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Innovative Development,  
Imagination for the Dream,  
Identity & Diversity

Feature

# Evolving **AI** Infrastructure Supported by Optical Device Technology



# Dawn of a New AI Era

## High-Speed, High-Capacity Requirements for Data Centers

— Optical Devices Are at the Core of Data Center Networks —

In recent years, data centers have entered a new phase. Since around 2023, the demand for data centers has skyrocketed as generative AI, including ChatGPT, rapidly made its mark. Compared to conventional data centers, AI data centers require massive amounts of computational processing for learning and inference, and require network capacity several tens of times greater.

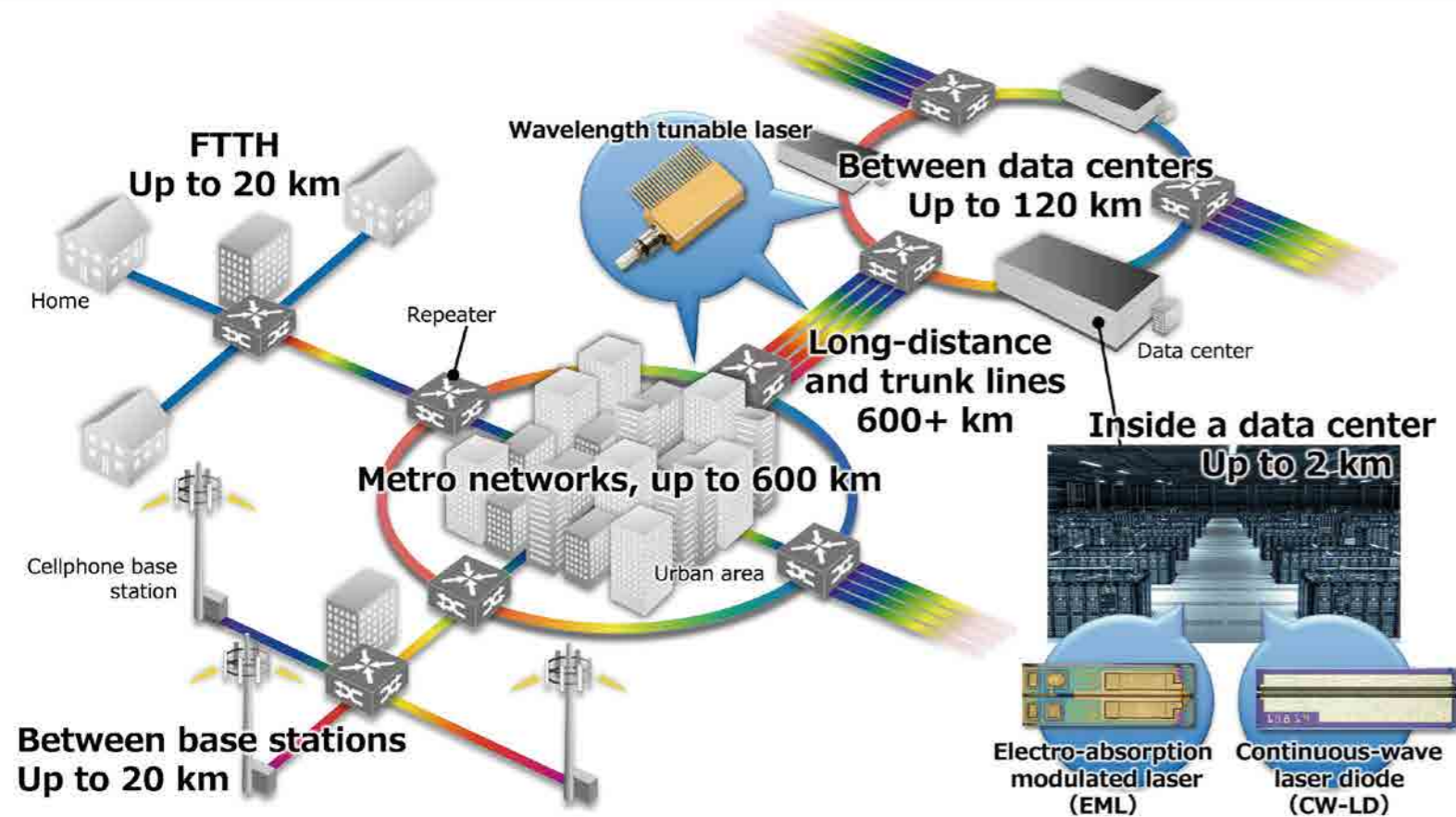
Optical devices are essential for the high-speed, high-capacity communication traffic required for AI data centers. Sumitomo Electric Group has been developing and manufacturing optical devices for many years. In particular, there is currently a growing social demand for optical devices on the transmitting end that use semiconductor lasers as light sources. This issue looks at the match between Sumitomo Electric Group's leading-edge optical devices and market needs, now and in the future.

ChatGPT is a trademark or registered trademark of OpenAI, Inc. or its subsidiaries in the United States and other countries.

# The Evolution of Optical Devices Essential for Optical Communications — Responding to the New Demands of Data Centers —

Optical Communication Networks and Optical Devices

Technology Development for High-Speed, High-Capacity Communications



## Semiconductor Lasers for Transmission: Essential Devices for High-Speed, High-Capacity Communications

Optical communication has now become an important component of social infrastructure, benefiting many people. To handle growing data traffic, a shift from metal cables to optical fiber cables has occurred because the latter allows for the stable transmission of large volumes of data at high speeds over long distances. In optical communications, signals are converted

from electrical to optical at the transmitting end, transmitted over optical fibers, and then converted back to electrical signals by a photodetector at the receiving end.

The critical factor is the light source. Currently, the light source used in optical communications is the semiconductor laser, which is a light-emitting element. The light source, emitting light with the same wavelength and phase, enables stable data transfer over long distances at high speeds. This is the optical device that the Sumitomo Electric Group has been developing and manufacturing for many years.

As communication traffic increases at data centers, there is a demand for the data center to handle faster, higher-capacity communication while reducing its power consumption.

