NGK has signed onto the United Nations Global Compact with 10 principles focusing on human rights, labor, environment, and anti-corruption. The NGK Group is conducting business in a manner consistent with these principles, with the aim of achieving a sustainable society.
## NGK Group Philosophy

### Our Mission

**Enriching Human Life by Adding New Value to Society.**

### Our Values

**Quality of People**  Embrace challenges and teamwork.

**Quality of Product**  Exceed expectations.

**Quality of Management**  Social trust is our foundation.

The NGK Group Philosophy is a signpost that guides every employee of the NGK Group. Formulated in 2019 to mark our 100th anniversary, it encompasses our desire to use our proprietary ceramic technology to contribute to future energy, environmental protection, and industrial progress, and to help people around the world live a happy, comfortable life.

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### Corporate Outline

<table>
<thead>
<tr>
<th>Company name</th>
<th>NGK Insulators, Ltd.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>2-56 Suda-cho, Mizuho, Nagoya 467-8530, Japan</td>
</tr>
<tr>
<td></td>
<td>Telephone + (81) 52-872-7181</td>
</tr>
<tr>
<td>Establishment</td>
<td>May 5, 1919</td>
</tr>
<tr>
<td>Top Management</td>
<td>Taku Oshima, Shigeru Kobayashi, Chiaki Niwa, Ryohei Iwasaki</td>
</tr>
<tr>
<td>Business</td>
<td>Manufacture and sale of electric power related equipment including insulators, and of ceramic catalyst carrier for exhaust gas purification, and of industrial products, and of beryllium copper products</td>
</tr>
</tbody>
</table>

**[Environment Business Group]**

Manufactures and sells HONEYCERAM® ceramic substrates for automotive catalytic converters, diesel particulate filters (DPFs) and gasoline particulate filters (GPFs) for removing particulate matter (PM) from vehicle exhausts, and in-vehicle high-precision NOx sensors

**[Digital Society Business Group]**

Manufactures and sells ceramic susceptors for semiconductor production equipment, reaction chamber parts, bonded wafers, piezoelectric micro-actuators for HDDs, translucent alumina ceramics, ceramic packages, and beryllium-copper and copper-nickel-tin products

**[Energy & Industry Business Group]**

Manufactures and sells products supporting stable electricity supply including insulators, equipment for power transmission/substation/distribution, and NAS® battery, as well as industrial equipment and facilities including kilns, drying furnaces, refractories, ceramic filters, separators, corrosion-resistant equipment, and low-level radioactive waste treatment systems
NGK Group Vision: Road to 2050

The NGK Group Vision announced in 2021 presents a picture of ‘what we want to be’ by 2050 along with the path we will take to get there. For NGK Group, 2021 is the year of our ‘Third Foundation’ as we pursue the self-transformation that will enable us to realize our vision.

**A company to contribute to carbon neutrality and digital society with our unique ceramic technologies**

**What we want to be**

**What we must do**

**Convert our business structure through 5 Transformations**

This Medium- to Long-term Vision outlines the kind of society we may attain by 2050 and positions the shift to carbon neutrality and a digital society as the most urgent issues we need to work on. The vision also identifies five areas of transformation that must be achieved: (1) ESG Management, (2) Profitability Improvement, (3) R&D, (4) Commercialization, and (5) Digital Transformation. Specific goals include realizing net zero CO₂ emissions by 2050 and developing new technologies and products for the areas in focus. The NGK Group will continue to build on its unique ceramic technology to create value in various forms, enabling sustainable business growth and contributions to society.

