Integrated Research Center for Sustainable Energy and Materials

Institute of Industrial Science The University of Tokyo

2019–2020

Integrated Research Center for Sustainable Energy and Materials Institute for Industrial Science 2019–2020

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Representative Activities

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International research center to realize a sustainable society through the fusion of materials engineering and energy engineering

On April 1, 2016, the "Integrated Research Center for Sustainable Energy and Materials (IRCSEM)" was established as our new research center. IRCSEM consists of 4 units as shown on page 5, with 10 principal investigators as core members and 5 principal investigators as support members.

In order to realize a sustainable society, it is imperative to not only recycle resources and materials at a higher level, but also use energy at a higher efficiency. Our center provides the first such platform in Japan to promote the fusion of energy engineering and materials science. In close collaboration with research institutions around the world, we will promote leading R & D in the highly advanced use of energy and resources, recycling of resources and materials, and creation of materials and systems with low environmental impact.

Furthermore, IRCSEM will plan to develop human resources who will play key roles in the next generation, through cooperation with our Endowed Research Unit for Non-ferrous Metals Resource Recovery Engineering (JX Metal Endowed Unit) and also industries related to the fields of our research.

Director Toru H. Okabe

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Core Members



Director Toru H. Okabe, Professor



Deputy Director Naoko Yoshie, Professor



Hiroyuki Inoue, Professor



Keiichi Edagawa, Professor



Naoki Shikazono Professor



Takeshi Yoshikawa, Associate Professor



Shunsuke Yagi, Associate Professor



Shuji Owada, Visiting Professor



Katsunori Yamaguchi, Visiting Professor



Atsushi Shibayama, Visiting Professor

Support Members



Yumiko Iwafune, Project Professor



Ryozo Ooka, Professor



Kazuhiko Ogimoto, Project Professor



Chiharu Tokoro, Project Professor



Takashi Nakamura, Project Professor

Research Units

Resources/Materials Recycling Unit: Design of Resources/Substances/Materials Flow and Process Control

>Process development based on international material flow

- Analysis of generation, immobilization, and recycling of hazardous substances
- >Development of recycling processes for exhaustible resources
- >Improvement of production technologies for base materials
- >Development of highly efficient electrolytic smelting processes

Members : Prof. T. H. Okabe, Assoc. Prof. S. Yagi, Visit. Prof. K. Yamaguchi, Visit. Prof. A. Shibayama

Recovering of PGMs from automobile scraps

Energy/Resources Efficient Utilization Unit: Base Engineering for a Low Energy Consumption Society

Solution growth of eco-semiconductors SiC and AIN using alloy solvent

- >Determination of economic indicators for energy and materials market
- ➤Improvement of power density and reliability of solid oxide fuel cell
- Development of novel heat technologies for heat engines and heat pumps

Members: Prof. N. Shikazono, Assoc. Prof. T. Yoshikawa

Advanced Substances/Materials Design Unit: Materials Engineering for Maximized Utilization of Resources/Substances

- Design and fabrication of polymers and glasses with a reduced environmental load
- >Development of chemical technologies for biomass utilization
- >Mechanical properties of environmentally sound materials
- >Development of novel high-efficiency thermoelectric materials

Members: Prof. N. Yoshie, Prof. H. Inoue, Prof. K. Edagawa

Establishment of Social Implementation Promotion Unit: Strong Cooperation with Industry

- >Development of ultra-long-life materials
- >Atomic-scale optimization for prolonging lifetime of materials
- >Optimization of waste treatment of huge amounts of structural materials
- >Establishment of recycling technology for socially valuable materials



Direct observation of high-temp.

interface during crystal growth

Melting of simulated waste borosilicate glass



Missions

Social Backgrounds

It is crucial to realize a low-energy consumption / highly recyclingbased society, and to reduce resource consumption and environmental loads on a global scale.

Visions

IRCSEM serves its roles as a world-leading international research center using its accumulated worldwide research network with a new focus on solving energy problems.

Research and Development / Education and Social Collaborative Activities

- Design of resources / substances / materials flow and control process
- ✓ Base engineering for a low energy consumption society
- Materials engineering for the maximized utilization of resources / substances
- ✓ Establishment of strong cooperation with industry
- Promotion of internationally cooperative research / suggestions and education of global human resources for the establishment of a highly sustainable society
- Industrial collaboration, promotion of the implementations of research achievements, and education of personnel in industrial sectors
- Communicate importance of energy, resources, and materials to public

Research Structure / Fields

Resources / Materials Recycling Unit

Design of Resources/Substances/Materials Flow and Process Control

Energy / Resources Efficient Utilization Unit

Base Engineering for a Low Energy Consumption Society Since April 2018, members of the Collaborative Research Center for Energy Engineering, Institute of Industrial



Creation of Brand New Science / Technology by Fusion of Research Education of Human Resources with Broad Vision

* Support Member

Okabe Laboratory

Resource Recovery and Materials Process Engineering

Future Materials : Titanium, Rare Metals

Changing Rare Metals to "Common" Metals !

Okabe Lab is focusing on research on new production processes for reactive metals and on environmentally sound recycling technologies for rare metals, based on "Future Materials : Titanium, Rare Metals" as the keywords.

Environmentally Sound Recycling Process for Rare Metals



in engines of motorcycles

http://www.bikebros.co.jp/vb/offroad/ofeat/ofeat-20130620/

Oxygen concentration in Ti increases during sintering due to its strong chemical affinity with Ti

produced by sintering and deoxidation in molten salt

Yoshie Laboratory

Polymeric and Environmentally Conscious Materials

Material Design Based on Polymer Dynamics Control

Dynamic Control of Hierarchical Structure in Polymers

We aim to create high-performance materials such as tough and self-healable elastomers and nano-patterned surfaces by dynamic control of the hierarchical structure in polymeric materials spanning from molecular to mesoscopic scales.

Bio-inspired tough elastomer



We developed a tough and self-recoverable elastomer by a multiphase design inspired by the byssus of mussels.

Seawater-driven self-healable elastomer



Using a water-triggered dynamic bond (boronic ester), we developed an elastomer with excellent self-healing ability in seawater.

Rigid and waterproof organic/inorganic nanohybrid



We fabricated a rigid and waterproof organic/inorganic nanohybrid by combining surface modification of natural clay and in situ polymerization.

Functional materials by dynamic structure control

Nano-patterning by dynamic phase separation



Lamellar nanopattern by freezing phase separation



We discovered a facile method to fabricate nanometer-scale periodic patterns by dynamically controlling the phase separation process in polymer blends.

Inoue Laboratory

Amorphous Materials Design

Gas Levitation Furnace and Glass

Material Design of Amorphous and Liquid States

We study the materials ranging from an amorphous state to a liquid state. Atomic and electronic structures of the amorphous and the liquid states are not well understood. We use analytical methods in order to understand these materials, and apply these metals to a variety of materials. Moreover, we will produce novel materials and their applications.