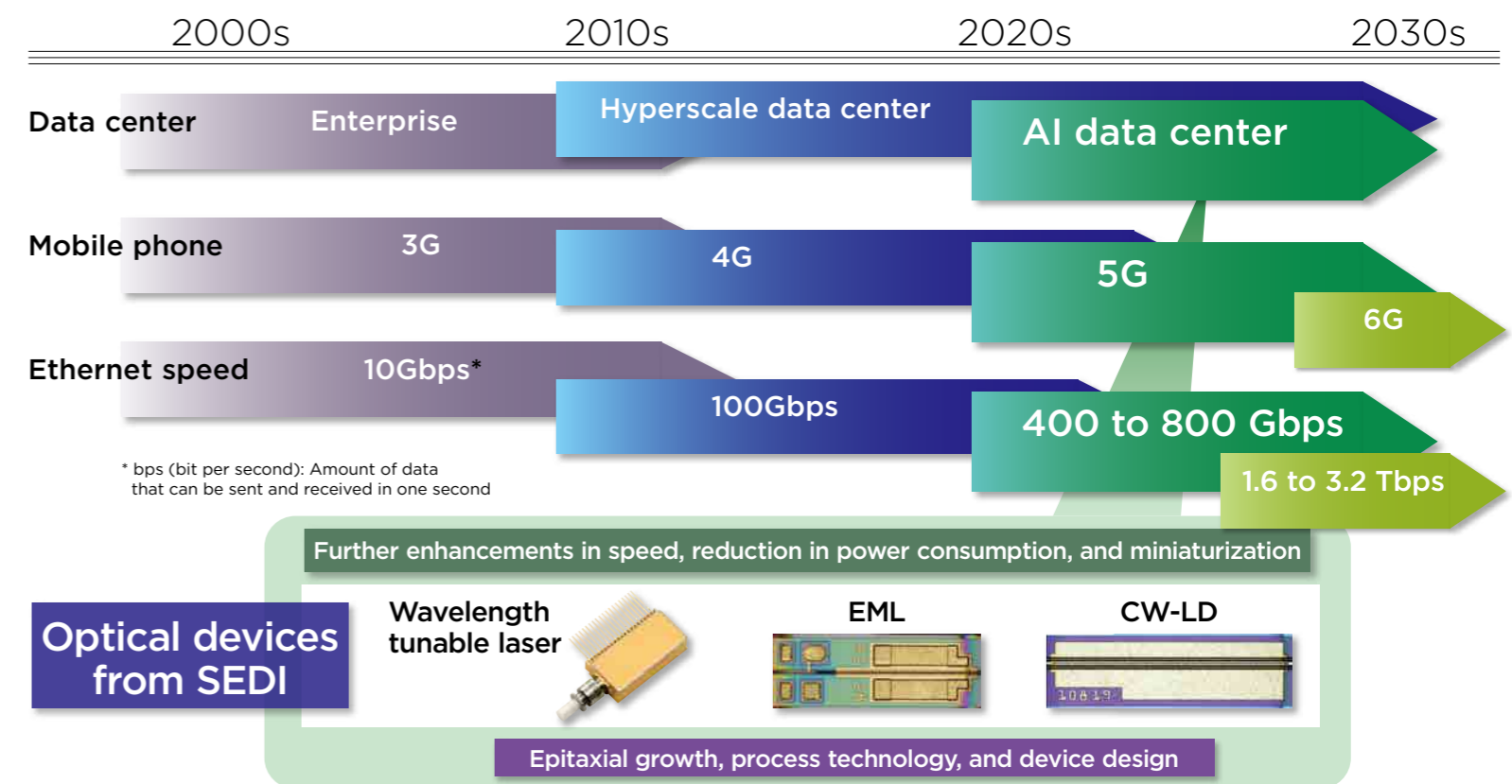
## AI Solutions Created by Extraordinary Processing Power

With the advent of generative AI, data centers are shifting to become AI data centers. The biggest difference compared to conventional data centers is the high processing power needed for AI computations. AI data centers

are equipped with hardware specifically designed for AI, such as graphics processing units (GPUs), that enable rapid learning and analysis of large amounts of data. The volume of data and computations that companies and research institutions need to process is increasing exponentially; optical devices are essential components for transmitting this massive volume of data quickly and reliably.

## Three Key Products Supporting Data Centers

Sumitomo Electric Device Innovations, Inc. (SEDI) is responsible for the optical device business of the Sumitomo Electric Group. SEDI has two domestic business sites in Yokohama and Yamanashi. In addition, it has a manufacturing site in Vietnam and development support divisions in Europe, the United States, and China, where the company designs, develops, and manufactures optical and wireless communication devices. The source of its strength is its ability to provide both optical and wireless communication solutions from a single company, from raw material development to final



products. The person who leads SEDI is President & CEO Hirotake Iwadate. He has worked on optical devices since joining the company and assumed his current position in June 2025.

"The explosive increase in data traffic requires optical devices that enable high-speed, high-capacity data transmission. We have responded quickly and effectively. We specialize in optical communication devices that connect devices within data centers and among data centers. Electro-absorption modulated lasers (EML) and continuous-wave laser diodes (CW-LD) (details below) are used within the data centers. In addition, we supply tunable lasers that can simultaneously send multiple wavelengths of light over optical fibers between data centers. The EML is a product with a history of approximately 40 years, and we are among the leaders in the global EML market. The CW-LD has achieved high levels of efficiency, high output, and small chip size and has come to dominate the global market." (Iwadate)

## High Technological Expertise Developed by Compound Semiconductors

SEDI's strength, which has allowed it

to maintain its competitive edge in the global market, lies in its materials. While silicon is a well-known semiconductor material, the materials used in optical devices include compound semiconductors composed of multiple elements, such as indium phosphide and gallium arsenide. Compound semiconductors enable the creation of light-emitting devices and high-performance electronic devices that cannot be achieved with silicon, which is a single-element semiconductor. The process used for the crystal growth of these compound semiconductors is known as epitaxial growth (details below). SEDI has been refining this technology for about half a century.

"Compound semiconductor optical devices are continually required to achieve higher speeds, capacities, and lower power consumption, and this demand continues to this day. Data communication speeds, which used to be around 10 Gbps, have now increased to 800 Gbps, with 1.6 Tbps on the horizon in the near future. To achieve even higher performance, there is a multitude of technical challenges that must be addressed. We want to bring about innovation while approaching the market and our

customers with sincerity." (Iwadate) Iwadate continues to explain SEDI's vision.

"The optical communications market is characterized by repeated cycles of growth and stagnation. Nonetheless, we take pride in having continued to invest and hone our technology development and manufacturing capabilities even through these cycles. We will continue to maximize the advantages of compound semiconductors and to supply high-value-added products." (Iwadate)



Hirotake Iwadate  
President & CEO, Sumitomo Electric Device Innovations, Inc.



Yamanashi Plant, Sumitomo Electric Device Innovations, Inc.

## Compound Semiconductor Substrates (Wafers): A Challenge for High Quality and Precision – Sumiden Semiconductor Materials Co., Ltd.

