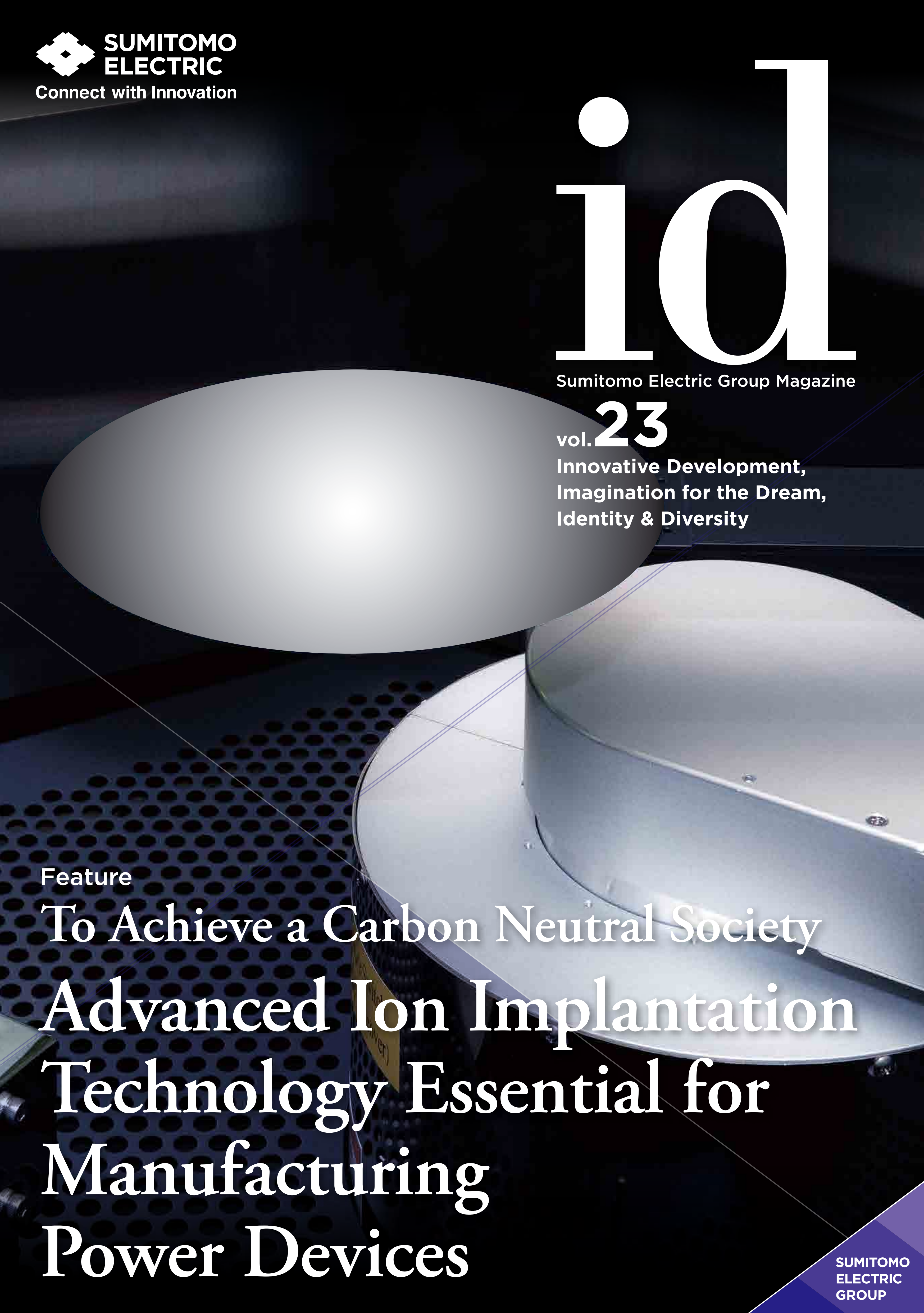


SUMITOMO ELECTRIC
Connect with Innovation

id

Sumitomo Electric Group Magazine
vol.23

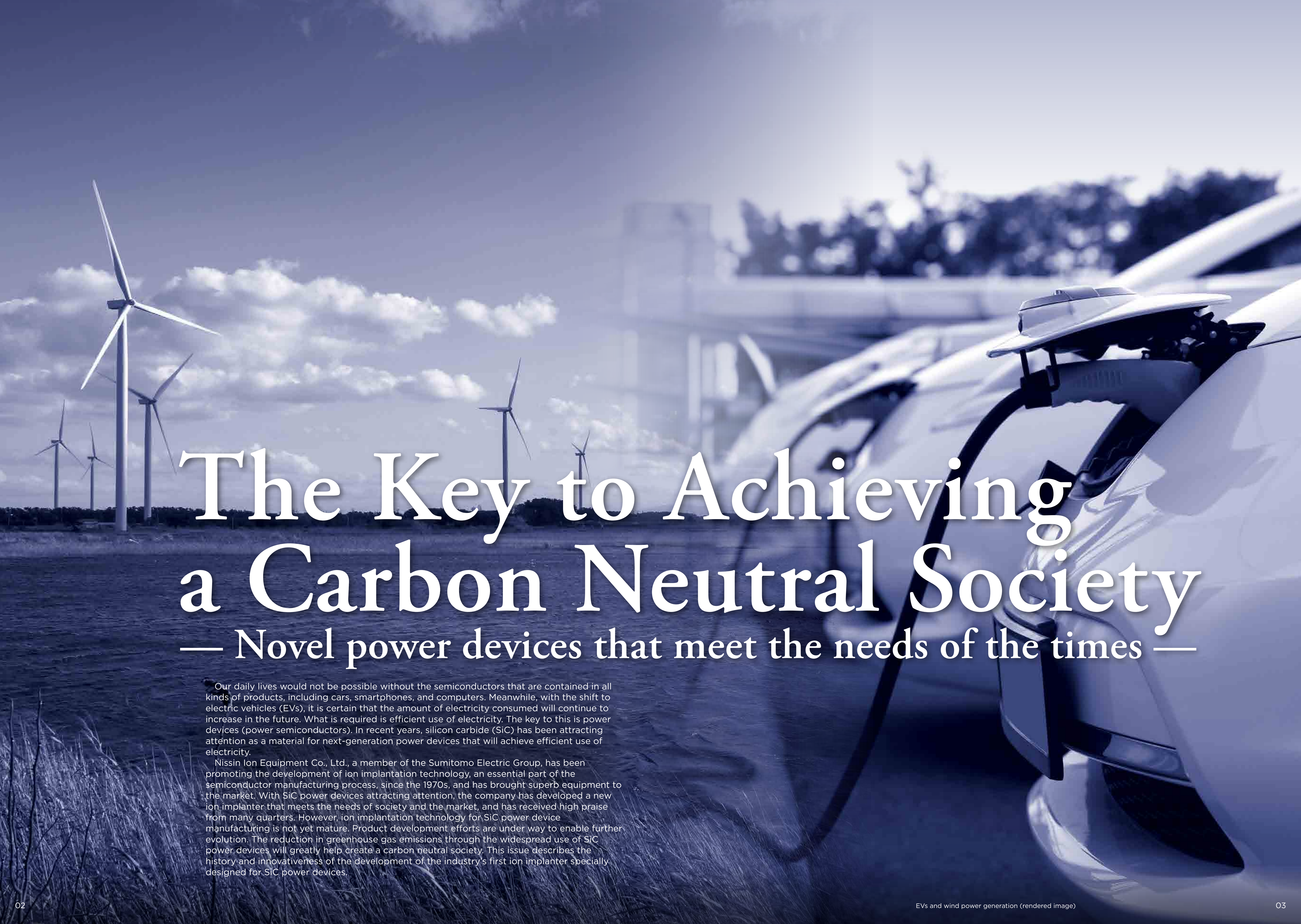
Innovative Development,
Imagination for the Dream,
Identity & Diversity