50

55

60

30 μm 35 μm 50 μm

AL₂O₃



Edagawa Laboratory

Mechanical Properties of Solids

Order in Atomic Arrangement and Physical Properties of Solids

Order in Atomic Arrangement and Physical Properties of Solids

If we evaluate solids microscopically, we find that atoms are arranged in an ordered manner. Microscopic structures in solids can be classified in view of the atomic order into three groups: periodic structures (crystals), quasiperiodic structures (quasicrystals), and amorphous structures. Such atomic orders often determine the macroscopic properties of solids. We aim to clarify the relation between the microscopic structure and the macroscopic physical properties of solids, and also at developing new materials with desirable properties using the information obtained through such studies.

Photonic and Electronic Properties of Dislocations in Semiconductors

The local electronic behavior may change due to existence of dislocations which are a kind of disturbance in the atomic arrangement induced by plastic deformation. We observed some related phenomena such as conductive spots on the surface of the semiconductors and the shifts in optical absorption edge.

Conductive spots on surface of GaN after plastic deformation



Change in optical absorption spectra by plastic deformation

Physical Properties Inherent to Quasicrystals

Quasicrystals, which have both the long-range order of the atomic arrangement and the rotational symmetry that is unallowable for crystals, show some unique properties. We observed the anomalous increase of specific heat at high temperature. Also, our high-temperature in situ HRTEM* observation showed the dynamic process of quasicrystal growth under a specific condition.



Electron diffraction pattern of icosahedral quasicrystal Breaking of Dulong-Petit's

law in high-temperature specific heat

Random Network Photonic Devices

In an artificial structure of dielectrics designed in a suitable manner, it is known that the electric wave in a certain wavelength region cannot propagate. Such a region, known as a 'photonic band gap,' arise from the mechanism analogous to the electric band gap occurring in an ordered atomic arrangement. Although it was thought that only periodic structures show those property, our laboratory showed that the same phenomena can be realized even in a certain type of amorphous structure.



600 T(K)

Structural models of photonic amorphous diamond (left) and photonic crystal diamond (right), and the fabricated specimens for the terahertz regime.





Measured electric wave transmittance spectra in terahertz regime.

*HRTEM - high-resolution transmission electron microscopy

Shikazono Laboratory

Thermal Energy Engineering

Solid Oxide Fuel Cell and Next Generation Heat Engines

Prediction of Polarization Characteristics and Microstructures of Solid Oxide Fuel Cell Electrodes

Solid oxide fuel cell (SOFC) is expected to become a promising power generation technology in the future because of its high efficiency and fuel flexibility. It is known that the electrode microstructures of SOFCs strongly affect the polarization characteristics of solid oxide fuel cells (SOFCs). Large-scale numerical simulation tools such as lattice Boltzmann, phase field, kinetic Monte Carlo, and discrete element methods are developed to optimize the complete lifetime characteristics of the electrodes from initial powder to long-term operation. Three-dimensional microstructures reconstructed by FIB-SEM play an inevitable role for the model validation.



R&D for Next Generation Heat Engines

Efficient utilization of thermal energy has become even more important for the present energy systems. To reduce energy loss, heat engines which operate at small temperature differences, and component technologies such as compact gas-liquid separators and compact heat exchangers are developed under collaboration with industry partners.

- · Development of two-phase expansion steam cycle
- · Large-scale simulation and optimization using supercomputers
- Development of component technologies: heat transfer enhancement, compact gas-liquid separators, compact heat exchangers, etc.



Two phase expander & demonstration unit for trilateral cycle



High-fidelity simulation of liquidgas two-phase flows



Compact gas-liquid separator



Compact finless heat exchangers

Yoshikawa Laboratory

High Temperature Sustainable Materials Processing

Solution Growth of Next-generation Semiconductors SiC and AIN

Production of Semiconductors from Molten Alloy

Our laboratory aims to develop innovative materials processes by combining high-temperature physical chemistry (including thermodynamics and crystal growth) with an original technique to visualize high-temperature reacting interfaces.

Solution Growth of Single Crystals of Wide-gap Semiconductors

Wide-gap semiconductors such as silicon carbide (SiC) and aluminum nitride (AIN) are key materials to achieve innovation in power conversion and optical devices. We are developing a rapid growth technique to produce their high-quality single crystals.

Control of Reacting Interface During Steelmaking Process

Tens to hundreds of tons of molten steel react during steelmaking process, but the reaction proceeds thorough micron-scale phenomena. We aim to contribute to the design of a sustainable process for the 21st century.

Low-temperature rapid growth of SiC by the float zone method



Reaction control between molten Fe and reaction agents the solidification in mold

Microstructure control during



Real-time Observation of Reacting Interface at High Temperature using Visible Light Transmission

We perform out the in situ observation of the high temperature interface of reacting couples using the transparency for visible light of a reacting material such as SiC.

For example, we observed the growth interface during the solution growth of SiC for the first time. We aim to establish the optimal conditions for the growth of high-quality crystal of SiC based on the nano-scale observation of interfacial morphology and defects in grown crystals.



Yagi Laboratory

Energy Storage Materials Engineering

Electrochemical Materials and Processes

Innovative Rechargeable Batteries and Highly Efficient Electrochemical Processes

The Yagi laboratory develops rechargeable batteries based on novel ideas and highly active electrochemical catalysts composed of abundant elements to contribute to the growth of a sustainable society.

Magnesium Batteries

Magnesium possesses two valence electrons and has the lowest standard electrode potential among the metals usable in air. The electrochemically deposited magnesium surface tends to be flat. We investigate magnesium battery technologies to achieve rechargeable batteries with high energy density and ease of handling.



High capacity of Mg metal				
		Potential (V vs. SHE)	Capacity (mAh/g)	Capacity (mAh/cc)
	Mg	-2.36	2200	3830
	LiC ₆	-2.8	372	841
	Li	-3.05	3860	2070



*SHE - Standard Hydrogen Electrode



Prototype of Mg battery



Analysis of the insertion/extraction behavior of Mg ions by electrochemical QCM**



**QCM – Quartz Crystal Microbalance

Catalysts for Oxygen Electrochemical Reactions

Oxygen electrochemical reactions are significant and are utilized in fuel cells, rechargeable metal-air batteries, electrochemical water splitting using renewable energy, and electrolytic smelting. We investigate highly active catalysts to promote oxygen electrochemical reactions using abundant elements.



Owada Laboratory

Materials Separation and Recycling Process

Visiting Professor from Faculty of Science and Engineering (School of Creative Science and Engineering), Waseda University

Smart Recycling

Smart Comminution and Separation

As valuable and useless components are mixed in natural and artificial (waste) resources, it is necessary to recover the former elements and to reject or appropriately treat the latter ones. The key technology of solid-solid separation, in other words "SOFT SEPARATION", should be applied with high efficiency and high reliability. In order to achieve the above separation, the following two technological developments are essential.

- 1. Smart Comminution to achieve high liberation of componential elements
- 2. Smart Sorting of compositional elements with high energy efficiency

The following are examples of research topics.

