

Special Research Projects

IMS has special research projects supported by national funds. Three projects in progress are:

- MEXT Nanotechnology Platform Program
Platform of Molecule and Material Synthesis
- Inter-University Network for Efficient Utilization of Research Equipments
- MEXT Program Advanced Research Infrastructure for Materials and Nanotechnology in Japan:
Spoke Organization in Advanced Material Circulation Techniques

These three projects are being carried out with close collaboration between research divisions and facilities. Collaborations from outside also make important contributions. Research fellows join these projects.

(a) MEXT Nanotechnology Platform Program Platform of Molecule and Material Synthesis

Since July 2012, Nanotechnology Platform Program supported by Ministry of Education, Culture, Sports, Science and Technology (MEXT) has been conducted in order to promote public usage of various nanotechnology facilities. This program will continue until March 2022 and consists of three platforms of nanostructure analysis, nanoprocessing, and molecule and material synthesis, together with the management center of the platforms. Each platform consists of about ten organizations all over Japan. IMS conducts a representative core organization of the Molecule and Material Synthesis Platform. All the organizations in this platform are shown in Figure. In this platform, to promote green and life innovation researches using nanotechnology related techniques not only

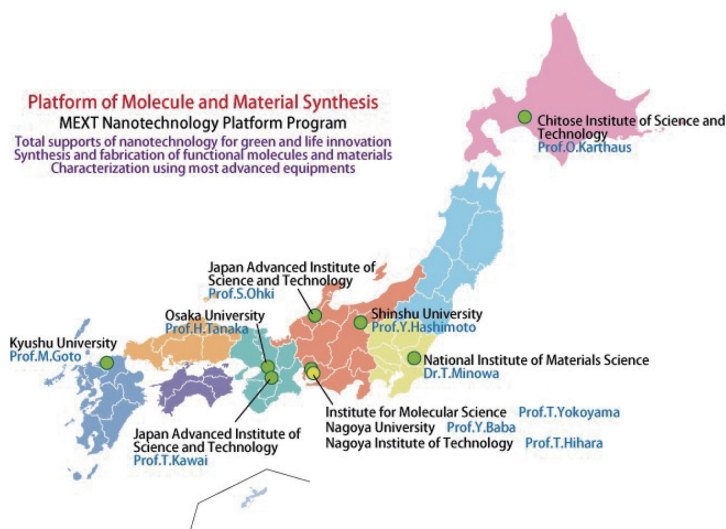
for universities and government institutes but also for private companies, we will open various kinds of our facilities with total supports including molecular synthesis, materials fabrications, characterization, data analysis and scientific discussion. We will encourage applications not only to each element, but to combined usage of several supporting elements for biotechnology and green chemistry. In IMS, the number of accepted proposals in FY2020 amounted 128 (111 non-proprietary and 10 proprietary proposals, excluding inhouse applications from IMS) and the total number of days used for the supports is 2127 (1960 days for non-proprietary proposals and 50 days for proprietary ones).

List of Supports in IMS (FY2020)

Supporting Element		Responsible Persons	Charging Persons
Platform Management		T. Yokoyama	M. Ohara, Y. Toyama
Organization Management in IMS			Y. Hyodo, Y. Funaki
UVSOR Synchrotron Radiation	X-Ray Magnetic Circular Dichroism	T. Yokoyama	T. Koitaya, K. Yamamoto, O. Ishiyama
Microstructure Fabrication	Maskless Lithography with Step Gauge	H. Yamamoto	M. Aoyama, T. Kondo, N. Takada, S. Kimura, T. Kikuchi, N. Mizutani, A. Ishikawa
	3D Optical Surface Profiler		
Equipment Development	Machine Shop		M. Aoyama, T. Kondo, T. Toyota, J. Mathuo
Electron Microscopy	Field Emission Scanning Electron Microscopy	T. Yokoyama	O. Ishiyama, A. Toyama
	Low Vacuum Analytical Scanning Electron Microscopy		S. Iki, T. Ueda, M. Uruichi
	Field Emission Transmission Electron Microscope		Y. Okano
X-rays	Single Crystal X-Ray Diffractometer	T. Yokoyama	M. Fujita, T. Mitsushashi
	Low Temperature Single Crystal X-Ray Diffractometer for Microcrystals		M. Fujiwara
	Molecular Structure Analysis using Crystalline Sponge Method		G. Kobayashi, F. Takeiri, M. Fujiwara
	Powder X-Ray Diffractometer		A. Mukaiyama
	Operando Multi-Purpose X-Ray Diffraction		
	Small Angle X-Ray Scattering for Solutions	S. Akiyama	
Electron Spectroscopy	Angle Resolved Ultraviolet Photoelectron Spectroscopy for Functional Band Structures	S. Kera, K. Tanaka	S. Ideta