Feature

To Achieve a Carbon Neutral Society

Advanced Ion Implantation Technology Essential for Manufacturing Power Devices

SUMITOMO ELECTRIC GROUP



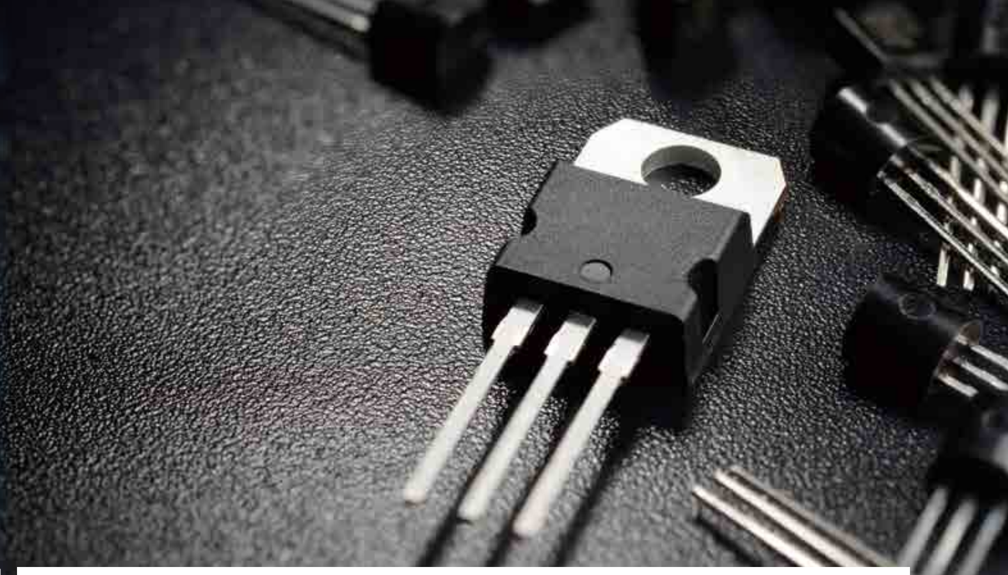
The Key to Achieving a Carbon Neutral Society

— Novel power devices that meet the needs of the times —

Our daily lives would not be possible without the semiconductors that are contained in all kinds of products, including cars, smartphones, and computers. Meanwhile, with the shift to electric vehicles (EVs), it is certain that the amount of electricity consumed will continue to increase in the future. What is required is efficient use of electricity. The key to this is power devices (power semiconductors). In recent years, silicon carbide (SiC) has been attracting attention as a material for next-generation power devices that will achieve efficient use of electricity.

Nissin Ion Equipment Co., Ltd., a member of the Sumitomo Electric Group, has been promoting the development of ion implantation technology, an essential part of the semiconductor manufacturing process, since the 1970s, and has brought superb equipment to the market. With SiC power devices attracting attention, the company has developed a new ion implanter that meets the needs of society and the market, and has received high praise from many quarters. However, ion implantation technology for SiC power device manufacturing is not yet mature. Product development efforts are under way to enable further evolution. The reduction in greenhouse gas emissions through the widespread use of SiC power devices will greatly help create a carbon neutral society. This issue describes the history and innovativeness of the development of the industry's first ion implanter specially designed for SiC power devices.

EVs and wind power generation (rendered image)



A semiconductor wafer and manufactured transistors (rendered image)

SiC Power Devices Inspire High Expectations for Efficient Electricity

— Ion implantation technology is essential for manufacturing —

The Challenge of Power Loss During Power Conversion

We use electricity every day. That electricity is generated by fossil fuels, hydro, nuclear, solar, or wind power, but the generated electricity cannot be used as is. Processes carried out between power generation and consumption include power conversion changing AC to DC and DC to AC, frequency conversion of AC, voltage and current regulation, and switching to turn the power on and off. Such high-voltage and high-current processes are controlled by power devices. Power devices are used in a wide range of sectors, from social infrastructure to everyday home appliances. The problem is that this control process always involves power loss. By reducing this loss as much as possible, it becomes possible to significantly reduce total greenhouse gas emissions.

While silicon (Si) has traditionally been widely used for power device wafers, in recent years, SiC has been attracting attention. Its excellent basic properties are clear when compared with Si. It has one-tenth the resistance, three times the thermal conductivity and high-frequency characteristics, and 10 times the high breakdown voltage of Si, and can operate at high temperatures of over 200°C. This allows the power module to be made smaller and lighter with lower power loss.