- Mechanical comminution to achieve high liberation
- Clarification of the mechanism of electrical disintegration
- Development of high-performance sensor-based sorting (including laser-induced breakdown) spectroscopy (LIBS), X-ray fluorescence (XRF), X-ray transmission (XRT)) and process optimization
- Recovery of precious metals and other valuable materials from incineration bottom ash
- Recovery of high-purity glass materials from spent photovoltaic (PV) panels
- Stochastic and rheological study on flotation



Concept of electrical disintegration







Plastic cover Connector metals Metals inside Various Materials of IC chip liberated by Electrical Disintegration

IC chip



The first developed LIBS sorter in the world, Feb, 2015



Equipment for measuring bubble-particle adhesion



Measuring process of bubble-particle adhesion





Shibayama Laboratory

Mineral Processing

Visiting Professor from Graduate School of International Resource Science, Akita University

Mineral Processing and Recycling

Development of Advanced Mineral Processing Technology and Recycling Process

Our laboratory is investigating the development of treatment process of unutilized resources that contain impurities and/or are of low-grade quality and the extraction of valuable metals from electronic waste. The typical research work is as follows.

Development of advanced technology for processing of unutilized mineral resources

- Treatment process of impurity-bearing copper minerals.
- Metal recovery form low-grade ore and mine.
- Development of rare earth recovery processes.

Development of processes to extract precious metal from wasted materials

- Process for recovering precious metals from printed circuit boards via halogen leaching.
- Development of novel extractant for selective extraction of precious metal.

Recovery of valuable metal from WPCB by physical separation



Development of novel extractant for PGM recycling





The novel extractant for selective extraction of Pd.

Selective extraction of palladium from automobile catalysts





Yamaguchi Laboratory

Recycling of Resources and Materials

Visiting Professor from Department of Resources and Environmental Engineering, Waseda University

Extractive Metallurgy and Resource Recovery

Recovery Process of Rare Metals in Non-ferrous Extractive Metallurgy

In the non-ferrous smelting process, the common metals of copper, lead, zinc and critical metals are produced from secondary materials such as scrap metals, alloys, and residues.

The valuable metals that result from the refining process can be raw materials for a wide range of application possibilities in various fields.

We suggest a new and effective recovery process of rare metals in non-ferrous extractive metallurgy.

- Recovery of rare earth elements from magnet scrap by using B_2O_3 flux.
- Copper enrichment based on liquid phase separations.
- Recovery of platinum group metals from automotive catalytic converters.
- High-temperature calorimetry.

The recovery of rare earth elements from rotors of hybrid vehicles and electric vehicles using B2O3 flux





Fe₂O₃400~600g B₂O₃1200~1800g

-Carbon Crucibl

Pig iron 900~1000g

Carbon 500~600g

Rotor

g. HV Rotors iving Motor 6.8kg、	Power Generator 2.1kg	
Pig-iron, ca	rbon,	

put into a carbon crucible	
1	
Melting in air at 1500°C using	
high-frequency induction melting	
furnace	
· · · · · · · · · · · · · · · · · · ·	
Addition of Fe ₂ O ₃ and B ₂ O ₃ flux	

ng at 1250°C for 0.5∼1 hr ↓ Cooling

Chemical analysis of the metal and slags with ICP-OES, C-S analysis and gravimetry for SiO





Figs. Samples obtained after melting process

Fig. Experiments

Crushed RE rich B2O3 - <u>1 mol L^{.1} HCl</u> Dissolution SiO₂ residue 1 mol L⁻¹ H₂C₂O₄ — HN₂ aq. pH con oH=2) ◀ 3 hours at 40 °C tion of Oxalates with stirring -Filt Solution RE oxalates By city gas burner in pl Calo crucible for 1 hours RE oxides



The total concentration of rare earth

Recovery rates were more than 99%

oxides was over 99 mass%.

Copper enrichment process of low-grade copper scraps based on liquid phase separation







Copper recovery against copper grade in scrap

High-temperature heat content measurement of silicon using drop calorimeter

a) Dropping mechanism b) Pt-10%Rh wire c) Pt/Pt-Ph thermocouple d) Alumina tube e) Molybdenum silicide MoSi2 heater D Rt envictor f) Pt crucible) Shutter h) Pt resistance thermom opper tube k) Dewar vessel I) Insulating material m) Distilled water

Drop calorimeter



Iwafune Laboratory

Energy Demand Science

Project Professor, Energy System Integration Social Cooperation Program

Sustainable Energy Demand and Supply

Energy Efficiency and Demand Response

3E & S (Energy security, Economy, Environmentally and Safety) are critical issues for energy systems. Massive introduction of renewable energy resources, such as photovoltaics or wind power generation and the flexible power system resources to compensate their intermittent behaviors, are essential to realize 3E & S energy systems. Demand response on the customer side is one of the potentially flexible resources. Adjustment of the power consumption on customer sides to better match the demand for power instead of adjusting the supply contributes economical power system operation.

IWAFUNE Laboratory has investigated energy efficiency and demand response in the "residential sector." We examined the structure of residential electricity consumption using Home Energy Management System (HEMS) data on 2000 households. We also examined the potential energy efficiency and demand responses compatible with inhabitant comfort.

The following are examples of our research topics.

- Construction of the HEMS database
- Understanding household demand structures and evaluating the effects of energy audits
- Potential analysis of energy efficiency and demand response
- Demand response model for heat pump (HP) water heaters and electric vehicles

HEMS database and energy audit in residential sector





Demand response model for heat pump water heaters





Ooka Laboratory

Urban Energy Engineering

Future urban planning & Future energy systems to realize ZEB

Prediction of Building and Urban Environment

Building and urban environment prediction systems have been developed to create sustainable building and urban spaces. We focus on flow, heat and pollutant dispersion in multiple scales from human-ambient to urban/regional.



Instantaneous velocity (m/s)



Measurement of indoor environment and human thermal comfort PIV measurement of air flow around building



High-speed, high-resolution analysis of outdoor air flow using large-eddy simulation based on the lattice Boltzmann method



Numerical estimation of local climate using WRF

Systems to Realize Zero Energy Building

39.375 H Ground (Wall function)

Roof (no-slip)

To realize a Zero Energy Building (ZEB), it is important to improve the efficiency of heat source systems. We have improved them to reduce energy consumption. Air conditioning systems with renewable energy sources and optimization of heat source systems have been mainly studied.



RE house at Kashiwa campus



Experimental thermal response test system



Optimization of thermal and electrical grid



HVAC system using Pile heat exchanger



Experimental water transport system in HVAC



Ogimoto Laboratory

Energy System Integration

Energy Integration and a Smart Sustainable Society

Sustainable energy systems, which are critical infrastructure to support social and economic activities, are currently facing new challenges to achieve security, economy, and reduction of environmental burdens such as carbon emission. Energy systems require transition to holistic optimization involving centralized and decentralized resources through integration of newer forms of supply, i.e. photovoltaic (PV), wind power, and other renewables, as well as novel demand devices including electric vehicles, heat pump water heaters, and energy storage.

Emerging energy systems require decentralized management for the integration of demand into demand-supply balancing to accommodate renewable generation characterized by constantly fluctuating output and newer types of electrical loads. The decentralized energy management will assure flexibility in operation and system configuration as well as enhanced robustness against risk factors.

