech. (The office for MSL CRP shall strictly storage the copy and keep the secrecy of your filing.)