JX Advanced Metals Corporation

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Corporate Profile
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JX Advanced Metals Corporation

CORPORATE PROFILE

Message from the Management

JX Advanced Metals is a nonferrous metals enterprise that conducts global operations related to nonferrous metals such as copper and rare metals, covering the full range of businesses from resource development, smelting and refining, to manufacture and sales of advanced materials, and recycling of metals from end-of-life equipment.

In recent years, the societal and business climate within which we operate has faced immense change. This is the result of such developments as progress in digital transformation, increasing momentum toward the decarbonization of society, deepening concerns over resource shortage and depletion, and increasing demands on companies in terms of their responsibilities to society.

The high value-added advanced materials we handle are essential for applications such as smart devices and telecommunications infrastructure. Thanks to our constant efforts to improve their quality and functionality, build a dynamic supply system, and develop new offerings, these materials serve to underpin progress in today's data-driven society. Furthermore, copper and other nonferrous metal resources are indispensable to achieving societal sustainability. We consider it our mission to continue supplying these resources stably into the future while also addressing ESG-related imperatives such as decarbonization and resource circulation, and are resolutely pursuing measures to this end.

Since our business commencement at the Hitachi Mine, we have maintained a work-oriented ethos to encourage free and open discussions and tackle difficulties together. With changes in society expected to accelerate further, we will continue boldly taking on the challenges of change and fulfilling our societal responsibilities to stakeholders as we seek to achieve sustained growth as an enterprise.

I hope we can rely on your continued warm support and encouragement as we pursue our goals.

President & Representative Director
Chief Executive Officer
JX Advanced Metals Corporation
Hayashi Yoichi

A Global Company Contributing to Development and Innovation in Society Through Advanced Materials

BusinessActivities

The JX Advanced Metals Group is engaged in a comprehensive range of nonferrous metal businesses, centered on copper and minor metals, spanning from mineral resources to smelting and recycling, and the manufacture and development of advanced materials.

Strategic Business Portfolio for Society in 2040

Social trends surrounding the JX Advanced Metals Group's business environment are undergoing major changes, including the advance of the data society and the growing global momentum toward achieving of the SDGs.
Against this backdrop, the Group has formulated its Long-Term Vision 2040, aiming to transform JX Advanced Metals Group into a technology-based company.
We seek to achieve sustainable growth by positioning each business as either a Focus Business, at the core of our growth strategy, or a Base Business, supporting our organizational foundation.

Focus Businesses ▶P5-8

Semiconductor materials segment

Thin Film Materials Business

Employing advanced technology cultivated over years of doing business, we are a supplier of a wide variety of sputtering targets for Semiconductor, compound semiconductor materials, high-purity metals, and more. These materials, provided on a global scale, find use cases in end products such as leading-edge IT equipment, medical instruments, and advanced electronics devices found in electric vehicles.

Tantalum and Niobium Business

Primarily driven by TANIOBIS GmbH, one of the world's leading manufacturers of tantalum and niobium, we contribute to evolution of the IoT/AI society through stable provision of products such as metal powders used in capacitors and semiconductor materials, high-purity oxides for SAW devices and optical lenses, chlorides and compounds, and superalloy additives.

ICT materials segment

Functional Materials Business

Employing advanced metal fabrication technology cultivated over years of doing business, the Company has become a global supplier of highly-advanced products such as rolled copper foils for flexible circuit boards, as well as precision copper alloys including titanium copper, Corson alloy, and phosphor bronze - all used in connectors and other parts.

Base Businesses ▶P9-12

Metals & Recycling segment

Mineral Resources Business

We hold interests in several mines in Chile and are striving for stable operation and further improvement of productivity.
We are also actively involved in the exploration and development of minor metal mines since demand for those metals is expected to increase in the future in the field of advanced materials.

Metal & Recycling Business

We are able to efficiently use our smelting processes to take copper concentrate and recycled raw materials and supply high-quality metal products such as copper and precious metals. These products are then used as materials for our advanced materials, as well as provided in a stable fashion in Japan and parts of Asia. In recent years, we have been contributing to the establishment of a recycling-oriented society especially through increasing the amount of recycled raw materials processed.

Focus Businesses

Our advanced materials with high functionality, high-added-value, and which have the number one global market share, support the advancement of the data society.