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<tr>
<td><strong>ESG Management</strong></td>
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<tr>
<td>Our foundation of management is to contribute to society through our business as a member of society. In particular, with regard to E (Environmental), we have formulated the ‘NGK Group Environmental Vision’ along with the ‘NGK Group Vision.’ In that Environmental Vision, we stipulate our targets as contributing to carbon neutrality through products and services as well as achieving net zero CO₂ emissions in our own activities by 2050.</td>
</tr>
<tr>
<td><strong>Profitability Improvement</strong></td>
</tr>
<tr>
<td>Regarding improvement in earning power, we are going to take on the following initiatives: -Generating cash by securely increasing our earning power over the next five years -Instilling management utilizing ROIC and analysis and improvement of profitability in each business within the entire NGK Group -Starting new actions in production processes to continue to reinforce our strengths as a manufacturer</td>
</tr>
<tr>
<td><strong>Research &amp; Development</strong></td>
</tr>
<tr>
<td>We will aim and work on to create a business with sales of 100 billion yen by 2030 through new business development, which we call ‘New Value 1000.’ In order to achieve this, we will invest 300 billion yen in R&amp;D over the next 10 years with 80% allocated to carbon neutrality and digital society.</td>
</tr>
<tr>
<td><strong>Commercialization</strong></td>
</tr>
<tr>
<td>In order to make ceramic products born from our strength more widely used in society, we will focus on expanding to solution business, not limited to just selling things, by improving our marketing capabilities and expanding collaboration with the outside partners.</td>
</tr>
<tr>
<td><strong>DX</strong></td>
</tr>
<tr>
<td>We will use the power of digital to accomplish the above business transformation.</td>
</tr>
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- NGK Group Vision
- NGK Group Environmental Vision
- NGK’s SDGs
NGK Group Vision: Road to 2050

**Carbon Neutrality**

**Digital Society**

NGK Group will contribute to carbon neutrality and digital society with our unique ceramic technologies.

**Contributory products**

- **CN**
  - Zinc rechargeable battery
  - Subnano-ceramic membranes

- **DS**
  - Lithium-ion rechargeable battery “EnerCera”®
  - Ceramic heaters
  - Bonded wafers
  - Piezoelectric micro-actuators for hard disk drives (HDDs)
Surprising Ceramics.

Our surprising ceramic technology brightens the future for energy, sustains the environment and human society, and discovers new and advanced technology.
**Maintaining Clean Air**

We respond to increasingly stringent emission regulations through our world-leading technology for purifying automobile exhaust gas, contributing to environmental protection and enriching our life.

**NGK’s fine ceramic technology keeps satisfying the needs of the world**

HONEYCERAM®
Ceramic substrates for automotive catalytic converters

Large-size HONEYCERAM (LSH)
HONEYCERAM with a very compact installation has a honeycomb structure which covers an area equivalent to two soccer grounds. It can carry catalysts for neutralizing harmful substances in automotive exhausts. The product steadily meets ever more rigorous emission regulations and has been adopted by automakers around the world.

**Diesel particulate filters (DPFs)**
The filters are effective in catching particulate matter (PM) in their fine pores and remove up to 99% of PM. Highly heat-resistant silicon carbide (SiC) filters are used in passenger cars, while lightweight cordierite filters are mainly used in larger vehicles.

**Gasoline particulate filters (GPFs)**
GPFs are particulate filters for gasoline-powered vehicles. GPFs are adopted in gasoline direct injection vehicles that are powerful yet as fuel efficient as hybrid cars. Building on its DPF technology, NGK commercialized GPFs for the first time in the world.

**In-vehicle high-precision NOx sensors**
NGK developed and commercialized the world’s first vehicle-mounted sensor capable of measuring nitrogen oxide (NOx) concentrations in automotive exhaust gas at the parts per million (ppm) level. Measuring real-time NOx concentrations and feedback enables precise control of the exhaust gas purification system to reduce NOx emissions.

**Ceramic heaters**
Our ceramic heaters are used to uniformly control the temperature of silicon wafers in the deposition process. The unique structure of a shaft bonded to the bottom of the heated pedestal, where wafers are placed, protects terminals and conducting wires from halogen gas, supporting stable supply and technological advancement of semiconductor fields.