The quality of semiconductor lasers used in optical communications depends heavily on the quality of the wafer. The wafers are produced by thinly slicing an ingot, a column of grown indium phosphide crystals. The company responsible for the manufacturing and development of these compound semiconductor substrates is Sumiden Semiconductor Materials Co., Ltd. Yuichi Oeki of the

Itami Crystal Production Engineering Group is in charge of the crystal growth process in wafer manufacturing.

"The materials are indium and phosphorus. They are subjected to a thermal reaction, melted at high temperatures to create a liquid, and then cooled to form single-crystal indium phosphide. My mission is to optimally control and manage high temperatures of over 1,000°C inside the crystal growth furnace to produce high-quality single-crystal indium phosphide. I continue to improve that process every day." (Oeki)

The ingot produced in this way is then sliced. The role of Tomoki Kimura of the Processing and Production Engineering Group is responsible for slicing the ingot.

"The ingot is brittle and easily chipped. Slicing at a scale of 0.5 mm to 0.8 mm, along with the subsequent chamfering process, requires meticulous attention. At the same time, maintaining the orientation of the crystal lattice, which indicates the crystal orientation of the wafer, is crucial during the manufacturing process. As it serves as a reference for processing, I am always striving to

Indium phosphide wafer (4 inches)



achieve high precision." (Kimura)

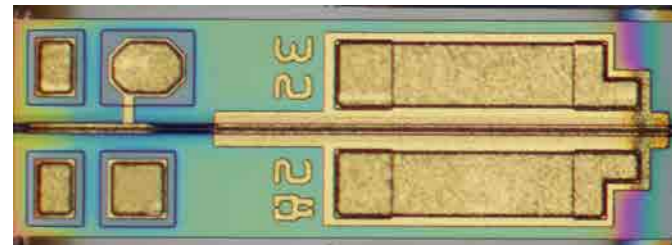
For Ryo Takasaki of the Facilities Group, the most important task at present is the installation of crystal growth furnaces.

"We have a number of crystal growth furnaces, but as demand for optical devices is growing rapidly, we are considering the introduction of additional furnaces. Crystal growth furnaces, which are used under high temperatures and pressures, require comprehensive safety measures, and there is also a requirement for technology to measure the temperature inside the furnace more accurately during crystal growth." (Takasaki)

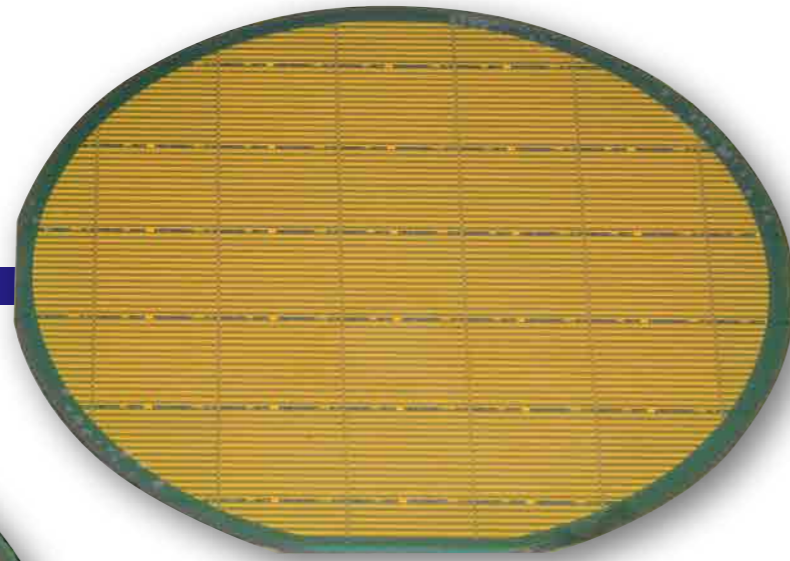
Sumiden Semiconductor Materials Co., Ltd. continues to take on the challenge of upgrading its capabilities with more advanced facilities and pursuing the production of even higher-quality wafers.



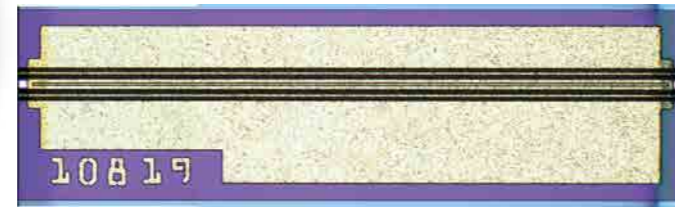
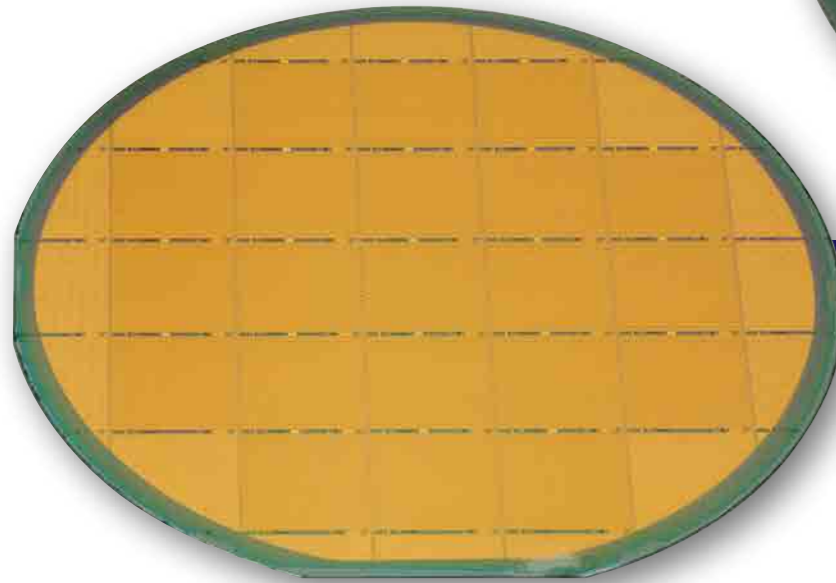
(from left) Tomoki Kimura, Processing and Production Engineering Group, Production Engineering Department, Sumiden Semiconductor Materials Co., Ltd.; Yuichi Oeki, Itami Crystal Production Engineering Group, Production Engineering Department, Sumiden Semiconductor Materials Co., Ltd.; Ryo Takasaki, Assistant Manager, Facilities Group, Facilities Department, Sumiden Semiconductor Materials Co., Ltd.