Energy System of the Next Generation

A long-term view covering technological innovations, socio-economic trends, and institutions is crucial for studying energy issues. Our energy system integration research, aiming at the optimum energy system, covers the following areas using technology assessment, simulation, optimization, scenario planning, strategic study, and other techniques

- Energy / Energy technology strategy
- · Dynamic analysis and assessment of energy supply and demand
- Analysis of variations and generation forecasts of renewable energy generation
- Unit commitment and load dispatch simulation











Variation of Wind Power Generation

Distributed Energy System

The high penetration of fluctuating generation from PV and wind would lead to difficulty of supplydemand imbalance within a whole power system. Stabilization of the overall system requires active harmonization between the centralized power systems, including the transmission/distribution systems, and the distributed energy systems/resources (including energy storage).

Our goal of the following research areas aims at the three axes of values, which are not only "energy and asset management for energy efficiency, economy, and environment" but also "contribution to overall energy/power system operation optimization" while enhance the "quality of life and work."





Tokoro Laboratory

Environmental Resource Processing Engineering

Resource Circulation, Separation and Concentration, Powder Processing

Technologies for Resource Circulation / Environmental Restoration



Special grinding technologies for separation of solids

Mn

Increase of SiO₂ exposure by removal of surface

Concentration of

Mn into a fine

particle fraction

Soil remediation by surface grinding



-		
	Curry Surger	**************************************

Filtration sand before surface grinding

Solid analysis to investigate the mineral separation



High pressure grinding roller (HPGR) for separation of heterogenous minerals through boundary fracture



- Selective destruction at the interface of heterogeneous mineral phases by high compressive stress
- Elucidation of fracture mechanism for further liberation enhancement

Control of mineral separation by microwave irradiation

- Selective isolation of mineral phases by heat
- crack formation at phase boundaries due to different thermal expansion
- b. selective change of surface properties

Optimization of crushing operations by simulations



- Estimation of grinding performance by analysis of collisions between stirrer and substrate
- Possible elucidation of stirring and granulation mechanisms

Pretreatment operations for improving the solid separation

Recovery of Co from Li-Ion batteries by slow heating

Process analysis to improve the recovery of valuable metals from Li-ion batteries (LIB)







Recovery of magnetite by slow-cooling crystallization

Study of the separation of magnetite from an amorphous phase slag via smoothcooling crystallization and magnetic separation



magnetite particle size and precipitation rate increased by decreasing the cooling rate

Advanced technologies for environment remediation

As removal by surface precipitation



Study and optimization of surface precipitation Possible recovery of inorganic elements in high efficiency

Removal enhancement by amorphization



> Enhancement of boron removal

Process optimization by combination of geochemical modeling and fluid analysis



- Creation of ground model from terrain data and reproduction of the dynamic shape water bodies
- Prediction of concentration profiles by considering chemical equilibria



Nakamura Laboratory

Metallurgy and Recycling System for Metal Resource Circulation

Sustainable Society from Coupling Technology and Social systems

Coupling Technology and Social Systems for Sustainable Society Goals

Concept of Coupling Technology and Social Systems



To develop the process technologies and social systems for metal recycling, waste detoxification and energy recovery based on the non-ferrous smelting industries

Novel recycling system based on harmonizing whole supply chains



Non-ferrous industry outreach to young people



Casting Metal Kingdom in Seirenn-jya Story Ancient 7 metals



Seirenn-jya is a neverending story of the Non-Ferrous Industry which can appeal its activity to young people

Representative Activities

Activities on Global Cooperative Research Activities, Collaboration Activities, and Outreach Activities

E-scrap Symposium 2016

September 27 (Tue), 2016 at the Institute of Industrial Science, the University of Tokyo

Youngsters' Science Festival of Tokyo in Koganei

October 9 (Sun), 2016 at Tokyo Gakugei University

Front Lines of refining and Recycling Technologies for Precious Metals (The 4th KIKINZOKU Symposium)

January 6 (Fri), 2017 at Institute of Industrial Science, the University of Tokyo

The 12th Workshop on Reactive Metal Processing (RMW12)

March 3 (Fri)-4 (Sat), 2017 at Massachusetts Institute of Technology

International Exchange with Norwegian University of Science and Technology (NTNU)

April 5 (Wed), 2017 at Institute of Industrial Science, the University of Tokyo

Workshop on Innovative Metallurgical Processes for Advanced Materials 1 Frontier on SiC Solution Growth

June 23 (Fri), 2017 at Institute of Industrial Science, the University of Tokyo

Youngsters' Science Festival of Tokyo in Koganei

September 24 (Sun), 2017 at Tokyo Gakugei University

An Annual Meeting of ICG (International Commission on Glass) October 22 (Sun)-24 (Sat), 2017 at Halic Congress Center (Turkey)

Symposium on Minor Metals in Non-ferrous Metals Smelting November 10 (Fri), 2017 at Institute of Industrial Science, the University of Tokyo

Front Lines of refining and Recycling Technologies for Precious Metals (The 5th KIKINZOKU Symposium) January 12 (Fri), 2018

at Institute of Industrial Science, the University of Tokyo

Symposium for Professor Masafumi Maeda

March 9 (Fri), 2018 at Institute of Industrial Science, the University of Tokyo

The 1st Special Seminar on Resource, Smelting, and Recycling of Non-ferrous Metals March 14 (Wed), 2018

at The Nippon Club (New York)

The 13th Workshop on Reactive Metal Processing (RMW13) March 16 (Fri)-17 (Sat), 2018

at Massachusetts Institute of Technology

ESI Startup Symposium

April 17 (Tue), 2018 at Institute of Industrial Science, the University of Tokyo

The 1st ESI Symposium

May 9 (Wed), 2018 at Institute of Industrial Science, the University of Tokyo

UT² Workshop

June 11 (Mon)-12 (Tue), 2018 at the University of Tokyo

Non-ferrous Metals Study Experience of Junior High School Students

June 13 (Wed)—15 (Fri), 2018 at Institute of Industrial Science, the University of Tokyo

The 2nd ESI Symposium

June 21 (Thu), 2018 at PACIFICO Yokohama

The 3rd ESI Symposium

July 9 (Mon), 2018 at Institute of Industrial Science, the University of Tokyo

Joint Summer Camp and Seminar by 5 Laboratories in the Field of Non-ferrous Metals Resource Recovery

July 14 (Sat) – 16 (Mon), 2018 at Waseda University Karuizawa Seminar House

How to Deal with Mining Environment after Resource Development in the SDGs Era

July 30 (Mon), 2018 at The Main Auditorium of the Science Council of Japan

Students from Takasaki High School Visited Laboratories at IIS. August 7 (Tue), 2018 at Institute of Industrial Science, the University of Tokyo

School Visit at the Urawa Daiichi Girls' High School September 22 (Sat), 2018

at Saitama prefectural Urawa daiichi girls' high school

An Annual Meeting of ICG (International Commission on Glass) September 23 (Sun) - 26 (Wed), 2018 at PACIFICO Yokohama

International Seminar on Impurities of Copper Raw Materials December 17 (Wed), 2018 at The Tokai University Club