Injecting Ionized Impurities into Wafers

Take EVs as an example. Many power devices are used in high-voltage DC batteries, the AC motor that drives the vehicle, and charging stations to convert between DC and AC power and between high and low voltages. Use of SiC significantly improves the environmental efficiency of the car, by not only reducing loss but also enabling the car to be smaller and lighter and simplifying the cooling system.

Manufacturing power devices requires several hundred process steps. One of the manufacturing process steps is ion implantation, which is performed by an ion implanter. What is ion implantation?

An ion is an atom that carries an electric charge. Atoms are originally neutral, but by transferring negatively charged electrons, atoms become ions with a negative or positive charge. The ion implanter converts a gas or vapor containing boron, phosphorus, arsenic, aluminum, or the like into plasma. After being ionized and high-voltage accelerated, ions are implanted into a wafer. In other words, ion implantation involves bombarding the wafer with ionized impurities. Introducing the appropriate amount of impurities controls the electrical characteristics of power devices. Ion implantation is used in the manufacturing process of power devices to improve wafer conductivity and electron mobility, form p-type and n-type semiconductors* and fine integrated circuits, optimize device performance, and build devices with different characteristics. It has become an indispensable technology that plays an important role in the power device manufacturing process.

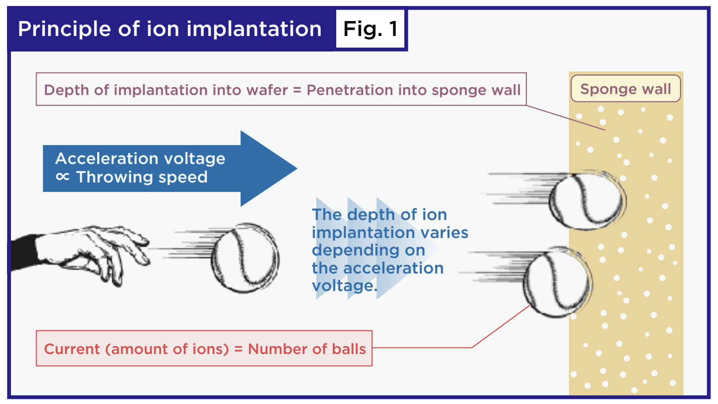
* p-type and n-type semiconductors: A p-type (positive) semiconductor is one in which electrical conduction occurs due to electrons moving to holes, while an n-type (negative) semiconductor is one in which electrical conduction occurs due to free electrons with a negative charge. Combinations of these semiconductors are the basic constituents of electronic devices.

Ion Implantation Technology Developed over Many Years

Nissin Ion Equipment Co., Ltd. (NIC) develops and manufactures ion implanters. The company was spun off in 1999 from Nissin Electric Co., Ltd., another member of the Sumitomo Electric Group. NIC is headquartered in Kyoto, Japan and has a development and production site in Shiga. In addition, the company conducts business globally with its sites based in Singapore, China, South Korea, the United States, and other countries. The company began producing ion implanters in the 1970s, when it was still part of Nissin Electric, and its epoch-making business began in the late 1980s with the launch of its ion implanters for flat panel displays (FPDs) and in the early 2000s with the start of production of the EXCEED family of mass-produced silicon ion implanters. Subsequently in 2009, the company became the first in the world to undertake the development of ion implanters for SiC power devices. A person who has led the evolution of these ion implanters is President Nobuo Nagai.

"In line with the progress in the SDGs, environmental impact reduction, and other global trends, SiC has long been a focus of attention as a power device wafer material. However, its application has been difficult for many years due to technical difficulties, high costs, and other issues. Nevertheless, as the demand of the times has turned to ecosystems, the conditions are now in place to make SiC power devices a reality. Leveraging the technology we have developed over many years in the development and manufacturing of ion implanters for very large scale integration (VLSI), we first developed a high-temperature ion implanter tailored for SiC power devices in 2009 for research use. Subsequently, in 2013, we released IMPHEAT, the industry's only mass production system at the time and offered it to power device manufacturers. Furthermore, in 2019, we launched an upgraded version of the machine, IMPHEAT-II, which has been highly praised by many." (Nagai)

However, IMPHEAT-II was not meant to be the ultimate ion implanter for SiC power devices. Nagai says, "There is no end to our efforts in pursuit of higher performance." Indeed, many challenges remain to be overcome in order to precisely meet market needs. In the following chapters, you will look at the development of the first unit, all the way up to the current efforts.



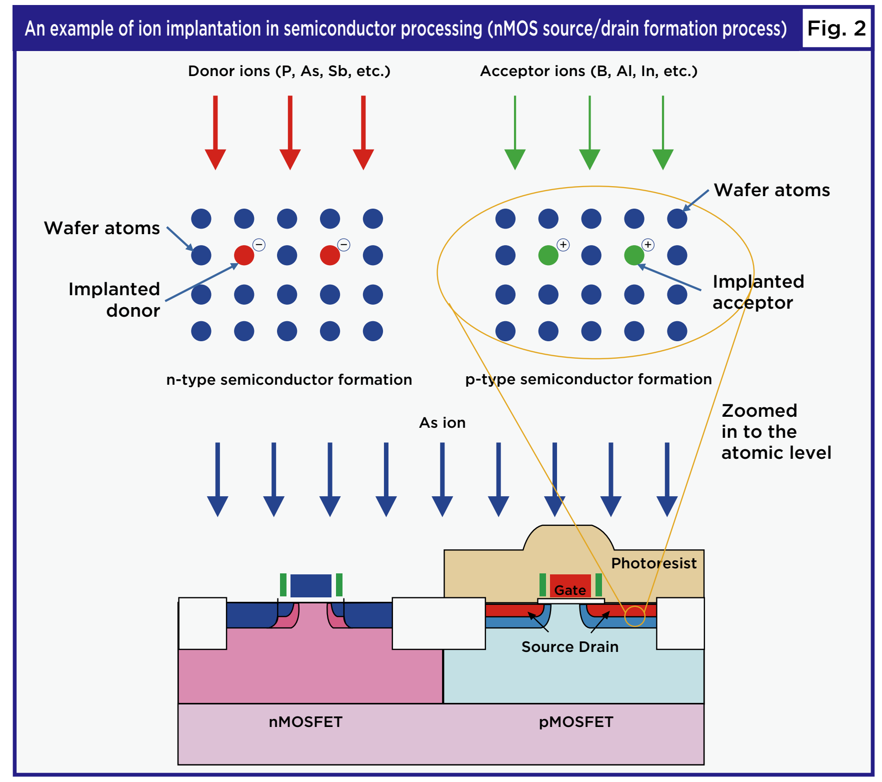


Fig. 1: Ion implantation involves the implantation of impurities called donors, which provide electrons, and acceptors, which receive electrons, into a wafer, which is an insulator in which electrons do not move freely. The process is like throwing balls (ionized impurities) into a sponge wall (wafer). By changing the speed and number of ions, it is possible to control the electrical characteristics of the power device, creating a usable semiconductor tailored to the purpose.