EML chip (above) and EML wafer (right)



CW-LD wafer (left) and CW-LD chip (right)



# Effectively Responding to Market Demands with New Devices — Trends in EML and CW-LD Development —

## EML Aiming for High Speed and Low Power Consumption

The EML, one of SEDI's main products, is an integration of a semiconductor laser that can stably emit light of a single wavelength (color) and an EA modulator. The conventional method of directly modulating the current flowing through a semiconductor laser to switch it on and off at high speed had a problem with signal degradation. The EA modulator was developed to solve this problem. This device prevents signal degradation by quickly switching between transmitting and blocking laser light. The EML has always been required to be faster and consume less power. Kyohei Maekawa of the Photonic Devices Design Department is in charge of design in the Lightwave Device Division.

"To achieve higher speeds, it is essential to reduce the electrostatic capacitance of the modulator. For that purpose, shortening the modulator length is effective, but this creates a trade-off. Doing so results in a weaker signal, which leads to communication errors. Our goal is to achieve both speed and signal integrity by devising the internal structure of the EA modulator. Semiconductor lasers emit light using

extremely small electron wells, called 'quantum wells'. By stacking them together to create multi-quantum wells and optimizing their structure, it becomes possible to emit light faster and more efficiently, so we are also working on developing this." (Maekawa)



Kyohei Maekawa, Design Group 2, Photonic Devices Design Department, Lightwave Device Division, Sumitomo Electric Device Innovations, Inc.

## Differential Drive — A New EML Driving Method

Masahiro Honda of the Product Development Department is in charge of project management, listening to customer needs and incorporating them into products. He is currently focusing on the development of a new method called "differential drive EML." Driving refers to supplying electrical

signals from outside to make the optical device operate correctly.

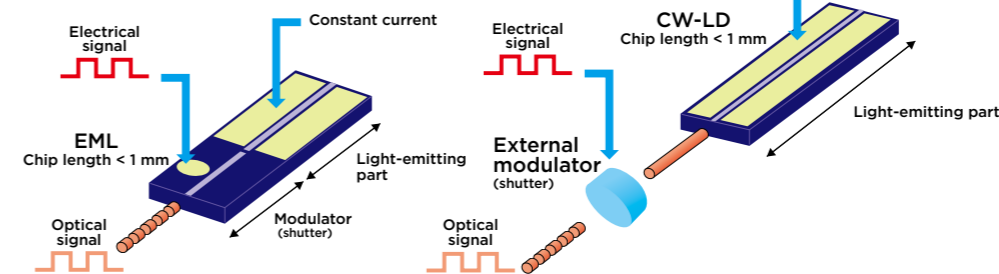
"Conventionally, EA modulators were driven by a single electrical signal. The differential drive EML is an improvement that allows it to be driven by two electrical signals. The background to this development was customer requests for higher speeds and lower power consumption. Using two electrical signals makes it possible to suppress the effects of external noise, which become more noticeable as speeds increase. Furthermore, the amplitude of the electrical signal can be reduced, which implies the possibility of reducing power consumption." (Honda)

The differential drive EML is important in fields such as data centers



Masahiro Honda, Sub-Leader, DC segment, Product Development Department, Lightwave Device Division, Sumitomo Electric Device Innovations, Inc.

## Schematic Diagram of EML and CW-LD Structures



A laser chip is a semiconductor chip that converts electricity into light. There are two types: the EML, which has an internal modulator (shutter) that can switch the light on and off and can independently convert electrical signals into optical signals. By contrast, the CW-LD has no internal modulator; it emits a continuous light and uses an external modulator to convert the light into optical signals.

that require high speed and energy efficiency. The device will continue to be improved as it incorporates feedback from customers, with the goal of achieving mass production.

## CW-LD Aiming for High Output and Low Power Consumption

One of SEDI's other main products, the CW-LD, which is becoming a major player in the data center market, is designed by Konosuke Aoyama of the Photonic Devices Design Department. The CW-LD is a semiconductor laser that constantly emits a certain light. Without

having an internal modulator, the device performs the conversion to an optical signal using an external modulator. Aoyama is working on how to achieve even greater output more efficiently.

"Current leakage is always an issue when increasing power output. It causes a significant decrease in power conversion efficiency. To reduce current leakage, we precisely controlled the temperature and gas ratio during crystal growth on the substrate and repeatedly studied the types and amounts of impurities required. In addition, we increased the width of the active layer that emits light so as to obtain light



Device design team members at work

more efficiently, and in parallel with this, by isolating areas with different electrical functions, power distribution has been optimized. As a result, high optical output and power conversion efficiency have been achieved. We are already in the phase of preparing for mass production." (Aoyama)



Konosuke Aoyama, Design Group 1, Photonic Devices Design Department, Lightwave Device Division, Sumitomo Electric Device Innovations, Inc.

# Process Development for Mass Production of Optical Devices



## — Developing Process Technologies for New Products —

### Epitaxial Growth and Dry Etching

Product specifications presented during the design stage are translated into a concrete form through process development, which is the source of SEDI's strength. One aspect of process development is the epitaxial growth of compound semiconductors. This technology involves forming and layering new thin crystal layers on top of a crystal substrate (wafer) in a way that precisely traces the crystalline structure of the substrate. This technology enables the creation of high-quality semiconductor layers with specific functions. The process is to form nanometer-scale thin films by transporting an organometallic raw material in conjunction with a gas that moves the raw material to a crystal growth furnace, where the material is thermally decomposed on a crystal substrate heated to approximately 600°C. Consequently, temperature and pressure control and appropriate gas selection have a significant impact on the crystal quality. SEDI has developed epitaxial growth technology over many years, enabling the formation of high-quality thin films with high precision and uniformity.

Dry etching proceeds in tandem with

this process. Developed specifically for miniaturizing laser chips, this technique uses gas and plasma to etch the substrate, achieving high-precision fabrication of intricate circuit patterns according to the design. SEDI possesses unique technologies that utilize dry etching to create smooth fine optical paths and precisely process distinctive structures, making them core technologies of SEDI alongside epitaxial growth technology.

### Achieving Improved Characteristics with Novel Compound Semiconductors

Tohma Watanabe of the Device Process Engineering Department has been in charge of epitaxial growth since joining the company. He has worked continuously on epitaxial growth technology since his student days.

"The manufacturing process for optical devices consists of repeated cycles of epitaxial growth and etching, known collectively as the growing and engraving process. I have been working on improving the characteristics of EML. Making the light flash faster and sending clearer signals leads to faster optical communication. The key is how much light the modulator can absorb.

