

Collaborative Research Projects – 2024
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. Creation of novel reaction fields through the catalyst design of multielement metal oxides
2. Elucidation and design of material functionalities based on computational and data science
3. Development of Performance Evaluating Method of Building Structures for Controlling Damage
4. Development of materials digital transformation approach and new electronic functional materials and devices

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 application forms (use Form 1 and Form1_(description) 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_2024.html).

International Workshop and Workshop:

Applicant should submit application forms (use Form 2 and Form2_(description) 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_2024_en/application_forms_2024.html).

4. Period of Project

International CRP and General CRP:

About one year from April 10th 2024 to March 20th 2025. 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 2024 to March 20th 2025

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 5th, 2024 (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, 2024.

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.

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 226-8501, 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

Creation of novel reaction fields through the catalyst design of multielement metal oxides

Representative: Keigo Kamata

In this research project, we will create innovative catalytic functions for direct conversion of inert chemical bonds under mild conditions and obtain new design guidelines for multifunctional catalysts based on our knowledge of nano-sized metal oxides. By high-functionalization and integration of catalytically active sites through multielement doping strategy, we have designed multifunctional catalysts with unique structures, valences, and active site densities that are difficult to achieve with single or two-component systems. We aim to create novel reaction fields and catalytic functions that enable the synthesis of oxygen-containing compounds and concerted catalysis with highly dense acid/base sites or metals.

Elucidation and design of material functionalities based on computational and data science

Representative: Fumiyasu Oba

It is essential to investigate the atomistic and electronic structures of materials for their understanding and design, as material functionalities originate from these microscopic structures. This project aims to elucidate the relationship between the structures and functionalities in electronic materials using computational approaches such as first-principles calculations and data-science approaches. In conjunction with experimental techniques such as spectroscopy and electron microscopy, we try to obtain and utilize information at the atomistic and electronic levels for the design of novel materials.

Development of Performance Evaluating Method of Building Structures for Controlling Damage

Representative: Koshiro Nishimura

A structural design method of buildings is changing to a performance evaluation method in recent years in Japan. Because common use of buildings after a disaster like an earthquake is often required, engineers need to evaluate the structural performances. It is needed to evaluate not only strengths but also deformations and damages because a large residual deformation may stop the common use of the building even if the structure keeps enough strength and capacity. The objective of this study is to develop a performance evaluating method of building structures, mainly concrete structures, for controlling damage.

Development of materials digital transformation approach and new electronic functional materials and devices

Representative: Toshio Kamiya

Combining data analysis as well as materials simulations and experimental materials research has become important to accelerate the development of new materials and devices. Thus, it is an urgent issue to build a new materials digital transformation system (MDX). In this project, we welcome ideas of a part of such MDX approach, its total design, or related issues.

MSL faculties

Name, Extension Number and E-mail Address:

Dial +81-45-924- followed by the extension number of each faculty member, except for *

| MSL Faculties | Extension | e-mail address |
|---------------------|------------------|--------------------------------|
| AIHARA Takeshi | 5344 | aihara.t.ab@m.titech.ac.jp |
| AZUMA Masaki | 5315 | mazuma@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 | 5304 | keisuke@mces.titech.ac.jp |
| IKOMA Toshiyuki | *+81-3-5734-2519 | tikoma@ceram.titech.ac.jp |
| ISHIHARA Tadashi | 5484 | ishihara.t.ai@m.titech.ac.jp |
| IZAWA Seiichiro | 5341 | izawa.s.ac@m.titech.ac.jp |
| KAMATA Keigo | 5338 | kamata.k.ac@m.titech.ac.jp |
| KAMIYA Toshio | 5357 | tkamiya@mssl.titech.ac.jp |
| KANDA Wataru | *+81-279-88-7715 | kanda@ksvo.titech.ac.jp |
| KATASE Takayoshi | 5314 | katase@mces.titech.ac.jp |
| KAWAJI Hitoshi | 5313 | kawaji@mssl.titech.ac.jp |
| KISHIKI Shoichi | 5332 | kishiki.s.aa@m.titech.ac.jp |
| KITANI Suguru | 5370 | kitani.s.aa@m.titech.ac.jp |
| KONO Susumu | 5384 | kono.s.ac@m.titech.ac.jp |
| KUROSAWA Miku | 5351 | kurosawa.m.ad@m.titech.ac.jp |
| MAJIMA Yutaka | 5309 | majima@mssl.titech.ac.jp |
| MATSUSHITA Nobuhiro | *+81-5734-2875 | matsushita.n.ab@m.titech.ac.jp |
| NAKAMURA Kazutaka | 5387 | nakamura@mssl.titech.ac.jp |
| NISHIMURA Koshiro | 5326 | nishimura.k.ac@m.titech.ac.jp |
| NITTA Ryosuke | 5376 | nitta.r.ab@m.titech.ac.jp |
| NOGAMI Kenji | *+81-279-88-7715 | knogami@ksvo.titech.ac.jp |
| OBA Fumiyasu | 5511 | oba@mssl.titech.ac.jp |
| PRADHAN Sujan | 5326 | pradhan.s.aa@m.titech.ac.jp |
| SASAGAWA Takao | 5366 | sasagawa@mssl.titech.ac.jp |
| SATO Daiki | 5306 | sato.d.aa@m.titech.ac.jp |
| SHIGEMATSU Kei | 5380 | kshigematsu@mssl.titech.ac.jp |
| TAKAHASHI Akira | 5343 | takahashi.a.bb@m.titech.ac.jp |
| TERADA Akihiko | *+81-279-88-7715 | terada@ksvo.titech.ac.jp |
| YAMAMOTO Takafumi | 5360 | yama@mssl.titech.ac.jp |
| YASUI Shintaro | *+81-3-5734-2906 | yasui@lane.iir.titech.ac.jp |

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

| Equipment | Contact person |
|--|-----------------------------------|
| 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 |
| High performance liquid chromatography Electron Spectroscopy for Chemical Analysis Infrared Spectrometer CHN elemental analyzer | HARA Michikazu |
| Experimental Equipment for Non-Structural Components | ISHIHARA Tadashi |
| Capillary gas chromatography | 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 Heat capacity measurement system using relaxation method | 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 1000kN hydraulic jack with 2 directional load cells | KISHIKI Shoichi |
| DATA LOGGER TDS630, Tokyo Sokki Kenkyujo Servo controlled static hydraulic pump and controlling units 4MN hydraulic jacks Concrete cylinder specimen end grinding machine | 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 Maskless Electronic Device Fabrication System | SASAGAWA Takao |

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 | ¥140,000 | ¥ 100,000 |
| | C | ¥ 30,000 | ¥ 100,000 |
| 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.)