Fig. 2: Ion implantation is one of the process steps in semiconductor manufacturing, including photoresist application, exposure and development, etching, resist stripping and cleaning, and planarization. By repeating these process steps while changing the circuit pattern, donor, and acceptor, electronic devices with a structure like the one shown in the cross-sectional view are formed on the wafer.

Nobuo Nagai
President, Nissin Ion Equipment Co., Ltd.

EXCEED and IMPHEAT are trademarks or registered trademarks of Nissin Ion Equipment Co., Ltd.

IMPHEAT-II in operation

Development History of the Ion Implanter IMPHEAT

— Going ahead of the times, taking on new challenges, and creating new products —

Challenges Associated with Different Ion Implantation Processes on Si and SiC

In 2009, Sumitomo Electric approached NIC about developing an ion implanter for SiC power devices. Sumitomo Electric, grasping the demands of the times for EVs, focused on the potential of SiC and had high hopes that NIC's ion implantation technology would serve as the catalyst for the creation of new power devices. Although the NIC technical team had knowledge of the excellent basic properties of SiC, many of them shared the view that ion implantation was technically difficult. An ion implanter consists of an ion source, which generates ions of the element to be implanted; an analyzer magnet, which separates multiple types of ions based on differences in mass and charge; an acceleration tube, which accelerates the ions to a specified energy; and an end station, which implants the ions into the wafer. However, there are significant differences between ion implantation on Si and SiC. First of all, the wafers themselves are different. While Si wafers have a high degree of flatness, SiC wafers have a low degree of flatness and are easily deformed by the effects of ion implantation and heat. Additionally, the wafer temperature during implantation is below 100°C with Si, but SiC requires heating to around 500°C. Furthermore, while the ion species implanted in Si were boron, phosphorus, and arsenic, in SiC it was necessary to implant aluminum in addition to phosphorus.

Automated transport system (IMPHEAT-II)

Wafer picked up with vacuum tweezers

Transport System Takes on High-Temperature Ion Implantation

At the time, the people who took on these challenges were the technical team currently responsible for providing technical support for installed products handled by NIC. While there were many challenges to overcome in developing an ion implanter for SiC power devices, the most pressing problem was related to high-temperature ion implantation, a notable difference from ion implanters for Si power devices. Shiro Shiojiri, a member of the technical team and responsible for developing a wafer transport system, encountered the major obstacle of high temperatures.

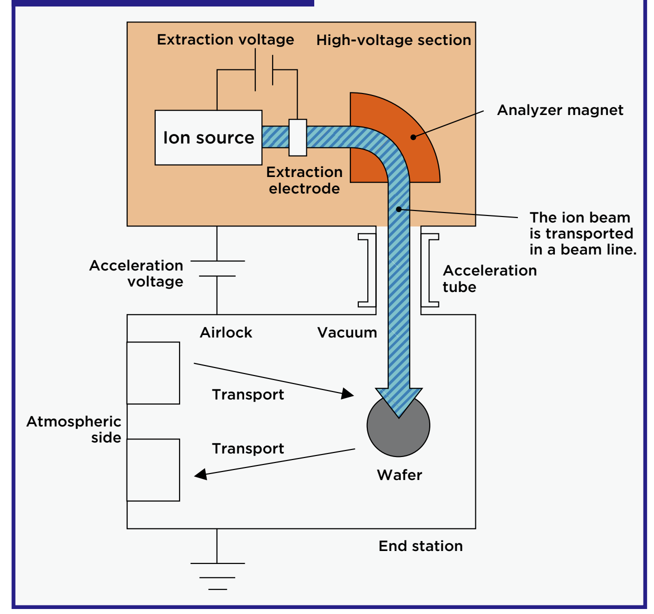
"Compared to Si, SiC has a unique problem in that it is difficult to repair defects in the crystal after ion implantation, so the challenge was to suppress the generation of defects during implantation. To achieve this, it was necessary to heat the SiC wafer to around 500°C while implanting ions. However, since the transport system had many components that are sensitive to heat, one of the challenges was how to insulate them from heat. I struggled to find a mechanism that would physically block heat and prevent it from spreading to the surrounding area," says Shiojiri.

The SiC wafer transport system remains one of the development challenges. In addition to being able to withstand high temperatures, achieving stable transport was also a major challenge. Tomoaki Kobayashi, who currently works as an expert, was also involved in the transport system and high-temperature protection measures.

"In early SiC implanters, wafers were placed on the holder by hand. For transportation, an electrostatic chuck was used, which uses electrical force to attract and hold the holder. It was necessary to consider the insulation between the power to the electrostatic chuck and the power to the high-temperature heater, as well as the appropriate voltages. There were also many challenges to overcome, such as how to raise the temperature quickly, how to achieve an even temperature distribution, and how to measure the temperature. We continued to make steady efforts to overcome these challenges one by one," says Kobayashi.

Kazuki Tobikawa was in charge of developing the high-temperature electrostatic chuck that Kobayashi mentioned and of measuring the wafer temperature.

"An electrostatic chuck is a component that attracts the wafer. We found that its attraction was rapidly lost at high temperatures. Thermal expansion caused the electrostatic chuck to warp, creating a gap between the wafer and the electrostatic chuck, reducing the attraction and making stable transportation difficult. So we aimed for stable transportation through trial and error, for example by attaching a sliding mechanism to the electrostatic chuck to suppress warping. Regarding temperature measurement, we sought cooperation from a radiation thermometer manufacturer building radiation thermometers for non-contact measurements, and we could solve the problem," explains Tobikawa.