Finding the optimal compound for the modulator's multi-quantum well structure was very difficult, but I persevered in process development and was able to proceed to mass production." (Watanabe)

Having achieved the optimization of the multi-quantum well structure, Watanabe aims to become a semiconductor manufacturing professional by mastering the process of epitaxial growth.



Tohma Watanabe  
Group 1, Device Process Engineering Department,  
Lightwave Device Division, Sumitomo Electric Device  
Innovations, Inc.

### Transition from 2-Inch Wafers to 4-Inch Wafers

Takumi Endo, who belongs to the same Device Process Engineering Department as Watanabe, is also

involved in process development. A turning point for him as an engineer working with optical devices was the expansion of wafers to 4-inch ones used in the manufacturing of laser chips.

"If the diameter is larger, many chips can be cut from one wafer. This allows us to achieve lower costs. However, changing the diameter necessitated a review of the equipment and manufacturing conditions, and I continued to optimize the process by tackling each challenge. Currently, 4-inch wafers are already in mass production and are one of the key sources of our competitiveness." (Endo)

Endo is also in charge of launching 4-inch wafers for the mass production of high-light output CW-LDs. The challenge for him is laser chip



Takumi Endo  
Group 1, Device Process Engineering Department,  
Lightwave Device Division, Sumitomo Electric Device  
Innovations, Inc.

miniaturization. By achieving this, he aims to contribute to cost reduction.

### Aiming to Optimize and Stabilize Production Facilities

Takuma Sekiguchi, who belongs to the Manufacturing Engineering Department, is in charge of pre-shipping inspection of mass-produced optical devices. His tasks go beyond merely judging products as pass or fail.

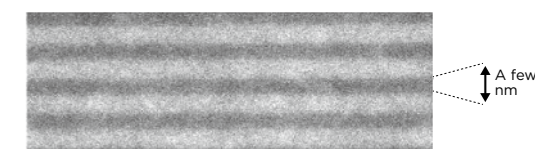
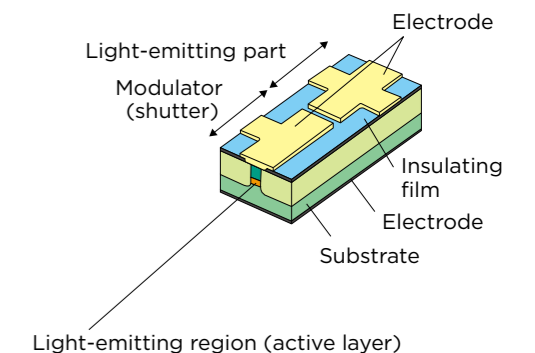
"Due to the surge in demand, our existing facilities cannot keep up, so we are implementing a plan to increase production. It takes about six months, including trial runs, for the equipment to be installed and operate stably. Another significant challenge is how to minimize the defect rate and reduce waste. Through various explorations, we hope to achieve optimization and stabilization not just in inspection, but also in production equipment, as well as cost reduction." (Sekiguchi)



Takuma Sekiguchi  
Chip & CoC Engineering Group, Manufacturing  
Engineering Department, Lightwave Device Division,  
Sumitomo Electric Device Innovations, Inc.

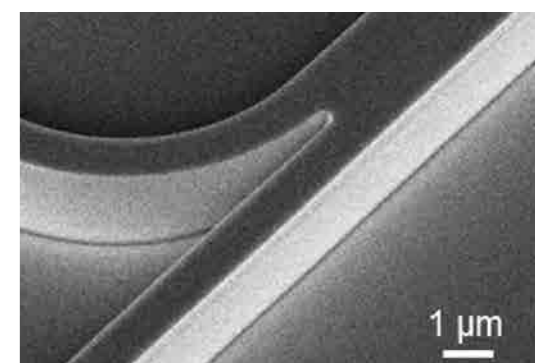
The team members continue to work hard amid the dramatic changes in the

### High-Quality EMLs from Epitaxial Growth



EMLs are constructed using a multi-quantum well structure in which multiple semiconductor layers with thicknesses of a few nanometers are alternately stacked.

### High-Precision Technology for Dry Etching



environment surrounding optical devices, including the need to respond quickly to the surge in demand and swift process development to meet the demands for new product development.

## C O L U M N

### Overseas Manufacturing Sites Efforts in Vietnam

— Sumiden Device Innovations Vietnam Co., Ltd.



SEDI's manufacturing sites are located in Yokohama and Yamanashi, along with an overseas site near Ho Chi Minh City, Vietnam. Sumiden Device Innovations Vietnam Co., Ltd. (SEDEV) is responsible for the production of optical modules that incorporate laser chips made by SEDI. SEDEV's main products are characterized by their small size, high optical output, and low power consumption. For example, a package about the size of a smartphone's nano-SIM card (the smallest SIM card) is assembled with approximately 20 components with extremely fine