The use of digital data in various industries and the popularization of 5th generation (5G) mobile communication systems have led to an ever-increasing need for advanced materials. The JX Advanced Metals Group contributes to the advancement of the data society by supplying customers around the world with high-quality advanced materials with its number one global market share, supported by advanced technological capabilities cultivated over many years of doing business in areas such as high purification, alloying, and rolling treatment. We will also consistently take on the challenge of innovation through further development and evolution of our accumulated technologies, and contribute to the advancement and innovation of society.

The JX Advanced Metals Group's Advanced Materials Supporting the Future Society

The advanced materials of the JX Advanced Metals Group play an important role in supporting the evolution of IoT and AI, as well as the development of a sustainable future society.

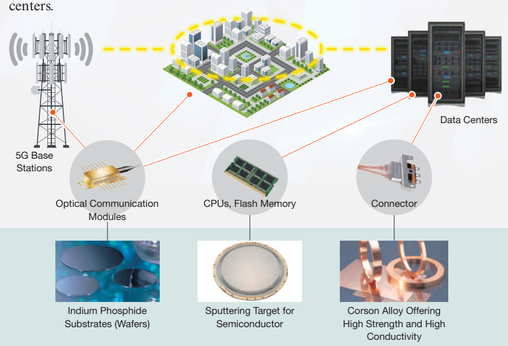
Contributions to Future Society

Supporting the Evolution of Smartphones for an Affluent Society

Smartphones have become an indispensable device in our daily life. In today's digital-driven society, it is expected that products will become more advanced and multifunctional in the future. In order to realize this evolution, it is essential that the components used in these smartphones, such as CPUs, flash memory, cameras, and flexible printed circuit boards, become more sophisticated. The advanced materials of the JX Advanced Metals Group support this evolution.

Contribution to High-speed, High-reliability and High-capacity Communications Through Supplying Materials for Communications Infrastructure

With the popularization of 5th generation (5G) mobile communication systems, a full-fledged digital society is expected to arrive in which all things around us are connected to networks. The JX Advanced Metals Group provides various highly-advanced materials that support high-speed and high-frequency communication infrastructure, including base station equipment and data centers.



Major Advanced Materials Offered by the JX Advanced Metals Group

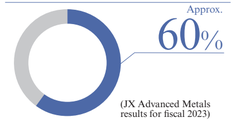
Sputtering Target for Semiconductor

Thin Film Materials Business

Timely provision of high-quality targets contributing to improved semiconductor reliability

These materials are harnessed to form fine wiring patterns on semiconductor wafers. We offer a wide variety of sputtering targets, including not only copper but tantalum, titanium, tungsten and cobalt. Our production processes offer a stable supply of high-quality products thanks to advanced technologies cultivated over years of business activities, including high purity capabilities. We also have four processing plants around the world, and have built a system that enables us to provide the products our customers demand in a timely manner.

Global Market Share



Approx. 60%

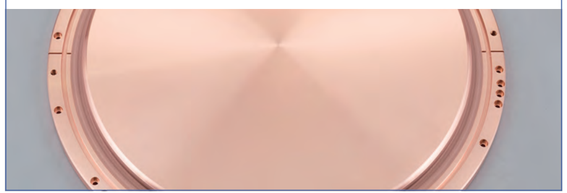
(JX Advanced Metals results for fiscal 2023)

Primary Application Example

Semiconductors (memory, logic, etc.)

Final Application Examples

Smartphones, PCs, home appliances, communication infrastructure, data centers, automobiles



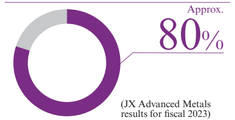
Treated Rolled Copper Foil for FPC

Functional Materials Business

Contributing to the miniaturization and longer lifespans of smartphones with excellent bending performance and durability

These are used in flexible printed circuit boards (FPCs), bendable wiring materials connecting internal smartphone components. These materials contribute to the miniaturization and longer lifespans of smartphones. The JX Advanced Metals Group has integrated processes spanning from raw material copper ingot casting to rolling, fabrication and surface treatment, and boasts a high market share with high quality recognized around the world.