Structure of ion implanter

Aluminum Ions Required for SiC Power Devices

Ion implanters for SiC power devices need to ionize aluminum, which is not normally used. Ionization converts gas or vapor containing the intended material into plasma, but there is no such gas that contains elemental aluminum. The person who took on this challenge was Tetsuya Igo, who is currently in charge of technical sales in the Semiconductor Equipment Division.

"We repeatedly considered what type of aluminum compound would be good to use. And we turned our attention to aluminum nitride. By applying a plasma of a gas containing fluorine to aluminum nitride, aluminum fluoride was generated, and an aluminum ion beam was successfully generated. The key was how to stabilize it. The high voltage applied caused discharges and made the beam generation unstable. Another challenge was to develop an aluminum ion source that could produce large amounts of aluminum ions for a long period of time. This was passed down as a task for the future," says Igo.

Thus, the first research unit was delivered. However, problems arose to the point that the team members had to commute to the client, Sumitomo Electric, for a year. The issues and new challenges discovered there led to the development of the mass-produced machines IMPHEAT and IMPHEAT-II as well as the next-generation ion implanter.

Shiro Shiojiri
Executive Engineer, Field Support Business Division, Nissin Ion Equipment Co., Ltd.

Tomoaki Kobayashi
Expert Manager, System Engineering Group, Field Support Business Division, Nissin Ion Equipment Co., Ltd.

Kazuki Tobikawa
Supervisor, System Engineering Group, Field Support Business Division, Nissin Ion Equipment Co., Ltd.

Tetsuya Igo
Supervisor, Business Group, Semiconductor Equipment Division, Nissin Ion Equipment Co., Ltd.

Creation and Evolution: The Inherited Spirit of the Development Staff

—Reaching out to the next generation with a desire to contribute to society—

The Birth of IMPHEAT and IMPHEAT-II

After completing the first model for research, the technical team pursued continued development to further improve the model. In 2010, they took part in a development project run by the New Energy and Industrial Technology Development Organization (NEDO) and completed an automated transport system for 6-inch SiC wafers. Furthermore, in response to customer requests, they optimized the transport sequence, improved temperature uniformity across the wafer surface, and mounted a high-frequency plasma flood gun to prevent charge-up (problems caused by static electricity or discharge). In 2013, the company launched IMPHEAT, the industry's only mass-produced ion implanter for SiC power devices at the time. Subsequently, in the context of the increasing need for energy conservation, power saving, and environmental performance, the market for SiC power devices was expected to expand, so they took on a new challenge. Based on IMPHEAT, the technical team made a number of improvements, including optimizing the structure of the automated transport system, adding a pre-heating process to heat SiC wafers to a high temperature in a short period of time, dualizing the transfer arm, and doubling the ion beam, thereby achieving a reduction in processing time. Moreover, they succeeded in improving the ion source to double the ion beam current, with the aim of improving the stability of the ion beam and increasing the beam intensity. As a result, the number of wafers processed per hour increased to 100, approximately three times the previous level. This was IMPHEAT-II, which was highly praised from all quarters. It was announced in 2019 and deliveries began in 2020.

Taking on the Challenge of Next-Generation Ion Implanters

Young engineers are being trained to carry on the aspirations of the technical team involved in the development of the first model. Currently, development is under way mainly by young engineers on a next-generation ion implanter, which can be considered an upgraded version of IMPHEAT-II. NIC's ion implanters have continued to evolve through continuous improvements and refinements. In fact, however, the issues that must be resolved have not changed since the first model was produced. The challenges are further optimization of the automated transport system, further shortening the time it takes to heat up to high temperatures, and stably producing high ion beam currents for a long period of time. It can be said that these improvements have been an ongoing effort since the first model was developed. Yuya Hirai is taking on the challenge of developing a new ion source.

"What I am constantly striving to do is to increase the beam current and operate the beam stably. This will be a major factor in differentiating us from our competitors. By changing the materials and process gases, we have successfully doubled the beam current. Furthermore, as there was a need to implant ions deep into the wafer without destroying the crystal, we also proceeded with the development of equipment that could measure the crystal orientation," emphasizes Hirai.

Shinsuke Inoue is responsible for the control design for the automated transport system.

"Achieving stable transportation has been under consideration for many years, but we are still only halfway there. Of course, transportation is now more stable than ever before. However, time is still lost during heating, and deformation, distortion, and cracks still occur due to heat. The goal is to have zero rejected wafers. In addition to the electrostatic chuck, a mechanical clamp that uses jaws to hold the wafer is also employed. We would like to utilize our know-how and knowledge of control, mechanical structure, and physics to achieve stable automated transport," says Inoue.

Jian Wang is working on the mechanical design of automated transport systems.

"When transported, wafers are vacuum-held on the robot hand on the atmospheric side. However, high-temperature ion implantation causes the wafer to warp, which creates a gap between the robot's suction part and the wafer placed on it, making it impossible to transport the wafer using vacuum suction. What I am currently working on is to develop a suction pad that is highly heat resistant and flexible. A flexible pad can adjust itself according to the warp, which helps prevent gaps from occurring," explains Wang.

Koyu Ueno has worked on a range of tasks, from determining the specifications, to the assembly and delivery of equipment for each customer. Recently, from the perspective of his specialty in mechanical design, he has been seeking improvement in the number of wafers processed per hour with the automated transport system, which is a key point in differentiation from competitors, while also undertaking new development projects.

"Until now, we have grown together with semiconductor manufacturers that have been leading the way with SiC in the domestic market, but from now on, we will also aim to develop equipment with layouts that are well received by overseas manufacturers, such as those in Europe, the U.S., and China, where growth is notable," says Ueno.

As a result of these efforts, the next-generation system is nearing completion. The plan is to complete an in-house machine this fiscal year, conduct further testing, and release it to the market next year.

Discussions continue to be held regarding the next product.