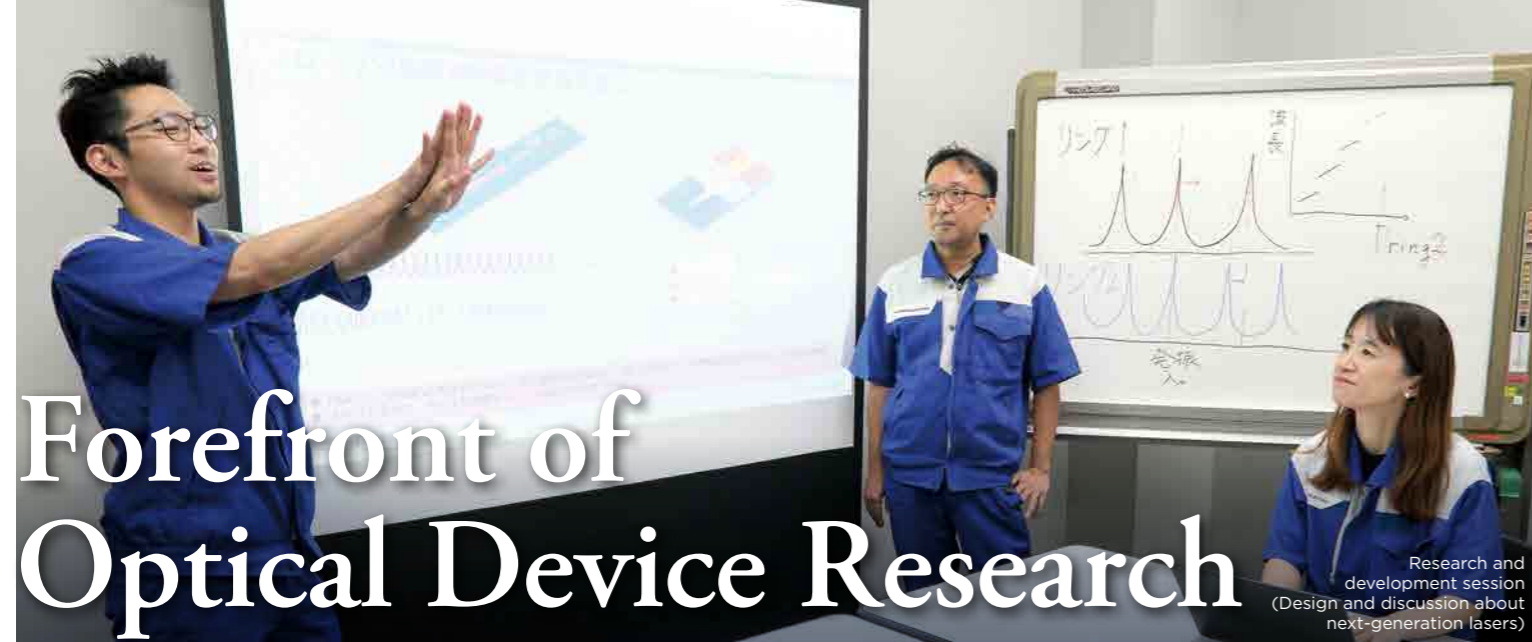


Motoki Saji  
General Director, Sumiden Device Innovations  
Vietnam Co., Ltd.

precision utilizing various joining technologies. At SEDI, the development and manufacturing staff work together, focused on ensuring stable mass production; SEDEV has taken further steps to thoroughly enhance its assembly and inspection methods, thus achieving shorter times and increased production. The individual overseeing all of this is General Director Motoki Saji.

"Looking ahead, I believe it is important to consider about how to manufacture products efficiently. While solidifying our foundation and actively incorporating innovative ideas and technologies that look forward the future, we aspire to make a significant contribution as a key manufacturing hub for high-performance optical modules." (Saji)

SEDEV strongly supports SEDI by promoting efficient production and by ensuring the stability and improvement of both mass production and production ramp-up framework.



# Forefront of Optical Device Research

Research and development session (Design and discussion about next-generation lasers)

## — Heterogeneous Integration Technology and Photonic Crystal Surface-Emitting Laser —

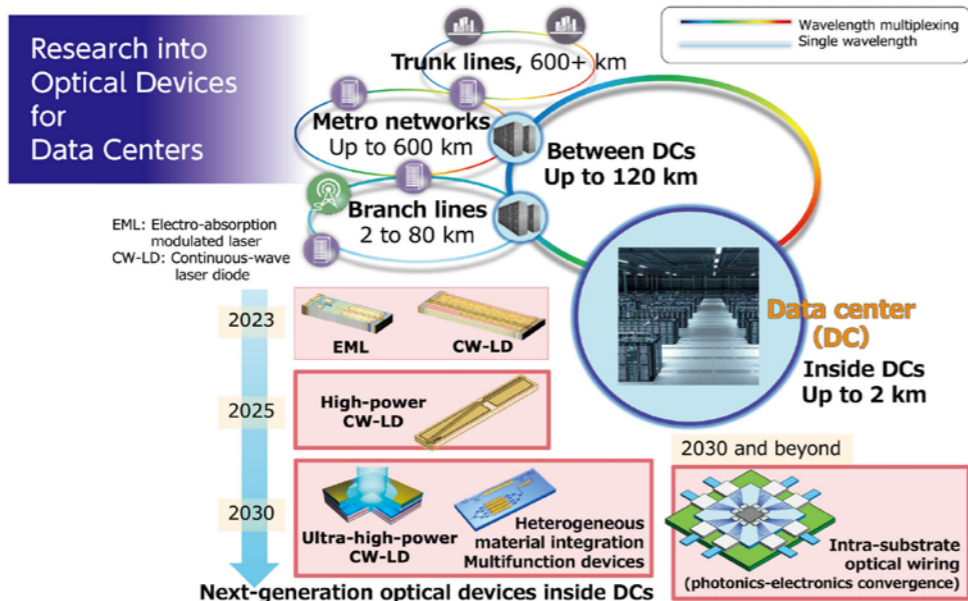
### Indium Phosphide and Silicon Photonics

SEDI has been supplying high-speed, high-capacity optical devices with lower power consumption in response to market needs. Sumitomo Electric's Transmission Devices Laboratory has been at the forefront of this effort and has provided support. The transmission speed of optical communication is anticipated to reach around 10 Tbps in the 2030s. However, conventional single-material optical devices are showing limitations in high-speed operation; a technological breakthrough is necessary. To tackle this challenge, attention has turned to heterogeneous material integration technology. This technology involves combining and integrating components. Hideki Yagi, from the Optical Devices Department of the laboratory, has been actively engaged in cutting-edge research and development for many years.



Hideki Yagi  
Senior Assistant General Manager, Optical Devices Department, Transmission Devices Laboratory

"Simply put, it is a technology that combines the advantages of indium phosphide semiconductors and silicon photonics.\* An indium phosphide light source and a modulator are properly bonded to the silicon substrate that guides and controls light. This allows the compound semiconductor to achieve high speed, while silicon photonics enables miniaturization and low power consumption. We are currently developing a bonding technology that uses oxygen. To achieve this, we are keenly aware that we need to understand physical properties involved, as well as the



knowledge and skills required for both silicon and indium phosphide processing. We aim to overcome this challenge and guide our efforts towards stable mass production." (Yagi)

\* A technology that creates a waveguide on a silicon substrate to propagate and control light. Information is transmitted using optical signals instead of conventional electronic circuits (electrical signals).

### Towards Game-Changing Photonics-Electronics Convergence Technology

Another major theme that the Transmission Devices Laboratory is addressing is "ultra-high output CW-LD." It is a next-generation semiconductor laser that uses a photonic crystal surface-emitting laser (PCSEL). This type of semiconductor laser emits light uniformly from the surface of the chip, achieving higher output compared to conventional semiconductor lasers that emit light from the edges. Masaki Yanagisawa, General Manager of the Optical Devices Department, is leading the research and development.

"When you increase the light-emitting area to achieve high output from a semiconductor laser, the beam quality tends to deteriorate. The PCSEL breaks through that limitation. By using a structure called a 'photonic

crystal,' we can achieve high output without degrading the beam quality." (Yanagisawa)

The Transmission Devices Laboratory is currently addressing two major themes. What direction will future optical devices take?