Global Market Share



Approx. 80%

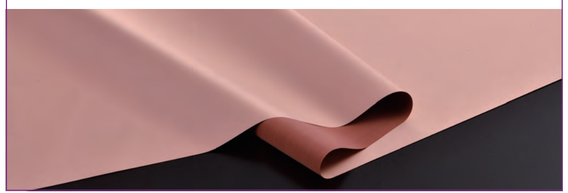
(JX Advanced Metals results for fiscal 2023)

Primary Application Example

Flexible printed circuit boards (FPCs)

Final Application Examples

Smartphones, PCs, home appliances, automobiles



High-Purity Tantalum Powder

Tantalum and Niobium Business

Stable supply of high-quality tantalum powder essential for capacitors and semiconductor wiring

Tantalum is a minor metal used as a barrier material for capacitors and semiconductor wiring. In 2018, the JX Advanced Metals Group welcomed new member, German firm H.C. Starck Tantalum and Niobium GmbH (now TANIOBIS GmbH), one of the world's leading manufacturers of tantalum materials. As part of the Group, TANIOBIS supplies high-quality tantalum powder with uniform particle size and extremely low impurity content to customers around the world.

Global Market Share

Approx. 50%

(JX Advanced Metals results for fiscal 2023, Company estimate)

Primary Application Example

Capacitors, sputtering targets

Final Application Examples

Smartphones, PCs, home appliances, communication infrastructure, data centers, automobiles

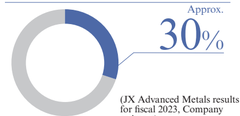
Indium Phosphide Compound Semiconductor Substrates

Thin Film Materials Business

Various compound semiconductor substrates backed by advanced technology

Compound semiconductors are semiconductors made from multiple elements exhibiting unique properties not found in silicon semiconductors, including excellent high-speed signal processing and responsiveness to light. JX Advanced Metals provides various compound semiconductor substrates, including indium phosphide (InP) substrates, which are indispensable for optical communication modules (light-receiving and emitting devices) that support high-speed and highly reliable communications. These substrates are backed by advanced technologies that include raw material purification and wafer processing technologies, and are expected to be adopted in new fields such as anti-collision sensors for automobiles in the future.

Global Market Share



Approx. 30%

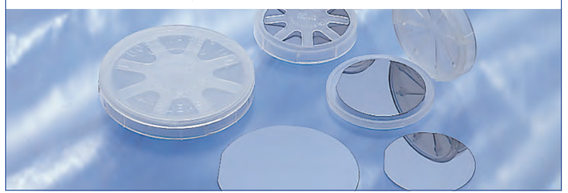
(JX Advanced Metals results for fiscal 2023, Company estimate)

Primary Application Example

Optical communication devices, high-frequency devices

Final Application Examples

Communication infrastructure, data centers, automobiles

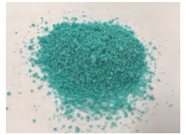


Base Businesses

Our base businesses are responsible for the stable supply of copper, minor metals and other nonferrous metals supporting the most essential but often invisible elements of our daily lives.

Demand for nonferrous metal resources, especially copper and minor metals, is expected to increase with a growing world population, economic growth in developing countries and rapidly growing interest in decarbonization. However, with deepening regional disparities and mineral resource shortages/depletion, competition to acquire mineral resources with good quality has intensified.

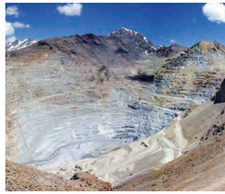
Recognizing that it is our social mission to provide a stable supply of nonferrous metals essential for the development of society, including copper and minor metals, the JX Advanced Metals Group strives to strengthen the competitiveness of Mineral Resources Business and Metal & Recycling Business, while promoting initiatives to build a recycling-oriented society.



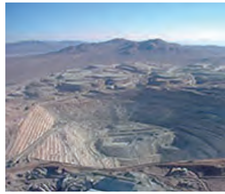
Mineral Resources Business

With copper concentrate exhibiting lower copper grade and increasing impurities worldwide, the value of clean, high-grade copper concentrates is on the rise. The copper concentrate produced at the Caserones Copper Mine, in which we hold interests, is clean with low impurities and provides a key raw material for the Saganoseki Smelter & Refinery operated by JX Advanced Metals Smelting Co., Ltd. To ensure stable raw material supplies we also hold interests in other high-quality overseas mines in addition to the Caserones Copper Mine, such as the Los Pelambres Copper Mine and the Escondida Copper Mine. We are also exploring and developing minor metal mines in order to secure a supply chain of raw materials for advanced materials. In 2022, we decided to participate in tantalum materials production business at Mibra Mine in Brazil.

Caserones Copper Mine



Los Pelambres Copper Mine



Escondida Copper Mine

Business Processes

Exploration and Development

Extensive exploration using satellites and helicopters. After exploration activities including chemical analysis of rock samples, the necessary production facilities are constructed, followed by mining activities.