Constantly Taking on New Challenges Leads to Contributing to Society and the World

They speak about their passion for developing ion implanters and what fascinates them about it:

"It's a continuous challenge to develop new technologies that will generate new value and be used by people all over the world. That's the best part of this development work, and what makes it so interesting." (Hirai)

"The ion implanter may not stand out, but it works behind the scenes to create new value for customers. We would like to expand our market share while maintaining our competitive advantages." (Inoue)

"All sciences, including chemistry, physics, and engineering, are applied to ion implantation. I enjoy that in itself. I also feel that it is rewarding to develop something that will make the world a better place, such as contributing to carbon neutrality." (Ueno)

"Using existing technology and my own ideas to make a better system means I can give shape to my ideas and thoughts, and I feel that it is the most rewarding job for an engineer." (Wang)

Given these thoughts of the technical team, what kind of market strategies are actually being pursued? You will see that in the final chapter.

Koyu Ueno
Assistant Subsection Chief, Equipment Design Engineering Team, Business Group, Semiconductor Equipment Division, Nissin Ion Equipment Co., Ltd.

Yuya Hirai
Section Chief, Local Deployment Team, Technology Group, Semiconductor Equipment Division, Nissin Ion Equipment Co., Ltd.

Wang Jian
Local Deployment Team, Technology Group, Semiconductor Equipment Division, Nissin Ion Equipment Co., Ltd.

Shinsuke Inoue
Supervisor, Local Deployment Section, Technology Group, Semiconductor Equipment Division, Nissin Ion Equipment Co., Ltd.

Young development staff who will lead the next generation

Spaces that allow for open and flexible thinking

The Shiga Works, commonly known as "Link Square"* of Nissin Ion Equipment Co., Ltd., was built as a cutting-edge R&D center for ion implantation technology. The plant is carefully designed to stimulate communication and foster an environment that will encourage innovation in order to create new value. An open, bright space where spontaneous communication is ensured fosters imagination, initiative, and teamwork.

* Link Square is named after the idea of a town where people, things and events connect with each other. The name also conveys the hope that it will be a place of learning (L), innovation, inspiration, and interaction (IN), and knocking (K) on the next door to the future.

Website of Nissin Ion Equipment Co., Ltd.

Shiga Works, Nissin Ion Equipment Co., Ltd.

Growing Global Expectations for Ion Implanters

— Promoting global strategies in the SDGs era —

Winner of the Grand Prix at the Semiconductor of the Year Awards

In 2021, IMPHEAT-II, launched in 2019, won the Grand Prix in the semiconductor manufacturing equipment category at the Semiconductor of the Year 2021, sponsored by the Electronic Device Industry News. The award was given in recognition of the innovative development, the establishment of a mass production system, and the impact it has had on society (including its contribution to achieving carbon neutrality). Attending the award ceremony was Tadashi Ikejiri, General Manager of the Ion Beam Business Division, who has been leading the development of ion implanters for SiC power devices. Ikejiri has played a central role not only in development but also in sales and marketing.

"As SiC devices became the focus attention, we read the trend and started development early on, building a mass production system. The impact of our development and sale of ion implanters for SiC power devices was not small, and while I was stationed in the U.S. we received an inquiry from a major power device manufacturer and concluded a business deal. This was an opportunity for our products to gain attention both domestically and internationally. Since then, we have worked on the development of ion implanters for many years. I believe that the technology and knowledge we have cultivated gives us a certain advantage," says Ikejiri.

Differentiation from the Competition to Develop the Market

Currently, NIC has a market share of approximately 90% in Japan and approximately 40% overseas in the market for ion implanters for SiC power devices. However, Takashi Sakamoto, General Manager of Semiconductor Equipment Department, points out that the competition is becoming tougher each year.

"Amid rising societal needs, such as achieving carbon neutrality, the number of entrants into the market for ion implanters for SiC power devices has increased. Take, for example, a huge US company that handles all types of semiconductor equipment. Our competitors are companies that are much larger than us. Some domestic companies are following suit. To win out, we will pursue technological superiority while also differentiating ourselves from our competitors by responding accurately and quickly to customer requests and improving our customer support system," comments Sakamoto.

Exterior of IMPHEAT-II

Ryohei Kataoka of the Marketing and Sales Department is the person on the front lines of sales, working to expand the sales of ion implanters for SiC power devices. He is responsible for the Asia region including Japan.

"In Japan, we have a high market share, and the stable operation of our products is highly rated by customers. In other parts of Asia, we are seeing an increase in business negotiations with customers in Korea and China. China has great potential for market expansion, and there are local manufacturers with large market shares, as well as Japanese manufacturers who have entered the market before us. The competition is getting fiercer each year. There are many SiC power device manufacturers, including small and medium-sized ones, so we feel it is necessary to identify companies with growth potential and markets where we will have success. I would like to promote the company's advantages and take on the challenge of developing the Asian market," shares Kataoka.

From the perspective of global strategy, the challenge lies in the European market. A customer support partner company based in Austria is the company's only foothold in Europe. The company plans to increase its presence in Europe in the future by establishing its own business site and providing meticulous customer service and after-sales care.

Aiming to Reach 100% Market Share, Just Like Ion Implanters for FPDs

So far we have looked at ion implanters for power device manufacturing. Another of NIC's main products is an ion implanter for flat panel display (FPD) manufacturing. Masashi Konishi, director in charge of this area, says he wants to develop the ion implanter for SiC power devices into a position similar to that for FPDs.

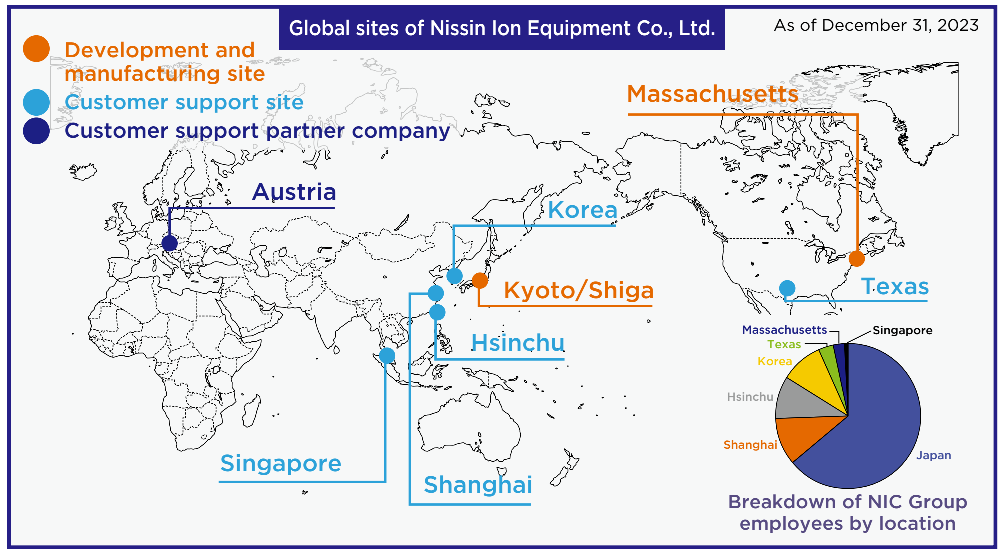
"Smartphones are one of the everyday products that incorporate FPDs. Ion implanters are essential for manufacturing FPDs, and the company has 100% market share for this equipment. High-definition smartphone displays would not be possible without the company. There were competitors in the past, but they gradually withdrew from the market.