PROGRAMS

Electron Spin Resonance	Pulsed High Field ESR	T. Yokoyama, T. Nakamura	M. Asada, M. Fujiwara, S. Iki, T. Ueda
	X-Band CW ESR		
	X, Q-Band CW ESR		
SQUID	Superconducting Quantum Interference Device		M. Asada, M. Fujiwara, S. Iki
Thermal Analysis	Differential Scanning Calorimeter (Solutions)	T. Yokoyama	T. Mizukawa, M. Uruichi, H. Nagao
	Isothermal Titration Calorimeter (Solutions)		
	Calorimeter for solids		
Mass Spectrometer	Matrix Assisted Laser Desorption/Ionization Time of Flight Mass Spectrometer		M. Fujiwara T. Mizukawa, M. Uruichi, K. Fujikawa
Spectroscopy	Microscopic Raman Spectroscopy	T. Yokoyama	M. Uruichi
	Fourier Transform Far Infrared Spectroscopy		
	Fluorescence Spectroscopy		
	Ultraviolet & Visible Absorption Spectroscopy		
	Circular Dichroism		T. Ueda T. Mizukawa, M. Uruichi, K. Fujikawa
Lasers	Picosecond Laser		T. Ueda
High Field NMR	800 MHz Solutions, Cryostat Probe	K. Kato	M. Yagi, S. Yanaka, Y. Isono
	600 MHz Solids	K. Nishimura	
	600 MHz Solutions	T. Yokoyama	T. Mizukawa, M. Uruichi, H. Nagao
Functional Molecular Synthesis and Molecular Device Fabrication	Organic Thin Film Solar Cells	M. Hiramoto	S. Izawa
	Organic Field Effect Transistors	H. Yamamoto	D. Hirobe
	Functional Organic Synthesis	N. Momiyama, T. Suzuki	N. Ohtsuka, T. Fujinami
	Large Scale Quantum Mechanical Calculations	M. Ehara	
	Magnetic Thin Films	T. Yokoyama	T. Koitaya, K. Yamamoto
	Metal Complexes	T. Kusamoto	R. Matsuoka
	Inorganic Materials	G. Kobayashi	F. Takeiri
	Biomolecule System	S. Akiyama	A. Mukaiyama, Y. Furuike
	Supplementary Apparatus in Instrument Center	T. Yokoyama	



(b) Inter-University Network for Common Utilization of Research Equipments

It is highly important to improve instrumental supporting environments for research and education in the field of science and engineering. Nowadays, advanced research instruments are indispensable for conducting researches and educations with high standard quality. To install such sophisticated instruments, tremendous amount of budgets would be necessary. In 2007, for constructing a national-wide network to provide easy accesses to high-level equipments to researchers and students in universities all over Japan, the five-year project “Functioning of Inter-University Network for Efficient Utilization of Chemical Research Equipments” was launched. The network maintains an internet machine-time reservation and charging system by the help of equipment managers and accounting sections in each university. 72 national universities as well as Institute for Molecular Science (total 73 organizations) all over Japan have been participating in the network. They are grouped into 12 local regions and in each region the regional committee discusses and determines the operation of regional

network systems with the hub university chairing. There is no barrier for every user to access to any universities beyond his/her regional group. From 2009, the registered equipments are open to the researchers and students of all the public (prefectural *etc.*) and private universities. Since 2010, the project has been renamed “Inter-University Network for Common Utilization of Research Equipments” still keeping the original strategy and stable functioning. Since 2018, the institutions that provide research facilities are open to public and private universities. Currently, the network is organized by 78 organizations. The number of registered users amounts to 15,000 in 500 universities/institutions/companies covering over 4,000 laboratories in Japan (July, 2021). Network usage reaches about 150,000 times a year, and the number continues to grow. Moreover, we have actively provided various opportunities where technical staffs and users can improve their technical skills and frankly communicate with each other.

(c) MEXT Program Advanced Research Infrastructure for Materials and Nanotechnology in Japan: Spoke Organization in Advanced Material Circulation Techniques

In fiscal year of 2021, “Advanced Research Infrastructure for Materials and Nanotechnology in Japan” program supported by Ministry of Education, Culture, Sports, Science and Technology (MEXT) just started, succeeding to MEXT Nanotechnology Platform program that will be finished in 2021. In this new program, six Hub&Spoke teams are constructed with the Center Hub of National Institute of Materials Science (NIMS), and IMS belongs to the Hub&Spoke team of Advanced Material Circulation Techniques with NIMS (Hub), Nagoya Institute of Technology (Spoke), and The University of Electro-Communications (Spoke). Domestic and international equipment sharing is a most important purpose in this program as in the Nanotechnology Platform program. Moreover, users and staffs are requested to provide experimentally obtained data to

the Data Platform that are being constructed in NIMS. The accumulated data will be open to all researchers for future material scientific investigations. Human resource development is also an important aim in this program. In IMS, this program is mainly managed by Instrument Center, supported by Research Center for Computational Science in data storage and transfer to NIMS Data Platform. Although practical executions start from next fiscal year, similar equipment sharing will be conducted as in the Nanotechnology Platform program. In 2021, a new electron spin resonance system will be installed through the program. We hope that this program will successfully be performed and equipment sharing usage in IMS will further be accelerated.