Mining

Large-scale mines in operation today are commonly "open pit" mines, which have a cone-shaped excavation. Generally, in copper mines, 100kg copper concentrates only contains around 1kg of copper. Therefore, it is necessary to mine over a large area.

Mineral Processing

Mined copper concentrates are crushed and milled with water, and then special reagents are added via air bubbles to separate copper-rich particles. This separation method is called "flotation".

Copper concentrates

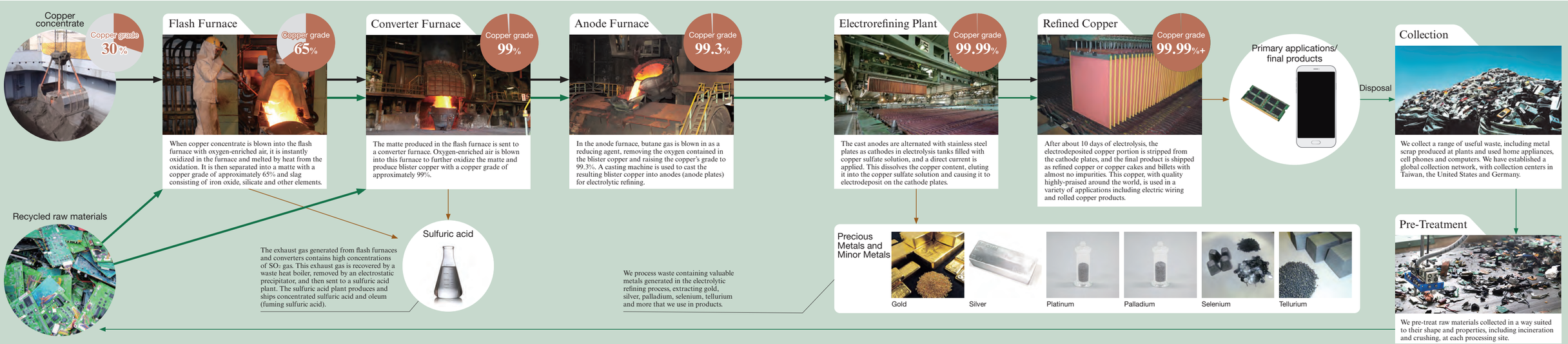
Through these processes, copper concentrate with around 30% copper purity are produced and transported to the smelting process.

Metals & Recycling Business

The JX Advanced Metals Group is promoting integrated management of metal smelting and recycling. We use copper concentrates, as well as recycled raw materials like used home appliances and electronic devices, in our high-efficiency smelting processes to produce refined copper of 99.99% or higher purity. This copper smelting also produces by-products, such as precious metals and sulfuric acid. These products are used as materials for our advanced materials, as well as supplied in a stable fashion to Japan, regions throughout Asia and other parts of the world. Copper smelting at the Saganoseki Smelter & Refinery of JX Metals Smelting Co., Ltd. employs a method with limited environmental footprint, using reaction heat from sulfur in the copper concentrates for melting. This excess heat is harnessed, enabling treatment of recycled raw materials and increasing the amount of these materials that are treated, contributing to the construction of a sustainable, recycling-oriented society. In addition, our detoxification business for industrial waste applies incineration and melting technologies cultivated in smelting. This business is unique for its zero-emission treatment that eliminates secondary waste that would otherwise require landfill disposal, contributing to pollution prevention as well.

Saganoseki Smelter & Refinery

Copper Smelting and Recycling Process



Research and Development

The JX Advanced Metals Group is actively working to advance research and development with the aim of becoming a technology-based company capable of harnessing nonferrous metal-related technology and knowledge. With this technology and knowledge, cultivated over many years of doing business, we will rapidly provide society with products and technologies driving evolution.

Research and Development Policy

We relentlessly pursue innovation by advancing and utilizing core technologies accumulated to date, and through co-creation with outside resources.

Evolution and Advancement of Core Technologies

We will continue to evolve and develop our core technologies, which have been the source of our competitiveness for more than a century since our founding, and pursue further potential in nonferrous metal materials.

<JX Advanced Metals Core Technologies>

- High Purity
- Composition and Structure Control
- Powder Control
- Precision Rolling, Stamping and Plating
- Surface Control
- Analysis, Evaluation, and Examination
- Separation, Extraction, and Refining

Cooperation with Startups

Bringing together JX Advanced Metals core technologies with the innovative technologies of startups, we will generate advanced materials offering new value and contribute to the further advancement of society.