Lab Tour for Junior High School Students of Okayama Souzan Junior High School at IIS, The University of Tokyo

November 9 (Fri), 2018 at Institute of Industrial Science, the University of Tokyo

Titanium Symposium 2018

November 9 (Fri), 2018 at Institute of Industrial Science, the University of Tokyo

E-scrap Symposium 2018

November 30 (Fri), 2018 at Institute of Industrial Science, the University of Tokyo

Special Joint Symposium : Front Lines of refining and Recycling Technologies for Precious Metals(The 6th KIKINZOKU Symposium)

January 11 (Fri), 2019 at Institute of Industrial Science, the University of Tokyo

The 2nd Special Seminar on Resource, Smelting, and Recycling of Non-ferrous Metals March 13 (Wed), 2019 at The Nippon Club (New York)

Symposium for Professor Nobuaki Sato and Professor Toyohisa Fujita

March 8 (Fri), 2019 at Institute of Industrial Science, the University of Tokyo

The 14th Workshop on Reactive Metal Processing (RMW14)

March 15 (Fri) - 16 (Sat), 2019 at Massachusetts Institute of Technology

E-scrap Symposium 2016

September 27 (Tue), 2016 Institute of Industrial Science, the University of Tokyo

A special symposium titled "E-scrap symposium 2016" was held on September 27, 2016, at the Convention Hall of the Institute of Industrial Science (IIS) with nine invited speakers from government, industry, and academia. The symposium was inaugurated with an opening address by Professor Teruo Fujii, Director of IIS. Approximately 200 people attended this symposium and enjoyed the discussion on the current status and challenges of E-scrap recycling. On September 28, a plant tour of the recycling facilities was arranged for students and young researchers. Participants visited the Strategic Urban Mining Research Base (SURE) of the National Institute of Advanced Industrial Science and Technology (AIST) and the Hitachi Works of the JX Nippon Mining & Metals Corporation.



Youngsters' Science Festival of Tokyo in Koganei

October 9 (Sun), 2016 Tokyo Gakugei University

A public event on "Youngsters' science festival of Tokyo in Koganei" was held on October 9, 2016, at Tokyo Gakugei University. At this event, lectures and exhibitions on rare metals were delivered by Prof. T. H. Okabe, director of IRCSEM. The demonstrations of shape memory alloys and electrochemical plating on metal plates were also performed by Dr. Akihiro Yoshimura, Associate Research Fellow at Institute of Industrial Science (currently at Chiba University).

Many children and parents were very interested in the lecture on rare metals used in our lives or unusual places. After the lecture, participants in the event ranging from children to adults enjoyed the demonstration of shape memory alloys and electrochemical plating.



Front Lines of refining and Recycling Technologies for Precious Metals (The 4th KIKINZOKU Symposium)

January 6 (Fri), 2017 Institute of Industrial Science, the University of Tokyo

A special joint symposium entitled "Frontier of Extraction and Recycling Technology for Precious Metals (The 4th KIKINZOKU Symposium)" was held at the convention hall at IIS by the JX Metals Endowed Unit, IRCSEM, and Rare Metal Workshop on January 6, 2017. The seminar began with opening remarks by Prof. Masafumi Maeda. Approximately 250 people, primarily from the non-ferrous and recycling industries, attended this symposium and enjoyed a lively discussion. After the lectures, a social gathering was held and further networking among the participants was promoted.



The 12th Workshop on Reactive Metal Processing (RMW12)

March 3 (Fri)-4 (Sat), 2017 Massachusetts Institute of Technology

The 12th Workshop on Reactive Metal Processing (RMW12) was held on March 3–4, 2017, at Massachusetts Institute of Technology (MIT), Cambridge, USA. The RMW, an annual workshop on material processing, is held in collaboration with industry members and universities worldwide, and has been jointly organized by Prof. Toru H. Okabe from IRCSEM and Prof. Donald R. Sadoway from MIT since 2006. Prof. Antoine Allanore from MIT has participated as an organizer since RMW10, and Prof. Shunsuke Yagi from IRCSEM has also participated as an organizer in this workshop. Approximately 45 researchers from numerous countries, such as the USA, Canada, Norway, and Japan, attended this workshop.

During the two-day workshop, eminent professionals delivered presentations on topics of current interest, such as the production/recycle processing of rare metals and advanced battery materials, which are essential for a sustainable society. The participants also actively engaged in discussions. The RMW is a leading workshop facilitating international research activities in the field of reactive metal processing.



International Exchange with Norwegian University of Science and Technology (NTNU)

April 5 (Wed), 2017 Institute of Industrial Science, the University of Tokyo

The International exchange with Norwegian University of Science and Technology (NTNU) was held on April 5, 2017 at Institute of Industrial Science, the University of Tokyo. Novel research on energy conversion materials and catalysts studied in IRCSEM was introduced to the participants, 15 undergraduate students and 1 associate professor from NTNU. The participants were engaged in discussions on research and student education. The participants also experienced a tour of the laboratories and workshop at IIS. IRCSEM makes a strong effort in transboundary educational activities through the international exchange with NTNU, one of the top institutes in North Europe.



Workshop on Innovative Metallurgical Processes for Advanced Materials 1 Frontier on SiC Solution Growth

June 23 (Fri), 2017 Institute of Industrial Science, the University of Tokyo

A workshop on the Innovative Metallurgical Processes for Advanced Materials 1 was held on June 23, 2017, in the Dw-604 at the Institute of Industrial Science (IIS). The workshop was initiated by Assoc. Prof. Takeshi Yoshikawa from IRCSEM and Dr. Didier Chaussende from CNRS Grenoble to serve as a platform to facilitate the discussion on the most recent activities in the field of innovative metallurgical processes for advanced materials. It is planned to be held every year alternately in France or in Japan.

The first workshop was dedicated to the hot topics of solution growth of SiC for power device application, supported by the IRCSEM. The program included a special lecture from Dr. Chaussende entitled "Solution growth of silicon carbide: state of the art and perspectives" and four presentations given by the researchers from both the university and national research institutions focusing on the control of growth front toward the stable continuous growth of high-quality crystals. More than 20 researchers leading the advanced research and development of SiC process in 8 institutions/companies attended the workshop and had deep discussions. Such discussions continued during the lab tour and in the social gathering after the scientific session.



Youngsters' Science Festival of Tokyo in Koganei

September 24 (Sun), 2017 Tokyo Gakugei University

A public event, "Youngsters' science festival of Tokyo in Koganei," was held on September 24, 2017, at the Tokyo Gakugei University. A lecture was delivered by Prof. Okabe, who is a director of IRCSEM, and an exhibition on rare metals was held. Demonstrations using shape memory alloys and electrochemical plating on metal plates were performed by Dr. Akihiro Yoshimura, Associate Research Fellow at Institute of Industrial Science (currently at Chiba University). Several children and parents were very interested in the lecture on rare metals, which are utilized not only in our daily lives but in unexpected places as well. After the lecture, participants ranging from children to adults enjoyed the demonstration of shape memory alloys and electrochemical plating.