**Electrostatic chucks**
Electrostatic chucks are used to hold silicon wafers in place during etching and other processes. Our electrostatic chucks can be flexibly adapted to diverse purposes of use to significantly improve the efficiency of semiconductor production processes. For instance, they can be integrated with high-precision heaters or attached to cooling plates.
Translucent alumina ceramics superior translucence and high strength are achieved by sintering high-purity alumina ceramics at high density. These are used in diverse products, mainly for the substrates in semiconductor chip packaging process where outstanding reliability is required.

Using NGK’s proprietary crystal-oriented ceramic plates as electrodes, these small and thin lithium-ion batteries feature high energy density. It can produce large enough current to support wireless communication, and can be mounted on devices through high-temperature processes due to its high heat resistance. It is expected to boost the widespread adoption of IoT devices and other next-generation appliances.

Ceramic packages for high frequency (RF) devices manufactured and sold by NGK Electronics have the top share in the world. The company also produces and sells ceramic packages for CMOS image sensors and crystal packages, among many others.

Composed of adding nickel and tin to copper, this high-performance alloy has excellent characteristics comparable to beryllium copper, as well as high heat resistance and wear resistance. It is widely used for contact springs, bearings, etc.

The key device that enables large capacity and superior reliability in hard disk drives (HDDs)

Piezoelectric micro-actuators for HDDs
NGK’s laminated piezoelectric actuators are among the smallest in the world, and they can precisely control the magnetic head of HDDs. They have been instrumental in boosting the capacity and reliability of HDDs, and are now active in data centers around the world.

Making electronics components smaller, lighter, and more reliable

Beryllium copper products
Beryllium copper alloy features excellent electrical and thermal conductivity of copper coupled with superior strength and durability comparable to special steel products. Beryllium copper strips are used as high-performance conductive springs in many advanced applications, including cars, industrial equipment, home appliances, and mobile devices.

Bonded wafers
Drawing on its proprietary ceramic bonding technology and ultra-high-precision thin polishing technology, NGK manufactures bonded wafers specifically developed for use in electronic devices. Bonded wafers with layers of different materials can yield performance and functions that are not possible with single-material wafers.

Enhancing the communication performance and speed of ICT devices

DCB and AMB substrate
These circuit substrates combine the superior heat dissipation and electrical conductivity of copper with the excellent insulation performance of ceramics. They can carry large electrical currents and exhibit high dielectric strength, and can be optimally designed for such use environments as industrial machinery and automobiles.

Translucent alumina ceramics
Translucent alumina ceramics superior translucence and high strength are achieved by sintering high-purity alumina ceramics at high density. These are used in diverse products, mainly for the substrates in semiconductor chip packaging process where outstanding reliability is required.

Lithium-ion rechargeable battery “EnerCera”
Using NGK’s proprietary crystal-oriented ceramic plates as electrodes, these small and thin lithium-ion batteries feature high energy density. It can produce large enough current to support wireless communication, and can be mounted on devices through high-temperature processes due to its high heat resistance. It is expected to boost the widespread adoption of IoT devices and other next-generation appliances.
Low-level radioactive waste treatment systems

This system safely treats low-level radioactive wastes from nuclear power facilities using NGK’s proprietary incineration and exhaust gas treatment technologies. Coupled with wide-ranging engineering support and maintenance services, the system effectively and reliably removes radioactive materials from wastes, contributing to the safe operation of nuclear power facilities.

Industrial heating systems (kilns and drying furnaces)

NGK’s proprietary heating and drying technologies are used in industrial heating systems that cover a wide range of temperatures. They are used in advanced applications, including kiln firing of lithium-ion battery parts and electronic components and drying of functional films and gold foils.

Refractory products

NGK’s refractories include jigs for firing ceramic parts and electronic components. Notable among these is the exceptionally thin and lightweight silicon carbide (SiC) refractories which can save energy and boost the performance and productivity of final products.