<Example of Cooperation>

- NanoWired GmbH (A bonding technology that can bond substrates and other materials at low temperatures by means of fine metal lawns formed on metal surfaces.)
- Material Concept, Inc. (copper paste technology)
- Alloyed Limited (alloy design for metal additive manufacturing)
- Lotus Thermal Solution Inc. (porous metal materials, known as “lotus metals”)
- Novel Crystal Technology, Inc. (gallium oxide crystals for power devices)

Contribution to the Sustainable Development of Society

JX Advanced Metals

Group Synergies

By bringing together the technologies, knowledge, and other management resources at each Group company and harnessing them in an organic and dynamic way, we will create new added value.

<Major Group Companies>

- TANIOBIS GmbH
- Toho Titanium Co., Ltd.
- TATSUTA Electric Wire and Cable Co., Ltd.

Promotion of Industry-Academia Collaboration

We actively promote collaboration with universities and other research institutions for the purpose of providing a stable supply of nonferrous and minor metals, developing materials, and fostering human resources who will lead the next generation.

<Example of Collaborations with Universities>

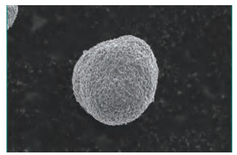
- Establishment of the Endowed Research Unit for Nonferrous Metal Resource Recovery Engineering at the University of Tokyo (2012-)
- Conclusion of an organizational collaboration and cooperation agreement with Tohoku University (2018-)
- Established the “JX Nippon Mining&Metals Joint Research Chair for Circular Economy Promotion” at the Graduate School of Engineering, Osaka University (2021-)
- Establishment of the Endowed Chair at Waseda University (2023-)

Research Themes (Excerpt)

Recycling Lithium Ion Batteries and Developing Next-Generation Battery Materials

Countries around the world show a striking trend in that they are encouraging widespread use of electric vehicles (EVs) to combat global warming. This has led to concerns that minor metals and other resources required for the lithium-ion batteries (LiBs) powering these EVs will face depletion and soar in price. Meanwhile, LiBs reaching end of life (EoL) are expected to be disposed of in mass quantities, necessitating a recycling system that can recover mineral resources safely and efficiently. Since 2009, JX Advanced Metals has been one of the world's pioneers in launching projects for recovering minor metals from recycling LiBs. Today, we are conducting research and development with the aim of realizing "closed-loop recycling" where we recover mineral resources from these LiBs and use them once again as LiB raw materials. We are also focused on the development of cathode materials for fully solid-state batteries, which are expected to be utilized as the next generation of batteries.

Demonstration trial facilities for automotive LiB recycling



Cathode materials for fully solid-state batteries (under development)

Developing Next-Generation Crystalline Materials

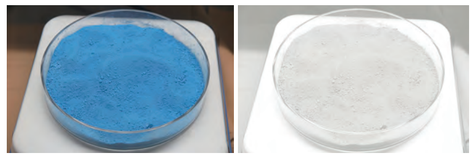
For many years, JX Advanced Metals has been producing and supplying crystalline material products such as indium phosphide (InP) compound semiconductor substrates used in optical communications. The quality of our products backed by advanced technologies has received high praise from a wide range of customers in Japan and overseas. It is anticipated that demand for crystalline materials will grow even further in an array of fields, for applications including next-generation optical devices for large-scale communication in the 6G era, light receiving and emitting elements, which are essential to commercialize advanced sensing technologies, and power semiconductors, critical for achieving a decarbonized society. The Company is also investing in start-ups and collaborating with Group companies to actively promote the development of next-generation crystalline materials.

Rutile TiO2 Crystals Produced by Group Company Furuuchi Chemical Corporation

Gallium oxide 100mm epitaxial wafer produced at Novel Crystal Technology, Inc., in which JX Advanced Metals has a stake

Developing Next-Generation Semiconductor Wiring Materials

In recent years, semiconductor structures have become increasingly complex and fine, leading to demands to develop more advanced materials. By applying high-purity and chlorination technologies that the JX Advanced Metals has cultivated over several years, we are developing metal chloride raw materials for use in Chemical Vapor Deposition (CVD), a cutting-edge semiconductor process. Furthermore, in 2018, we signed an organizational collaboration and cooperation agreement with Tohoku University and established the Joint Research Chair on Next-Generation Wiring Materials Research, as part of our work to also proactively research and develop next-generation wiring materials through industry-academia collaboration.