Similarly, we would like to reach 100% market share for ion implanters for SiC power devices. To achieve this goal, I believe it is important to take on new technologies and new markets," says Konishi.

Under the Nissin Electric Group's medium- to-long-term business plan "VISION 2025," which was launched in April 2021, NIC is working on a growth strategy centered on the SDGs and strengthening the business foundation that supports it. The development and expansion of sales of ion implanters for SiC power devices is part of this effort. The company aims to evolve into a total supplier of innovative equipment, technologies, and services that utilize ion beam and plasma technology.

"Ion implantation technology is a key technology that will contribute to a sustainable global environment. We believe that providing the technology to the world will contribute to achieving carbon neutrality and lead to the creation of a society in which everyone around the world can thrive. It is an aspiration and a dream shared by all employees of the company. We will continue to implement initiatives where our business growth leads to contributing to society," says Nagai.

The SiC power device market is expected to thrive even more in the future. This will result in a significant reduction in greenhouse gas emissions from electricity use. There is no doubt that NIC was a catalyst. As seen in the efforts of NIC, the Sumitomo Electric Group will seize every opportunity to promote activities aimed at conserving the global environment.




Takashi Sakamoto
General Manager of Semiconductor Equipment Division, Nissin Ion Equipment Co., Ltd.


Tadashi Ikejiri
Operating Officer and General Manager of Ion Beam Business Unit, Nissin Ion Equipment Co., Ltd.


Masashi Konishi
Director, Nissin Ion Equipment Co., Ltd.


Ryohei Kataoka
Group Manager, Sales Group 1, Marketing & Sales Dept., Nissin Ion Equipment Co., Ltd.


Presentation at an international academic conference
Ryota Wada, Technical Marketing Group, New Business Development Dept.


Won the Grand Prix given at the Semiconductor of the Year 2021 awards (June 2021)
(Tadashi Ikejiri, General Manager of the Ion Beam Business Unit, holding the award certificate and trophy)

"You have things you can do as an individual. Do it with all your heart and soul."
This is the meaning of the phrase *"Banji-nissei"* found in the Sumitomo Spirit, which has been passed down for 400 years within the Sumitomo Electric Group. Our employees take this philosophy to heart and diligently apply it to their daily duties. This spirit is also found in the attitude of athletes and coaches engaged in sports. This is why the Sumitomo Electric Group supports a variety of sports and athletes, including track and field. Specifically in track and field, we are strengthening our efforts with the goal of "producing athletes who can compete on the world stage." Through these efforts, the Sumitomo Electric Group strives to contribute to the development of sports and local communities.

Aiming Higher, Our Challenge Will Never End

Please take a look at our sports support videos and athletics promotional footage.

The videos can be viewed on YouTube via the QR codes below.

Sports support video

YouTube

Title: **Why Sumitomo Electric Supports Sports**

The video summarizes the prehistory of our track and field team, its recent results and athletes, CSR activities such as the Athletics Festa, and the reasons why the Company supports sports.
■ Language: English and Japanese/Length: 6 min 40 s

English
https://www.youtube.com/watch?v=YxTqroYFhRs

Japanese
https://www.youtube.com/watch?v=RpG3JNBUZRU

Athletics promotional videos

YouTube

The videos show athletes Shunsuke Izumiya, Rikuya Ito, Koki Ueyama, Hyuga Endo, Yuki Koike, Shuhei Tada, Yuma Maruyama, and Midori Mikase as they strive to reach even greater heights.
■ Language: Japanese and English subtitles/Length: 15 s, 30 s, 60 s

English
15 s
https://youtu.be/7aj1qgA1Qw0
30 s
https://youtu.be/v3G5Hegvs8A
60 s
https://youtu.be/7kf4pVEKI5I

Japanese
15 s
https://youtu.be/0tM0TqXaQaw
30 s
https://youtu.be/JmJsQ2YUsqE
60 s
https://youtu.be/ynwyFH2yi50

Candid photos

Four Track and Field Athletes Join the Company

This year, four track and field athletes (Kazuki Kurokawa, Aoto Suzuki, Sumire Hata, and Shota Fukuda) joined our company. The four athletes have achieved outstanding results in various competitions in recent years and are expected to achieve great things in the future.

With the addition of the four new athletes, we aim to improve the overall strength of the team, and we will continue to focus on developing athletes who are ready to take on the world stage.

We look forward to seeing each athlete's future success and appreciate your continued support for our track and field team.

