

Endowed Research Unit for Non-ferrous Metals Resource Recovery Engineering (JX Metals Endowed Unit)

[Towards Highly Sustainable Society]

Institute of Industrial Science, Endowed Chairs

Non-ferrous Metals Resource Recovery Engineering

<http://www.metals-recycling.iis.u-tokyo.ac.jp/>

Industry–University Collaboration Center for Developing New Metal Recycling Processes

Sponsor: JX Nippon Mining & Metals Corporation

Recycling valuable materials is crucial for sustainable development. High-quality natural resources are depleting, and resource nationalism is intensifying in countries that own abundant natural resources. Therefore, it is imperative for the Japanese society to promote the recycling of rare metals and base metals. This unit develops environmentally-sound processes for recycling based on smelting and refining technologies for non-ferrous metals. Furthermore, in collaboration with industrial sectors, this unit aims at training young researchers and engineers belonging to this field.

[Period] 1st period: January 2012 to December 2016 (5 years)
 2nd period: January 2017 to December 2021 (5 years)
 3rd period: January 2022 to December 2026 (5 years)

In the second period, this unit advanced and strengthened the activities undertaken in the first period and spread awareness about the significance of this field among the general public, especially young generation (under high-school age) and their parents.

In the third period starting from January 2022, in addition to the past activities, we are developing newer activities focusing on SDGs and STEAM education.

Project Prof. Shunji Yamanaka joined the unit in April 2023.

Research Group



Development of Efficient Recycling Technologies for Rare Metals

Resource Circulation of Rare Metals

Raw Materials: Ti, W, Re, ...

Products Scraps: Aircrafts, Cutting tools, Electronics

Recycling Process: Pyrometallurgy, Hydrometallurgy, Electrochemistry

Okabe Laboratory is developing new, efficient, and environmentally-sound processes to recycle rare metals such as titanium, tungsten, cobalt, rhenium, and platinum group metals because an increase in the demand of these metals is expected in future.



Development of Separation and Concentration Technology to Utilize Waste/Refractory Ore as "Resource"

Consumption → Secondary materials → High purity metals & materials

Refractory ore → Mining → Separation/Concentration Process → Smelting

Toward... Sustainable metal utilization

Tokoro Laboratory explores solid–solid separation and concentration technology without heating or dissolving the waste or refractory ore to achieve an energy-efficient process. This process is considered "pre-treatment" or "middle treatment" performed before the metallurgical/hydrometallurgical process that produces high-purity metals.



Developing Non-ferrous Metal Production Processes

Raw materials (Ores) → Mineral Processing → Smelting, Refining → Industrial Materials (Metals, Materials) → Manufacturing → Final Products: Transportation Vehicle, Communication Equipment, Power supply Instrument

Kurokawa Laboratory develops energy-efficient, environmentally-sound, and economical process schemes to produce various non-ferrous metals. As compared to the conventional processes, these processes can minimize energy consumption, maximize recovery ratio of target metals, and reduce the amount of waste generated.



Development of a better future society by creating new value from intellectual property (IP)

Industry-Academia Collaboration and Intellectual Property

Creation of IP, Protection of IP, Exploitation of IP

IP is the key to the implementation of technologies and ideas into society. Sugano Laboratory takes the perspective of IP in advanced research and considers how to protect IP for social implementation. We create new opportunities for collaborative creation based on IP. IP connects many people, builds new knowledge, creates new places, and develops a better future society.



Development of nonferrous metal products and education of the next design engineers through Design and Prototyping

Nonferrous Metals Industry

Hidden Needs → Design & Prototyping → Products

Nurturing Design Engineers

Nonferrous metals are essential materials for advanced devices and clean technology. Yamanaka Laboratory is engaged in a new attempt to express the value of nonferrous metals to society broadly. Through these projects, we will nurture a new type of design engineers who have both technical knowledge and aesthetic sense.



Highly efficient metal production and recycling processes

Ore Intermediate Product → Metal Production and Recycling Process Reduction/Refining → Metal Scrap → Advance devices Clean technologies

Wastes → Low cost High purity metals

Ouchi Laboratory is engaged in research on the development of new smelting and recycling processes for nonferrous metals and aims to achieve the goal of "highly efficient use of energy and resource recycling." We contribute to the development of advanced technologies by efficiently converting energy into metal, and to the realization of a sustainable society by developing innovative resource recycling processes.