"From the perspective of reducing environmental impact, the demand for lower power consumption in optical devices will always exist. In response to this demand, we have begun working on photonics-electronics convergence technology. This technology combines electronic and optical devices, replacing electrical wiring with optical wiring, aiming to increase network capacity, reduce latency, and achieve significant power consumption reduction. I want to develop technology and products that will have a positive impact on society and be a game-changer." (Yanagisawa)



Masaki Yanagisawa  
Manager, Optical Devices Department, Transmission Devices Laboratory

# Leading Sales Strategies for the AI Era

## — Sumitomo Electric Group's Optical Devices Are Being Deployed in Collaboration with Overseas Sales Offices —

### Sales Companies in the US, Europe, and China Are Promoting Sales Activities

The Lightwave Device Sales Department of Sumitomo Electric's Infocommunications Device Sales Division is responsible for the sales and marketing of optical devices. The majority of customers for the optical devices supplied by SEDI are overseas. The company's sales structure includes sales offices in the US (San Jose),



Members of the Lightwave Device Sales & Marketing Department and overseas business sites

Europe (UK and Italy), and China (Hong Kong and Shenzhen), who actively promote optical devices with emphasis on their performance. The Lightwave Device Sales Department is responsible for overseeing all sales activities, including those of each sales company. Its main customers are manufacturers that develop and manufacture optical transceivers for short-distance optical communications, which are in high demand within data centers, and for high-capacity optical communications between data centers. We spoke to Seiichi Sanada, Department Head of the Lightwave Device Sales & Marketing Department, about actual sales activities.

"A distinctive feature of the data center business is that the product cycle is extremely fast. Unless we quickly develop next-generation products and continue to have them adopted by customers, we will not be able to achieve a stable business. In addition, there are industry standards for optical

communications, and we need to participate in the standardization phase and advance our development. For this reason, we are also working to involve optical transceiver manufacturers in our efforts to directly approach data center operators. We explain our proprietary technologies to them and get involved in their planning process from the beginning. I believe that this style of communication is the key to successful sales." (Sanada)



Seiichi Sanada  
Department Head, Lightwave Device Sales & Marketing Department, Infocommunications Device Sales Division

### Expanding Business by Continuing to Connect with Customers

Akihito Kudo of the Data Center Network Group is in charge of sales to optical transceiver manufacturers. He is in charge of one of our major clients, a Chinese manufacturer.



Akihito Kudo  
Assistant Manager, Data Center Network Group, Lightwave Device Sales & Marketing Department, Infocommunications Device Sales Division

"It's very important to understand what customers want and when they want it, and to deliver what they need at the right time. My mission is to

increase sales of existing products, promote design-in activities for new products, and lead to the successful introduction of new products." (Kudo)

What kind of approach will be required in sales in the future?

"Historically, the optical communications industry has seen big fluctuations in supply and demand. It's likely that both the technology and players will evolve in the next five to ten years. As we adapt to changes in demands and technologies, we need to stay connected with customers we believe this to be the key to our business expansion." (Sanada)

### Standardization of Platforms with the Telecom Sector

Lastly, we interviewed Toshio Higashi, General Manager of SEDI, who oversees the optical device business, about his outlook for the future.

"Currently, the data center market is largely polarized between North America and China. GPUs, the heart of AI data centers, have been almost exclusively dominated by the United States, but GPU development in China is accelerating, and a huge market is expected to eventually emerge in the country. We need to understand the supply chain situation of optical transceiver manufacturers and formulate customer strategies. In the future, we should also consider standardizing platforms not only for data centers but also for the telecommunications sector, including mobile wireless communications and broadcasting. I believe that leveraging our cross-disciplinary expertise in process technologies will reveal new opportunities for optical devices." (Higashi)



Toshio Higashi  
General Manager, Lightwave Device Division, Sumitomo Electric Device Innovations, Inc.

The optical devices of the Sumitomo Electric Group that support the advancing AI society will continue to evolve and create a new world of optical communications for society at large. These devices hold limitless possibilities for the future.



Sales meeting

# A Key Solution for a Green Society

## Redox Flow Battery: Safe Energy Storage with a Long Lifespan

**Osamu Inoue**  
President

In its long-term vision toward Fiscal Year 2030, Sumitomo Electric Industries, Ltd. has adopted the slogan "Living in Safety and Comfort on Our Green Planet."

As global warming accelerates and initiatives toward a sustainable environment become ever more critical, how will the Sumitomo Electric Group contribute to the realization of a green, environmentally-friendly society?

President Osamu Inoue shares his insights on the Group's growth strategy centered on three priority fields (energy, infocommunications, and mobility) as well as the potential of the redox flow battery, which is attracting attention as a large-capacity energy storage system that offers both long service life and a high level of safety.

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### Enhancing Corporate Value Through Three Key Areas

#### — The Sumitomo Electric Group 2030 VISION and the Mid-term Management Plan emphasize the realization of a green society.

Since its founding, the Sumitomo Electric Group has provided products and services that contribute to safe and comfortable living.

In the current Mid-term Management Plan 2025, we have set forth the goal of "Creating a Green Society Through Our Connecting and Supporting Technologies." Addressing environmental challenges such as global warming is becoming increasingly important in achieving a sustainable society.

This is why we have positioned energy as one of our three key areas for medium- to long-term corporate value creation. By offering a broad range of products and services compatible with renewable energy, we are contributing to the realization of a decarbonized society.

#### — The numerical targets of the Mid-term Management Plan 2025 were achieved one year ahead of schedule.

In fiscal 2024, consolidated results reached net sales of ¥4.68 trillion, operating income of ¥320.6 billion, and a pre-tax ROIC of 9.3%. These results all exceeded the targets originally set for fiscal 2025.

These results reflect steady progress, particularly in the three key areas.

In energy, demand expanded for power cables and substation equipment for renewable energy. In infocommunications, orders related to data centers for generative AI grew significantly. And in mobility, demand for automotive wiring harnesses remained robust.

For fiscal 2025, although we expect a year-on-year decline in revenue and profit due to the impact of U.S. tariff policies under the Trump administration, we believe we can still exceed our target levels.

#### — Looking ahead to fiscal 2030, what path do you envision?

We aim to achieve ¥5 trillion in consolidated net sales and ROIC exceeding 10% by fiscal 2030, continuing growth centered on the three key areas.

At the same time, sustainable growth requires nurturing future sources of earning. One area in which we see significant potential is the redox flow battery.

### Over 20 Years of Operation and 99% Recyclability

#### — What kind of product is the redox flow battery?

A redox flow battery is a large-capacity energy storage system that charges and discharges electricity through reduction-oxidation reactions while circulating an electrolyte.