Corrosion-resistant equipment and systems

NGK manufactures exceptionally corrosion-resistant pumps and valves for chemical, pharmaceutical, and steel industries where heated acids and organic solvents are used in chemical processes. NGK also manufactures glass linings that prevent electrostatic charges and ensure safety.

Ceramic membranes and separators

Ceramic membranes feature excellent separation and filtration performance, making them suitable for the sterilization of mineral water and the solid-liquid separation of various substances, from organic solvents to viscous liquids including honey. The superior separation performance of these filters creates new possibilities for engineering.

Supporting Global Power Supply and Advances in the Industry

We ensure stable electricity supply and explore new potentials for energy, transforming a wide range of industrial segments including the chemical and pharmaceutical industries.

The world’s first large-capacity energy storage system contributing to further diffusion and development of renewable energy

NAS® battery

With an array of superior features, including large capacity, high energy density, and long service life, the NAS battery systems can produce high output of electric power for long periods of time. The battery systems have already been utilized in many locations with wide range of applications such as leveling the load peaks, spreading the use of renewable energy, etc.

Insulators

The insulators play a critical role in supporting transmission lines and steel towers and equipments insulated. NGK offers the products of uncompromising quality capable of withstanding the harshest conditions such as earthquakes, typhoons, and heavy accumulations of snow, ensuring the safe and secure supply of electricity.

Hot-line insulator washing equipment

Hollow insulators, station post insulators, bushings, and other devices are used at substations. Dust and salt tend to accumulate on the surfaces of insulators installed close to the sea or in an industrial area, which can lead to flashovers. The hot-line insulator washing equipment uses water jet spray to clean the insulators so they can maintain their performance.

Corrosion- and heat-resistant ceramic membranes with excellent separation performance

SDGs pursued by Energy & Industry Business Group

- Supporting Global Power Supply and Advances in the Industry
- We ensure stable electricity supply and explore new potentials for energy, transforming a wide range of industrial segments including the chemical and pharmaceutical industries.

NAS®, HONEYCERAM and EnerCera are trademarks of NGK INSULATORS, LTD., registered in the United States.
Creating the Future with the Potentials of Ceramics

NGK Group is committed to achieving Carbon Neutrality and a Digital Society through the tireless pursuit of new technologies that can change the world.

From its very beginning, the NGK Group has sought to reexamine conventional ceramic manufacturing practices in light of the latest science and technologies in order to help it identify the optimal combination of process conditions for each of its products. And after nearly 100 years, this pursuit of optimization has accrued a wealth of technology and expertise from which the NGK Group draws its competitive strength.

It Started with a Fragment of Insulator

When electricity was beginning to be widely spread in Japan during the Meiji Period (1868-1912), all high-voltage insulators were imported. Kazuchika Okura, who later became the first president of NGK Insulators, decided that insulators should be manufactured in Japan, declaring that “we do this for the sake of society’s future, and not for our own profit.” A study of special high-voltage insulators followed, which started with the examination of a fragment of a U.S.-made insulator and resulted in the establishment of NGK Insulators. Ever since then, the company has embraced original ceramic technologies as its core, responding to the needs of society through cutting-edge manufacturing and contributing to the advancement of the world.

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The NGK Group’s Core Technologies

- Control techniques
- Material technologies
- Production/ process technologies
- Parts structural design
- Core technologies

The fragment of an insulator that played a part in the foundation of NGK Insulators (1905)

A special high-voltage insulator made around the time the company was founded.

Sulfuric acid corrosion-resistant apparatus (1931)

The first unit of HONEYCERAM that came off the production line in 1976. This item has been registered as an essential historical material for science and technology by the National Museum of Nature and Science in 2009.

Subnano-ceramic membranes

Zinc rechargeable battery

Lithium-ion rechargeable battery “EnerCera”®

Gallium nitride (GaN) wafers