An Annual Meeting of ICG (International Commission on Glass)

October 22 (Sun) — 25 (Wed), 2017 Halic Congress Center, Turkey

An annual meeting of ICG (International Commission on Glass) was held in Istanbul, Turkey from October 22 to 25, 2017. The meeting is organized annually by international academic societies in the field of glass science and engineering. Professor Hiroyuki Inoue, IRCSEM, IIT, the University of Tokyo is one of the organizers of this event. The event this year was held by Turkish glass company Şişecam. There were 421 participants from 26 countries, with 6 keynotes, 24 invited lectures, 94 oral presentations, and 18 poster presentations. In addition to the above presentations, the meetings of Council, Steering Committee, and Coordinating Technical Committee were held. The ICG meeting will be held in Krakow, Poland in 2020 and in Korea in 2021. The next meeting (ICG2018) will be held in Yokohama by Prof. Inoue.



Symposium on Minor Metals in Non-ferrous Metals Smelting

November 10 (Fri), 2017 Institute of Industrial Science, the University of Tokyo

A special symposium entitled "Symposium of Minor Metals in Non-ferrous Metal Smelting" was held by the JX Metals Endowed Unit, IRCSEM on November 10, 2017. The seminar began with opening remarks by Prof. Nakamura. More than 160 people from the non-ferrous and recycling industries, academics, and government attended and enjoyed a lively discussion on the future vision and challenges of mining, production, and circulation of minor metals in non-ferrous metal smelting, such as molybdenum, rhenium, and bismuth. After the lecture, a social gathering was held. This encouraged further interaction among the participants.



Front Lines of refining and Recycling Technologies for Precious Metals (The 5th KIKINZOKU Symposium)

January 12 (Fri), 2018 Institute of Industrial Science, the University of Tokyo

A special joint symposium entitled "Frontier of Extraction and Recycling Technology for Precious Metals (The 5th KIKINZOKU Symposium)" was held by the JX Metals Endowed Unit, IRCSEM, and Rare Metal Workshop on January 12, 2018. The seminar began with opening remarks by Prof. Masafumi Maeda. It included 7 presentations given by the lecturers from industries and academia including a foreign company and Lect. Tsuyoshi Minami at IIS. Approximately 250 people, primarily from the non-ferrous and recycling industries, attended this symposium and enjoyed a lively discussion. After the lectures, a social gathering was held and further interaction among the participants was promoted.



Symposium for Professor Masafumi Maeda

March 9 (Fri), 2018 Institute of Industrial Science, the University of Tokyo

A special symposium entitled "Symposium for Professor Masafumi Maeda" was held by the JX Metals Endowed Unit, IRCSEM, and Rare Metal Workshop at the Convention hall in Building An on March 9, 2018. The seminar is held to highlight the research activity and prospects of non-ferrous metallurgy achieved by Prof. Maeda. More than 250 people, from the non-ferrous and recycling industries, academia and government related to Prof. Maeda attended and enjoyed a lively discussion.

Professor Tetsuya Uda, Department of Materials Science and Engineering at Kyoto University, gave a lecture on "New Smelting Process of Titanium". Mr. Hiroshi Asahi, Executive director of the Sumitomo Metal Mining, delivered a talk on "Future perspective of non-ferrous mining and smelting and their collaboration of academic-industry-government". Professor Maeda delivered an enthusiastic 90-minute lecture on "Outlook of mining and smelting of non-ferrous materials and the collaboration of industry-academia-government – histories of research and people". After the lecture, a social gathering was held. This promoted further interaction among the participants.



Adam C. Powell, IV Infinium Prof. Geir Martin Haarberg Norwegian University of Science and Technology



The 1st Special Seminar on Resource, Smelting, and Recycling of Non-ferrous Metals

March 14 (Wed), 2018 The Nippon Club (New York)

The 1st Seminar on Resource, Smelting, and Recycling of Non-ferrous Metals was held on March 14, 2018, at The Nippon Club, New York, USA. This seminar was organized by The University of Tokyo, New York Office. This seminar is held for Japanese companies in the US to enhance the networking of industry-government-academia. One-hour-long lectures entitled "Recent topic of Non-ferrous metal recycling" and "Recent topic of Resource, Smelting, Recycling of Rare Metals" were delivered by Prof. Takashi Nakamura, IIS and Prof. Toru H. Okabe, Director of IRCSEM, respectively. After the lectures, a lively discussion was held, which continued through the social gathering. Most participants enjoyed further networking at the second party afterwards.

This seminar was the first seminar organized by Ms. Yoshimi Nakabayashi at Research Management Office, Institute of Industrial Science, The University of Tokyo to solicit donation for the activities of The University of Tokyo New York Office. It was sincerely appreciated that several companies had already donated to the activities.



The 13th Workshop on Reactive Metal Processing (RMW13)

March 16 (Fri) – 17 (Sat), 2018 Massachusetts Institute of Technology

The 13th Workshop on Reactive Metal Processing (RMW13) was held on March 16–17, 2018, at Massachusetts Institute of Technology (MIT), Cambridge, USA. The RMW, an annual workshop on material processing, is held to promote industry-academia collaboration worldwide, and has been jointly organized by Prof. Toru H. Okabe and Prof. Shunsuke Yagi from IRCSEM, and Prof. Donald R. Sadoway and Prof. Antoine Allanore from MIT. The RMW is a leading workshop facilitating international research activities in the field of reactive metal processing with approximately 50 attendees from many countries, such as the USA, Canada, Norway, and Japan.

During the two-day workshop, presentations on topics of current production/recycle processing of rare metals and advanced battery materials, which are essential for a sustainable society, were given. The participants also enjoyed lively discussions. Additionally, students and support staff from MIT and IIS cooperated to coordinate the workshop and enjoyed close networking.



UT² workshop

June 11 (Mon) – 12 (Tue) , 2018 The University of Tokyo

The 17th Annual UT² Graduate Student Workshop (UT² workshop) was held at the University of Tokyo on June 11–12, 2018. This workshop is conducted every year, alternately at the University of Toronto and the University of Tokyo. In 2018, researchers and graduate students belonging to the departments of Materials Science, Chemical Engineering, and Mechanical Engineering at both universities participated and gave more than 20 presentations related to the research on sustainable materials and smelting technologies, etc. This workshop is an excellent opportunity for networking among young students.



Non-ferrous Metals Study Experience of Junior High School Students at IIS, The University of Tokyo

June 13 (Wed)—15 (Fri), 2018 Institute of Industrial Science, the University of Tokyo

Six students from the Musashino Daisan Junior High School visited Okabe's laboratory at the Institute of Industrial Science, the University of Tokyo, for three days (June 13-15, 2018), to gain practical experience. Prof. Takashi Nakamura, a support member of IRCSEM, and Prof. Shunsuke Yagi of IRCSEM lectured to the students. Students learned about non-ferrous metals, particularly rare metals and conducting experiments using rare metals. The students actively engaged during their visit by asking many questions and exchanging opinions with each other during the experiments. They also communicated with the students from University of Toronto.



