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.

Research Group

**Development of Efficient Recycling Technologies for Rare Metals**

*Project Prof. Toru H. Okabe*

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”**

*Project Prof. Chiharu Tokoro*

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**

*Project Prof. Harumasa Kurokawa*

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)**

*Project Prof. Tomoko Sugano*

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**

*Project Prof. Shunji Yamanaka*

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**

*Project Lecturer Takanari Ouchi*

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.