High-purity metal chloride used in advanced semiconductor devices

Developing Materials for Metal Additive Manufacturing

It is anticipated that metal additive manufacturing devices will be adopted in a wider array of fields thanks to their advantages of being able to form complex shapes and to handle small-lot and made-to-order production. JX Advanced Metals has invested in Alloyed, which is engaged in the business of designing alloys for metal additive manufacturing devices and developing proprietary software for additive manufacturing equipment. In our partnership with Alloyed, we promote collaboration in the development and application of metal powders for additive manufacturing as well as in the development of new copper alloys for precision rolling. In our collaboration, we are working to utilize the development of pure copper and copper alloy materials for medical implant materials, ultra-high melting point materials for aerospace applications, and various other applications, utilizing high-quality raw materials produced by our Group, including copper, tantalum, and niobium.

Pure copper powder used for metal additive manufacturing with surface treatment

Ankle implants designed and formed by Alloyed

ESG

Today, ESG (Environmental, Social and Governance) perspectives are indispensable for companies to achieve long-term growth. As a leading company in the nonferrous metals industry, the JX Advanced Metals Group is actively promoting ESG management.

(Photo) Oshima cherry blossoms at the Hitachi Mine, where greenery was restored to a mountain devastated by smoke pollution

The JX Advanced Metals Group's Materialities

The JX Advanced Metals Group has identified six materialities in order to realize our 2040 Long-Term Vision, and we are taking actions to address these. We have also set key performance indicators (KPIs) for each materiality. The ESG Committee is in charge of administrating this system, measuring and assessing the levels of achievement for each KPIs.

- E: Contribute to Environmental Conservation
- S: Provide Advanced Materials that Support Lives and Lifestyles
- S: Create Attractive Workplaces
- S: Respect Human Rights
- S: Coexistence and Co-Prosperity with Local Communities
- G: Strengthen Governance

Priority Items to Address

Addressing Climate Change

As the world moves more rapidly toward decarbonization, the JX Advanced Metals Group is stepping up its efforts to decarbonize, establishing a key goal of 50% in total in-house CO_2 emissions reductions by fiscal 2030 (vs. fiscal 2018) and net zero CO_2 emissions by fiscal 2050.

Contributing to a Recycling-Oriented Society

At the JX Advanced Metals Group, we believe that our mission is to minimize resource final disposal through an ongoing cycle while maintaining the maximum value of these resources. In addition to working on resource recycling by harnessing our advanced technological capabilities, we will contribute to the creation of a recycling-oriented society by collaborating with external companies and research institutions.