Joint Summer Camp and Seminar by Five Laboratories in the Field of Non-ferrous Metals Resource Recovery

July 14 (Sat)—16 (Mon), 2018 Waseda University Karuizawa Seminar House

On July 14-16, 2018, a summer camp was jointly held by five laboratories of Profs. Toru H. Okabe and Shunsuke Yagi from IRCSEM, Prof. Chiharu Tokoro, a support member of IRCSEM, and Profs. Shuji Owada and Katsunori Yamaguchi, Visiting Profs. of IIS and members of IRCSEM. The networking amongst the members researching in the field of non-ferrous metals and resource recovery was deepened through the enjoyment of sports and social gathering.

On the last day of the camp, a seminar titled "Thinking about Perspective of Resource Recycling" was held. Mr. Hiroki Fukuda from The University of British Columbia, Dr. Rui Koide from Institute for Global Environmental Strategies, and Dr. Takanari Ouchi, Research Associate, of Okabe's Laboratory gave lectures to over 70 undergraduate and graduate students.

Dr. Ouchi introduced the difference between Waseda University, Massachusetts Institute of Technology, and The University of Tokyo where he has conducted his research. Based upon his experiences in the developments of high performance electronic devices, energy storage, and non-ferrous smelting and recycling, he enthusiastically explained that the resource recovery and energy saving of processing are essential and appealed the importance of non-ferrous metals and resource recovery to the students.



How to Deal with Mining Environment after Resource Development in the SDGs Era

July 30 (Mon), 2018 The Main Auditorium of the Science Council of Japan

The open Symposium entitled "How to Deal with Mining Environment after Resource Development in the SDGs* Era" was held by "Division of Resource & Materials Circulation for SDGs" of the Materials Engineering Committee, Comprehensive Engineering Committee, and the Environmental Studies Committee of the Science Council of Japan on July 30, 2018.

The Endowed Research Unit for Non-ferrous Metals Resource Recovery Engineering (JX Metal Endowed Unit) participated in the symposium as a co-sponsor in cooperation with the Mining and Materials Processing Institute of Japan (MMIJ). More than 200 people participated at the symposium held at the main auditorium of the Science Council of Japan, and it was a very successful seminar. The symposium started with opening remarks by Prof. Takashi Nakamura, a support member of IRCSEM. Four lectures were presented including "To what extent the corporate responsibility has to be fulfilled ? - agreement formation between stakeholders is the key - " given by Prof. Itaru Yasui, Professor Emeritus of the University of Tokyo and President of Sustainability Promotion Organization. After the lectures, a comprehensive discussion was organized by Prof. Chiharu Tokoro from Waseda University, a support member of IRCSEM. This symposium was planned and managed by Prof. Tokoro and Prof. Nakamura, the affiliation of member of the Science Council of Japan. The JX Metal Endowed Unit worked mainly on advertisement of the symposium, and audience attraction activities.





*SDGs – Sustainable Development Goals

Students from Takasaki High School Visited Laboratories at IIS.

August 7 (Tue), 2018 Institute of Industrial Science, the University of Tokyo

A laboratory tour was held by Office for the Next Generation (ONG) as a part of "Super Science High School (SSH)" activities of Takasaki High School. Seventeen second-year students from the school visited IIS.

In Okabe's laboratory, Prof. Okabe from IRCSEM introduced various rare metals and enthusiastically explained the importance of non-ferrous metals. Students were interested in rare metals and activities and life at the laboratory and asked many questions.



School Visit at the Urawa Daiichi Girls' High School.

September 22 (Tue), 2018 The Urawa Daiichi Girls' High School

A school visit was held on September 22, 2018 by the Office for the Next Generation (ONG) at the Saitama prefectural Urawa daiichi girls' high school. Prof. Okabe from IRCSEM delivered a lecture about the importance of non-ferrous metals commonly used and environmental problems that accompany metal production. Additionally, an experiment using shape-memory alloys was demonstrated. There was also an exhibition on rare metals. Students showed a interest in the lecture and the experiment.



An Annual Meeting of ICG (International Commission on Glass)

September 22 (Sun) — 26 (Wed), 2018 The Pacifico Yokohama

The International Commission on Glass (ICG) Conference was held in conjunction with the 59th Meeting on Glass and Photonic Materials together with the 14th Symposium of the Glass Industry Conference of Japan.

During the four-day event The Pacifico Yokohama Conference Center offered fascinating panoramic views of the surrounding coast and the harbor with its replica early 20th century sailing ship somewhat dwarfed by huge cruise liners. Inside the main Conference Hall, the atmosphere was bright and dynamic; rooms were clearly labelled and movement between the six parallel sessions was easy. The overall theme was 'Innovations in Glass and Glass Technologies: Contributions to a Sustainable Society' and featured two Plenary talks on the first morning. Prof. Akio Makishima spoke on the subject 'Scientifically really important or Technologically really important?' while Takuya Shimamura from AGC Inc., Japan spoke on 'The Past, Present and Future of Japan's Glass Industry ? Its contribution to our Sustainable Society.' The conference theme defined during the opening ceremony was further developed by four keynote speakers. For the main program, 60 invited speakers and some 200 oral and 100 poster presentations followed.

The 10 best students were selected on the basis of their oral or poster presentations. All together there had been 588 delegates and 29 different countries were represented. Of the attendees, 88 were students and 12 were retired, giving 488 regular delegates. The ICG also held meetings of several of its committees and at the Council Meeting. Prof. Alicia Duran was elected as the 25th ICG President, the previous incumbent, Prof. Manoj Choudhary having completed his term of office.



International Seminar on Impurities of Copper Raw Materials

October 17 (Wed), 2018 The Tokai University Club

An international seminar on the Impurities of Copper Raw Materials was held by the Japan Oil, Gas and Metals National Corporation (JOGMEC), the third Japan-Chile Academic Forum, and Institute of Industrial Science (IIS) at the Tokai University Club (Kasumigaseki Building, 35th floor) on October 17, 2018. A total of 22 presentations were delivered by representatives of governments, universities, institutions, and corporations from various countries. More than 200 individuals attended the seminar with an interest in dealing with the impurities of copper raw materials, especially arsenic.

On October 16, 2018, a meeting to exchange opinions on the same topic was held. Professor Nakamura, a support member of IRCSEM, served as a facilitator.



Lab Tour for Junior High School Students of Okayama Souzan Junior High School at IIS, The University of Tokyo

November 9 (Fri), 2018 Institute of Industrial Science, the University of Tokyo

On November 9, 2018, 25 students from the Okayama Souzan Junior High School visited Okabe's laboratory of the Integrated Research Center for Sustainable Energy and Materials (IRCSEM). The students learned the importance of minor metals and the recycling of them. The students enthusiastically asked questions and actively participated in an experiment using shape-memory alloys during the visit.



Titanium symposium 2018

November 9 (Fri), 2018 Institute of Industrial Science, the University of Tokyo

On November 9, 2018, at the Institute of Industrial Science (IIS), The University of Tokyo, "Titanium symposium 2018" (The 2nd Titanium symposium) was held by the Endowed Research Unit for Nonferrous Metals Resource Recovery Engineering (JX Metal Endowed Unit), IRCSEM, Rare Metal Workshop, and The Japan Titanium Society. Lectures were given by Dr. Yasuaki Sugisaki, President and Representative Director, Osaka Titanium Technologies Co., Ltd., Prof. Hongmin Zhu from the Department of Metallurgy, Materials Science and Materials Processing, Tohoku University, Prof. Toru H. Okabe from the IRCSEM, Prof. Takayoshi Nakano from the Division of Materials and Manufacturing Science, Osaka University, and Dr. Yoshitsugu Miyabayashi, Executive Managing Officer, Toho Titanium Co., Ltd.