Our redox flow battery systems use non-flammable electrolytes, are highly resistant to degradation, and offer an operational life exceeding 20 years. The new model scheduled for release this fiscal year is designed for up to 30 years of operation, significantly longer than other battery technologies.

In addition, the system components are made of flame-retardant materials, eliminating the risk of ignition that is seen in lithium-ion batteries.

The electrolyte can be reused, and 99% of the remaining materials are recyclable, making the system highly environmentally friendly.

#### Features of the Vanadium Redox Flow Battery



##### High Level of Safety (Minimal Fire Risk)

The electrolyte is non-flammable and all components are made of flame-retardant materials.



##### Long Life

Due to its fundamental charge/discharge mechanism, there is no degradation of electrolyte or electrodes, and the number of charge-discharge cycles does not accelerate degradation. The system can be operated for long periods, regardless of the operating method.



##### Environmentally Friendly

The electrolyte can be reused, a practice already proven in the field. Additionally, with proper material separation, up to 99% of system components can be recycled. (Sumitomo Electric also participates in the Green Transformation (GX) League, an initiative led by the Ministry of Economy, Trade and Industry of Japan; and has obtained wide-area certification for industrial waste treatment from Japan's Ministry of the Environment.)



The vanadium redox flow battery delivered to the Minami Hayakita Substation of Hokkaido Electric Power Network, Inc.

— Where have these batteries been installed?

They are used primarily as storage systems for renewable energy sources such as wind and solar power. Because renewable energy output depends on natural conditions and cannot be easily controlled, storing surplus electricity in batteries enables a stable supply aligned with demand.

The system installed at Hokkaido Electric Power Network’s Minami-Hayakita Substation is the largest commercial installation to date and stabilizes wind power output.

They have also been adopted in regions such as Kashiwazaki City in Niigata Prefecture, Minami-Kyushu City in Kagoshima, and the Oki Islands in Shimane Prefecture.

Overseas, commercial operation began in California following a demonstration project that started in 2015. The high level of safety and recyclability was particularly valued in a region with strong environmental awareness.

— What challenges remain for wider adoption?

Because redox flow battery systems require tanks and pumps to circulate electrolytes, a certain installation footprint is unavoidable.

Through downsizing efforts, systems can now be installed starting from three 20-foot containers. We aim to further reduce size to expand installation options and stimulate demand.

Cost reduction is also a key challenge. We are working to lower initial costs by increasing production volume, developing more cost-effective materials, and improving system efficiency.

As installations increase, establishing robust maintenance systems for inspections and repairs will also be essential.

For “Goho Yoshi” (Five-Way Win)

— How are redox flow battery systems positioned within 2030 VISION?

They are a key solution for realizing “Living in Safety and Comfort on Our Green Planet.”

The Sumitomo Electric Group follows the philosophy of “Goho Yoshi”(Five-Way Win), which refers to five kinds of stakeholders: employees, customers, suppliers, regional communities, and shareholders & investors.

To deliver value to all stakeholders, steady business growth is essential. Alongside our current strong businesses, we must also cultivate the next pillars of growth.

Although business for the redox flow battery is still relatively small, we aim to quickly monetize this business to more than ¥10 billion in annual sales. Interest is growing in various regions in Japan as well as overseas.

While high initial costs can be a hurdle, we strive to communicate the total value: safety, environmental performance, long-duration storage, and recyclability.

Revived by Engineers’ Passion.



Please see the website for more details. ⇨



Please see here for the feature on 'id'. ⇨  
"id" vol.19 Feature: Supporting Renewable Energy  
The Mission of Redox Flow Energy Storage Batteries

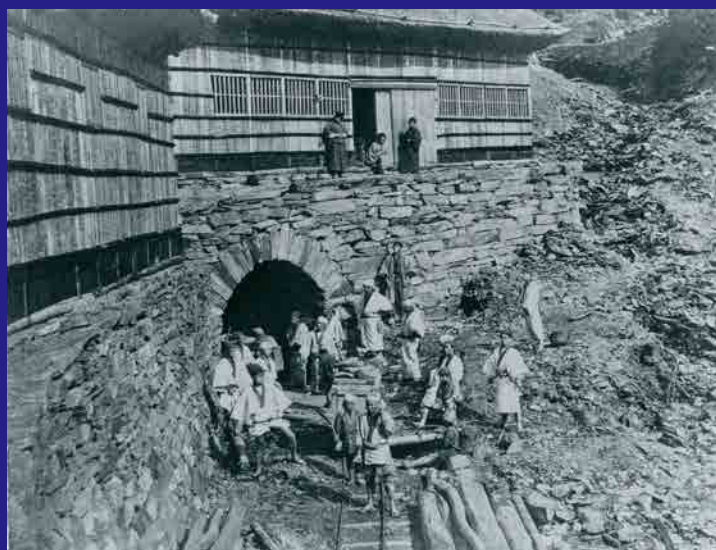


## Sumitomo Biographies

# Saihei Hirose



Saihei Hirose



South entrance of Adit No. 1 (photographed in 1881). Evidently, tracks were laid and cargo was moved by trolley. Photo courtesy of Sumitomo Historical Archives

### —Laying the Foundation for Sumitomo's Prosperity —

The Sumitomo family grew dramatically during and after the Meiji period. The foundation for this was laid by the first soriji (director-general), Saihei Hirose. In 1865, at the age of 38, Hirose became manager of the Besshi Copper Mines. During the Meiji Restoration, the mines faced the threat of being seized by the new government, but he argued, "the Besshi Copper Mines have been managed independently by the Sumitomo family," and in 1873 the new government officially granted Sumitomo permission to continue managing the mines. He also worked hard to implement copper mine management reconstruction; he introduced dynamite mining for the first time in Japan, which significantly increased copper production. These achievements protected the foundation of the Sumitomo family and paved the way for further development.

Later, in 1877, Hirose became soridainin

(prime agent) of the Sumitomo family and played an important role in the Osaka business world during the Meiji period, contributing to the establishment of the Osaka Stock Exchange and the Osaka Chamber of Commerce and Industry. He is also said to be the first civilian to receive a decoration (the Order of the Sacred Treasure, Fourth Class). Hirose's management skills and innovative spirit contributed greatly to Sumitomo's business expansion.

Furthermore, he valued employees and focused on improving the working environment. This "management that values people" established a stable organizational culture at Sumitomo, which became the foundation for its later growth. Hirose's achievements went beyond commercial success; he contributed to the modernization of the Japanese economy and had a positive impact on the way companies are managed.

Information and videos not posted in this magazine are found on the "id" special site

<https://sumitomelectric.com/id>



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