From left: Aoto Suzuki, Sumire Hata, Kazuki Kurokawa, Shota Fukuda

■ Profiles

Aoto Suzuki

[Personal Best]
100 m: 10.33 s
200 m: 20.67 s
400 m: 45.94 s
[Major Achievements]
Champion, 2021 All-Japan Intercollegiate Championships 100 m
3rd place, 2021 Japan Championships in Athletics 400 m
Represented Japan (4th runner), 2021 Tokyo Olympics 4 × 400 m relay

Sumire Hata

[Personal Best]
Long Jump: 6.97 m (national record)
[Major Achievements]
Champion, 2021 - 2023 Japan Championships in Athletics (three-time champion)
20th place, 2022 World Athletics Championships
23rd place, 2023 World Athletics Championships
Champion (new national record), 2023 Asian Athletics Championships
4th place, 2023 Asian Games
9th place, 2024 World Athletics Indoor Championships

Kazuki Kurokawa

[Personal Best]
400 m hurdles: 48.58 s
(7th best in Japan)
[Major Achievements]
Champion, 2021 Japan Championships in Athletics
Represented Japan, 2021 Tokyo Olympics
Two-time champion, 2022 Japan Championships in Athletics
Represented Japan, semifinalist, 2022 World Athletics Championships
Represented Japan, semifinalist, 2023 World Athletics Championships

Shota Fukuda

[Personal Best]
Hammer Throw: 72.18 m
(7th best in Japan)
[Major Achievements]
Champion, 2021 Japan Championships in Athletics
Champion, 2023 Japan Championships in Athletics
3rd place, 2023 Asian Athletics Championships
6th place, 2023 Asian Games
Champion, 2023 Asian Throwing Championships

EXPO 2025
OSAKA, KANSAI, JAPAN

SUMITOMO EXPO2025

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Expo 2025 Osaka, Kansai, Japan | Schedule | 184 days from April 13 to October 13, 2025 | Venue | Yumeshima, Osaka

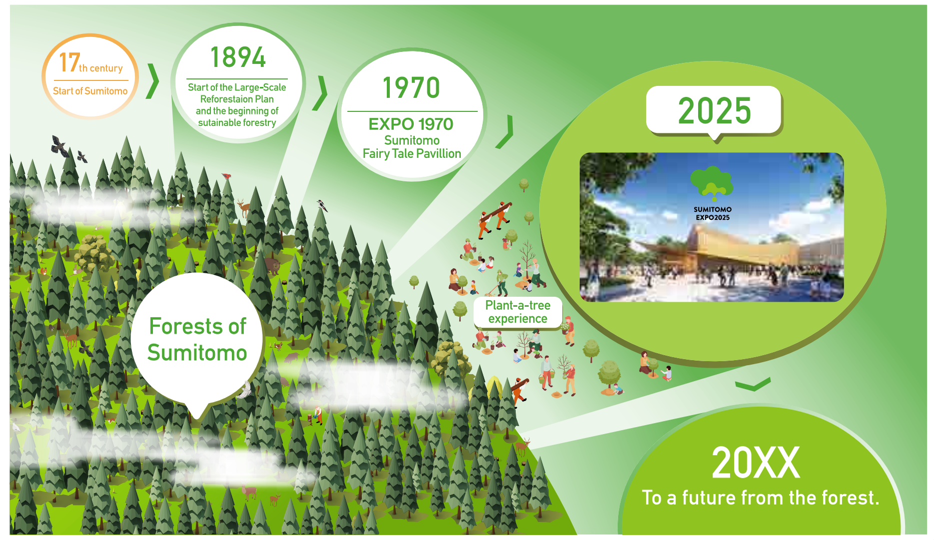
Our Message

Throughout its 400-year history, Sumitomo has treasured the forest, and this is the spirit upon which it has grown. Respect the diversity of life dwelling on this precious planet. There is so much we can learn from the different forms of life co-living in the forest. We humans heading toward the future are also a part of that nature.

Let's set off on a journey from the 2025 Sumitomo Pavilion and venture into a bright future where people, forest, and all living things resonate and live in harmony.

The Sumitomo Pavilion transcends time and circles again

Starting from its re-forestation plan in 1894, the "Sumitomo Forest" has continued to stride toward the future based on its philosophy of "Benefit for self and others, private and public interests are one and the same." The "plant-a-tree experience" will bring visitors in touch with Sumitomo Forest while speaking to the importance of caring for tomorrow's world. The planted trees, through time, will be passed on in an unbroken chain into the future.



Sumitomo Pavilion: Design and Concept

The Sumitomo Pavilion is inspired by the "peaks of the Besshi Mountains" in Shikoku where Sumitomo's foundation was established; and features a silhouette of its mountain ranges. Lumber procured from the "Sumitomo Forest" was processed through careful consideration. Please enjoy the architecture of this pavilion that uses the trees, succeeded from our predecessors, in its entirety, based on the concept of "valuing each life, one tree at a time."

Exhibition Experience

When the wind invites you into this forest, you will start seeing its different face. Here, you will hear "voices of life" that only you can hear, "vibrance of life" that only you can feel, and "UNKNOWN" stories of life unheard and unseen until now.

Discover the UNKNOWN FOREST.

EXPO 2025 Osaka, Kansai, Japan See you at the Sumitomo Pavilion!

The Official Sumitomo Pavilion homepage is open!
sumitomoexpo.com

A Place Related to Sumitomo's History

— Osaka —

Keitakuen Garden

Sumitomo's ties with Osaka date back to the early Edo period. It all began when the second head of the Sumitomo family, Tomomochi, opened a copper smelter (copper refinery) in Osaka, taking up the family business of copper refining and copper craftsmanship. Since then, Sumitomo has expanded its business mainly in Osaka.

In this issue, we invite you to explore Keitakuen Garden, a historic site linked to Sumitomo, located in Tennoji Ward, Osaka.

Keitakuen Garden

Keitakuen Garden is a traditional Japanese garden with a pond in the center, located within Tennoji Park, where you can see one of Osaka's symbolic landmarks, Tsutenkaku Tower.

It was the garden of the Sumitomo family's Chausuyama main residence and was designed by Ogawa Jihei VII (also known as Ueji), a leading figure in modern gardens. The garden was completed in 1918 after 10 years of construction. There are three islands, large and small, floating in the pond. The vast garden is designed to allow visitors to stroll around the surrounding forest and enjoy the views. It is home to a collection of famous stones and trees from all over Japan. Ogawa Jihei is a landscape gardener who is credited with establishing the modern style of landscaping, having designed numerous gardens including Heian Shrine Garden, Maruyama Park, and Murin-an.

Chausuyama, adjacent to Keitakuen Garden, was once home to the graves of powerful clansmen and is said to have served as the headquarters of Tokugawa Ieyasu during the Winter Siege of Osaka and of Sanada Nobushige (Yukimura) during the Summer Siege of Osaka.

In 1926, Keitakuen Garden was donated to the city of Osaka by the Sumitomo family.

Due to renovation work, the garden is closed from April 1, 2024 and is scheduled to open in the spring of 2025.

id vol.23

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

https://sumitomoelectric.com/id

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