After the lectures, 12 poster presentations and several exhibitions by companies were given. Over 200 people from industry, academia, government, and media enjoyed the lively discussion and strengthened the networking among the participants.



E-scrap symposium 2018

November 30 (Fri), 2018 Institute of Industrial Science, the University of Tokyo

A special joint symposium entitled "Frontier of Extraction and Recycling Technology for Precious Metals (The 5th KIKINZOKU Symposium)" was held by the Endowed Research Unit for Non-ferrous Metals Resource Recovery Engineering (JX Metal Endowed Unit), IRSEM, and the Rare Metal Workshop on January 11, 2019. Around 270 people, primarily from the non-ferrous and precious metal recycling industries, attended this fifth symposium and actively participated in a lively discussion.

Eight presentations, including one from overseas, about the current and future status of smelting and recycling of precious metals, were given. A social gathering combined with a poster session was held to promote further networking between the participants from industry and academia.



Special Joint Symposium : Front Lines of refining and Recycling Technologies for Precious Metals (The 6th KIKINZOKU Symposium)

January 11 (Fri), 2019 Institute of Industrial Science, the University of Tokyo

A special joint symposium entitled "Frontier of Extraction and Recycling Technology for Precious Metals (The 5th KIKINZOKU Symposium)" was held by the Endowed Research Unit for Non-ferrous Metals Resource Recovery Engineering (JX Metal Endowed Unit), IRSEM, and the Rare Metal Workshop on January 11, 2019. Around 270 people, primarily from the non-ferrous and precious metal recycling industries, attended this fifth symposium and actively participated in a lively discussion.

Eight presentations, including one from overseas, about the current and future status of smelting and recycling of precious metals, were given. A social gathering combined with a poster session was held to promote further networking between the participants from industry and academia.



The 2nd Special Seminar on Resource, Smelting, and Recycling of Non-ferrous Metals @UT-NYO

March 13 (Wed), 2019 The Nippon Club (New York)

The 2nd Seminar on Resource, Smelting, and Recycling of Non-ferrous Metals was held on March 13, 2019, at The Nippon Club, New York, USA. This seminar was organized by The University of Tokyo, New York Office. This seminar was held for Japanese companies in the U.S. to enhance networking among individuals from industry, government, and academia. One-hour-long lectures entitled "Nickel Business of Sumitomo Mining and Metals –Vertical Integration Business Model–" and "Recent Topic of Resource, Smelting, Recycling of Rare Metals" were delivered by Dr. Harumasa Kurokawa and Prof. Toru H. Okabe, respectively. After the lectures, a lively discussion was initiated, which continued through the social gathering. Most participants benefited from additional networking at the second party held afterwards.



Presentation and discussion

Networking among participant

The 14th Workshop on Reactive Metal Processing (RMW14)

March 15 (Fri)—16 (Sat), 2019 Massachusetts Institute of Technology

The 14th Workshop on Reactive Metal Processing (RMW14) was held on March 15–16, 2019, at the Massachusetts Institute of Technology (MIT), Cambridge, USA. The RMW, an annual workshop on material processing, is held to promote industry–academia collaborations worldwide, and it has been jointly organized by Prof. Toru H. Okabe and Prof. Shunsuke Yagi from IRCSEM, and Prof. Donald R. Sadoway and Prof. Antoine Allanore from MIT. The RMW is a leading workshop facilitating international research activities in the field of reactive metal processing with approximately 50 attendees from many countries, such as the USA, Canada, Norway, and Japan.

The two-day workshop included presentations on topics of current production/recycle processing of rare metals and advanced battery materials, which are essential for a sustainable society. The participants also participated in fruitful discussions. Additionally, students and support staff from MIT and IIS cooperated in coordinating the workshop and benefited from personal networking opportunities.



Access

Transportation Network



- 東京大学生産技術研究所 IIS-UTokyo KOMABA RESEARCH CAMPUS 小田急線・東京メトロ千代田線/代々木上原駅(駅番号:OH05・C01)から徒歩12分 Odakyu Line / Tokyo Metro-Chiyoda Line 12-min walk from Yoyogi Uehara Station(Station Number:OH05・C01) 小田急線/東北沢駅(駅番号:OH06)から徒歩8分 Odakyu Line 8-min walk from Higashi-Kitazawa Station(Station Number:OH06) 京王井の頭線/駒場東大前駅(駅番号:IN03)西口から徒歩10分 Keio Inokashira Line 10-min walk from Komaba-Todaimae Station(Station Number:IN03) 京王井の頭線/たノ上駅(駅番号:IN04)から徒歩10分 Keio Inokashira Line 10-min walk from Kenoue Station(Station Number:IN04)
- 東京大学生産技術研究所 千葉実験所 IIS-UTokyo CHIBA EXPERIMENT STATION JR総武本線西千葉駅から徒歩5分 5 min. walk from Nishi Chiba station (JR Sobu Line)

International Research Center for Sustainable Materials Institute of Industrial Science, the University of Tokyo 4-6-1 Komaba, Meguro-ku, Tokyo, 153-8505 JAPAN Room Number : Fw-201 Tel : +81-3-5452-6740 Fax : +81-3-5452-6741 http://susmat.iis.u-tokyo.ac.jp/

Location of Komaba Research Campus

小田急線/東京メトロ千代田線 東北沢駅(小田急線各停のみ)より伝参8分 代々木上原駅より徒歩12分 京王井の頭線(いずれも各停のみ) 静場東大前駅より徒歩10分 池ノ上駅より徒歩10分 Odakyu Line/Tokyo Metro-Chiyoda Line Keio Inokashira Line 10-min walk from Komaba Todaimae Station 10-min walk from Ikenoue Station 8-min walk from Higashi-kitazawa Station 12-min walk from Yoyogi Uehara Station 至去参通 r Omote-代々木上原駅(急行停車 Yoyogi Uehara Statio 東京メトロ 千代 Metro Chivoda - 喫茶店 Coffee shop 書店 Book store 井の頭通り (ashira Stri 代々木上原駅南 公司 Park 上原小学 Uehar 生産技術研究所 「IIS Univ. of Tokyo 信号 Traffic ei/ IE S Main gate 松蔭学園 Shoin Gaku 山手通りへー For Yamate Street 西门 West 駒場公園 Komaba Park 東大簡場 I キャンパス (教養学部等) Kamaba I Campus 和場りい (防場) gat Komat Campi 場小学校 maba Primary School そば屋 Noodle Restaurant 京王井の頭線 Keio Inokaeki 西口 West For S 2 駒場束大前駅 (各駅停車のみ) Komaba Todaimae Station Å 三菱UFJ銀行 Bank

Campus Map



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