Complying with International Norms and Initiatives

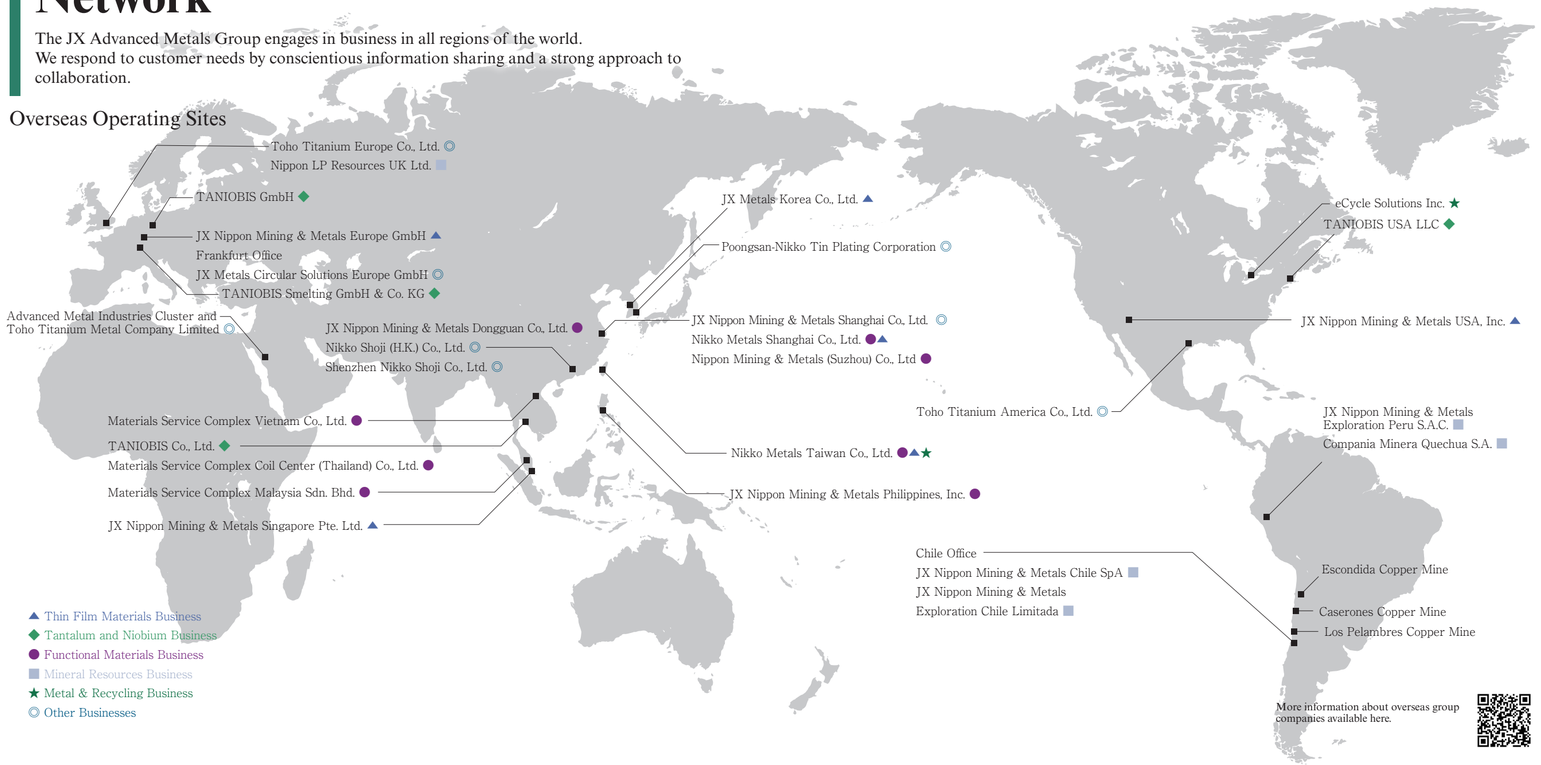
The JX Advanced Metals Group is committed to contributing to the realization of a sustainable society through active participation in various industry associations and compliance with social requirements such as international norms and initiatives. We will continue to fulfill our social responsibilities as a member of the international community doing business on a global scale.

Sustainability Report ▶https://www.jx-nmm.com/english/sustainability/

Network

The JX Advanced Metals Group engages in business in all regions of the world.
We respond to customer needs by conscientious information sharing and a strong approach to collaboration.

