

**Collaborative Research Projects – 2018**  
**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, B or C):**

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. Development of novel negative thermal expansion materials by manipulation of multiple orders
2. Elucidation and design of material functionalities based on computational and data science
3. Enhancement of earthquake-resistant technology based on multi-degrees-of-freedom experiment
4. Development of life innovation materials
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.

## 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 (<http://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](mailto:suishin@msl.titech.ac.jp)). The application form can be downloaded from MSL website ([http://www.msl.titech.ac.jp/english/msl\\_crp\\_en/crp\\_2018\\_en/application\\_forms\\_2018.html](http://www.msl.titech.ac.jp/english/msl_crp_en/crp_2018_en/application_forms_2018.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](mailto:suishin@msl.titech.ac.jp)). The application form can be downloaded from MSL website ([http://www.msl.titech.ac.jp/english/msl\\_crp\\_en/crp\\_2018\\_en/application\\_forms\\_2018.html](http://www.msl.titech.ac.jp/english/msl_crp_en/crp_2018_en/application_forms_2018.html)).

## 4. Period of Project

### **International CRP and General CRP:**

About one year from April 10<sup>th</sup> 2018 to March 20<sup>th</sup> 2019

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 10<sup>th</sup> 2018 and March 20<sup>th</sup> 2019

## 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 26, 2018 (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, 2018.

## **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. Award Presentations to Outstanding Research Activities**

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

## **12. 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: <http://www.msl.titech.ac.jp/english.html>

## **Abstracts of Topic-Specified Collaborative Research Projects**

### **Development of novel negative thermal expansion materials by manipulation of multiple orders**

**Representative: Masaki Azuma**

There is a growing concern about the deviation of positioning owing to thermal expansion of structure materials in the fields of advanced electric devices such as power semiconductors and 3D-ICs and energy materials for thermopower and electric fuel cells. Control of thermal expansion is indispensable for the break-through. Our goal is the establishment of thermal expansion control technique through the development of novel giant negative thermal expansion materials by utilizing the charge, orbital, spin and phonon degrees of freedom in solids and the manipulations of these orderings as well as the understanding of thermodynamics of the materials.

### **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 at elucidating 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 level for the design of novel materials.

### **Enhancement of earthquake-resistant technology based on multi-degrees-of-freedom experiment**

**Representative: Satoshi Yamada**

Recently enhanced earthquake-resistant technologies are developed including base-isolated technology and passive control technology. High earthquake-resistant performance is already utilized in many buildings by those technology. However, those technologies are supported by the experiment in which specimens are basically subjected in-plane behavior.

Existing buildings have three-dimensional shape and also earthquake acts on buildings as three-dimensional external force. In this research, enhancement of earthquake-resistant technology based on the experiments which reproduces complicated stress condition of structural components under real earthquake is studied.

### **Development of life innovation materials**

**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: Hideo Hosono**

We are pleased to call for abstracts of MSL Collaborative Research Projects on “Development of New Functionalities in Abundant Element Materials”. It is not only important but also timely to develop new functionalities with abundant element systems. The functionalities that should be targeted include electronics and ionics device functionalities and catalytic activities. 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).

MSL Faculties	Extension	e-mail address
AZUMA Masaki	5315	mazuma@msl.titech.ac.jp
AZUMA Yasuo	5341	azuma@msl.titech.ac.jp
FUJITA Shinnosuke	5385	fujita.s.ag@m.titech.ac.jp
HARA Michikazu	5311	mhara@msl.titech.ac.jp
HIRAMATSU Hidenori	5855/5314	h-hirama@mces.titech.ac.jp
HOSONO Hideo	5009	hosono@msl.titech.ac.jp
IDE Keisuke	5855	keisuke@mces.titech.ac.jp
IIMURA Soshi	5134	s_iimura@mces.titech.ac.jp
ISHIDA Takanori	5330	ishida.t.ae@m.titech.ac.jp
ITOH Mitsuru	5354	Mitsuru_Itoh@msl.titech.ac.jp
KAMATA Keigo	5338	kamata.k.ac@m.titech.ac.jp
KAMIYA Toshio	5357	tkamiya@msl.titech.ac.jp
KATASE Takayoshi	5855 /5314	katase@mces.titech.ac.jp
KAWAJI Hitoshi	5313	kawaji@msl.titech.ac.jp
KISHIKI Shoichi	5332	kishiki.s.aa@m.titech.ac.jp
KITA Yusuke	5312	kita.y.ad@m.titech.ac.jp
KONO Susumu	5384	kono.s.ae@m.titech.ac.jp
MAJIMA Yutaka	5309	majima@msl.titech.ac.jp
NAKAMURA Kazutaka	5397	nakamura@msl.titech.ac.jp
OBA Fumiyasu	5511	oba@msl.titech.ac.jp
SASAGAWA Takao	5366	sasagawa@msl.titech.ac.jp
SATO Daiki	5306	sato.d.aa@m.titech.ac.jp
TANIYAMA Tomoyasu	5632	taniyama@msl.titech.ac.jp
WAKAI Fumihiro	5361	wakai@msl.titech.ac.jp
YAMADA Satoshi	5330	yamada.s.ad@m.titech.ac.jp
YASUI Shintaro	5626	yasui.s.aa@m.titech.ac.jp

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

<b>Equipment</b>	<b>Staff</b>
High-pressure synthesis apparatus SQUID Magnetometer ( MPMS ; Quantum Design )	AZUMA Masaki
Physical Property Measurement System Under High Magnetic Field Visible and Near-Infrared Raman Spectrometer X-RAY DIFFRACTOMETER Atomic Force Microscopy System Electron Probe Micro Analyzer Environment Control Atomic Force Microscopy System	ITOH Mitsuru
SQUID Magnetometer ( MPMS ; Quantum Design ) High-Resolution Solid-State NMR Spectrometer (BRUKER AVANCE III HD) Single-Crystal Four-Circle Diffractometer X-ray Powder Diffractometer <sup>3</sup> He- <sup>4</sup> He Dilution Refrigerator	KAWAJI Hitoshi
2000kN Dynamic Loading Actuator	KISHIKI Shoichi
Scanning Electron Microscope	MAJIMA Yutaka
Short-pulsed laser irradiation system Femtosecond time-domain spectroscopy system	NAKAMURA Kazutaka
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)	YAMADA Satoshi

\* 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	¥250,000	¥ 40,000
	C	¥ 150,000	¥ 30,000
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.)