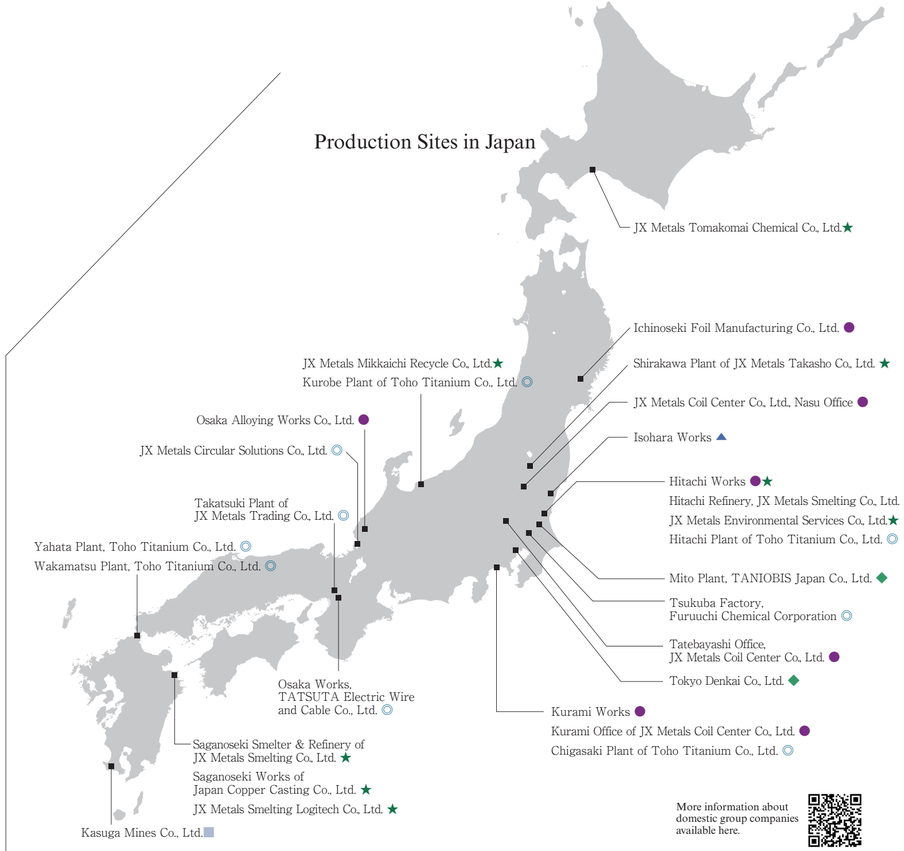
Overseas Operating Sites



▲ Thin Film Materials Business
◆ Tantalum and Niobium Business
● Functional Materials Business
■ Mineral Resources Business
★ Metal & Recycling Business
◎ Other Businesses

More information about overseas group companies available here.

Production Sites in Japan



More information about domestic group companies available here.

End of May, 2024

Corporate History

1905 Our Founding Year

Fusanosuke Kuhara opens the Hitachi Mine (Ibaraki Prefecture)

1916

Opened the Saganoseki Smelter & Refinery (Oita Prefecture), one of the largest smelters in Japan

1949

Established Karasuyama Laboratory (Tokyo), a predecessor of our R&D organizations

1964

Kurami Works (Kanagawa Prefecture) opened with state-of-the-art rolling mills

1985

Isohara Works (Ibaraki Prefecture) opened, becoming a new main manufacturing center in Japan

2003

Nikko Metal Manufacturing established (as a spin-off of Nikko Metals' metal fabrication business)

2006

New Nikko Metals established (through the three-way merger of Nikko Metals, Nikko Materials, and Nikko Metal Manufacturing)

2014

Launched production at Caserones Copper Mine (Chile)

2020

Relocated headquarters to Toranomon, Minato-ku

1912

Kuhara Mining established

1914

Construction of the world's tallest stack, at 155.7 meters high, at the Hitachi Mine to deal with pollution in the area

1928

Kuhara Mining renamed to Nippon Sangyo

1929

Nippon Mining established (spun off from the mining and smelting division of Nippon Sangyo)

1968

Chile Office established

1970

First Nikko process flash smelting furnace completed at Saganoseki

1973

Second Nikko process flash smelting furnace completed at Saganoseki

1978

New recycling furnace built at Hitachi Smelter & Refinery

1986

Nippon Mining Museum opened

1992

Start of operations at Nikko Metals (as a spin-off of Nippon Mining's metals and metal fabrication businesses, with Nippon Mining renamed Japan Energy in 1993 after merging with Kyodo Oil Co., Ltd.)

1998

Nikko Metals listed on the First Section of the Tokyo Stock Exchange

1999

Nikko Materials established (as a spin-off of Japan Energy's electronic materials business)

2002

Established Nippon Mining Holdings, Inc. (Merger of Japan Energy and Nikko Metals)

2010

JX Holdings established (through the merger of Nippon Mining Holdings and Nippon Oil Corporation)

2016

Changed Japanese name of JX Nippon Mining & Metals

2017

JXTG Holdings established (with the merger of JX Holdings and Tonen General Sekiyu, renamed ENEOS Holdings in 2020)

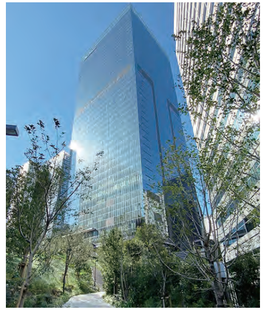
2017

Frankfurt Office established

2018

Acquired shares in H.C. Starck Tantalum and Niobium GmbH (now TANIOBIS GmbH)

Corporate Profile



Company Name	JX Advanced Metals Corporation
Paid-in Capital	75.0 billion yen
Head Office	The Okura Prestige Tower 10-4, Toranomon 2-chome, Minato-ku, Tokyo 105-8417, Japan TEL : 03-6433-6000 (Switchboard)
Business Lines	Thin Film Materials Business Tantalum and Niobium Business Functional Materials Business Mineral Resources Business Metal & Recycling Business
Employees	Consolidated: 10,431 Non-consolidated: 3,345 (as of March 31, 2023)