As a signatory to the United Nations "Global Compact" initiative, the NGK Group pledges to contribute to the realization of a sustainable society through business activities that conform to the compact's ten principles covering human rights, labor standards, the environment, and anti-corruption policies.
NGK Insulators responds to the world and
the future needs through ceramic technologies.

Using ceramics, we can make a brighter future for energy.
Using ceramics, we can help sustain the environment and human society.
Using ceramics, we can discover new and advanced technologies.
Using the untold power of ceramics,
we can meet the needs of every age and provide the world with new values.
“Look forward and aim high”—here at NGK Insulators,
we continue the quest for creative manufacturing.
Ever since the company’s establishment in 1919, NGK Insulators Ltd. has continued to develop and supply products that help support our social foundation and preserve the environment. By fusing key materials such as porous ceramics, functional ceramics and ceramics for use as structural material together with our unique molding, firing, processing and evaluation technologies, we strive to create groundbreaking products that leverage the full potential of ceramics. In order to demonstrate the best performance as a global company that could compete in the world, each NGK member must be highly motivated, constantly embrace challenges, and improve their individual ability. With the passion and pride toward manufacturing, we refine our knowledge, skills and techniques to get through the fierce global competition as a unified team. Meanwhile, we at NGK also relish the challenge of tackling the many thorny issues the world faces in relation to energy and the environment. In addition to our long track record in sectors such as energy, ecology and electronics, we are eager to use these new ventures to further expand our operations into new and uncharted fields. In keeping with the NGK Group Philosophy, our mission is "Enriching Human Life by Adding New Value to Society." Indeed, we remain dedicated to applying our state-of-the-art technologies quickly and innovatively to meet popular demand for environmental protection and solid support for people’s livelihoods and industries.

Taku Oshima
President
NGK Insulators was founded out of a desire to localize the production of special high-voltage insulators, a key component in the modernization of Japan.
The Electrification gradually began to gain traction at the end of the 19th century. At the time, Japan relied on imports for high-voltage insulators. Japanese high-voltage insulator R&D and production began only with a desire to make a contribution to the country by producing insulators locally and a piece of an American insulator to study. Despite such humble beginnings, NGK Insulators has consistently succeeded in developing ultra-high-voltage, ultra-high-strength insulators to meet the massive demand for electricity of rapidly evolving lifestyles and developing industries. As a result, we have grown into the world’s foremost manufacturer of insulators underpinning power supply the world over.

Here at NGK Insulators, our formidable technological strengths, honed by long years of experience in the production of ceramic insulators, have enabled us to further develop a range of new technologies which are now contributing to the development of the energy, ecology and electronics sectors. These include the world’s first large-capacity storage batteries, which are paving the way for next-generation infrastructures; vehicle exhaust cleaning components that provide a major leap forward in the fight to overcome environmental issues; industrial machinery that provides momentum for chemical industries; and the precision machinery that underpins the evolution of electronics.

All of us at NGK Insulators are committed to leveraging our original ceramic technologies to advance the creation of things that meet the needs of all society and promote the betterment of the whole world.

The History of NGK Insulators’ Manufacturing

1919 NGK Insulators, Ltd. established by spinning off the insulator division of Nippon Toki, Ltd. (now known as Noritake Co., Limited).
1923 Bushing production operations begin.
1929 Testing facilities completed for 1,000 kV-class high-voltage insulators.
1931 Manufacturing and marketing of sulfuric acid corrosion-resistant apparatuses for the chemical industry begin.
1935 Suspension insulators exported to India (Full-scale export of NGK products).
1958 Manufacturing and marketing of beryllium copper products begin.
1965 NGK’s first overseas distribution company: NGK Insulators of America, Ltd. (now known as NGK- Locke, Inc.) incorporated.
1968 Construction of the High Voltage Laboratory completed.
1971 Manufacturing and marketing of translucent alumina ceramics HICERAM begin.
1973 NGK’s first overseas production base, Locke Insulators, Inc., established (USA; production currently ceased).
1976 Manufacturing and marketing of ceramic catalyst carrier HONEYCERAM for automotive exhaust gas purification commence.
1978 NGK delivers first low-level radioactive waste treatment system.
1986 Characters used in Japanese company name changed; English name remained the same.
1989 Production of diesel particulate filters begins.
1995 NGK delivers the world’s largest gas bushing for UHV transmission facility (11.5 m).
1996 Mass production of ceramics for semiconductor manufacturing equipment begins.
1998 NGK Foundation for International Students established.
2002 Fine ceramic water purifier goes on sale.
2003 Mass production of NAS battery systems begins.
2007 NGK develops one of the world’s largest subnano-ceramic membranes.
2012 Production of gasoline particulate filters begins.
2014 Production of bonded wafers begins.
2016 Mass production of copper-nickel-tin alloy products begins.
2018 Commercialization of gallium nitride (GaN) wafers and micro-lenses for ultraviolet LEDs begins.
2019 The NGK Group Code of Conduct is revised.
2019 The NGK Group Philosophy is established.
2019 Commercialization of chip-type ceramic secondary batteries "EnerCera".
Enriching Human Life by Adding New Value to Society.

Over the years, the NGK Group has provided new value to society with our unique technology, and contributed to improving quality of life, fostering the development of industry, and conserving the global environment. We will remain committed to meeting the demands of the age by continuously refining our technology and achieving new levels of innovation. We believe that this contributes to a better life for every person, now and in the future.

Our Values

Quality of People
Embrace challenges and teamwork.

Quality of Product
Exceed expectations.

Quality of Management
Social trust is our foundation.

Here at NGK Group, we seek to harness the strengths of our core ceramic technologies to pursue opportunities in the energy, ecology and electronics sectors.

Energy
Development and manufacturing products that help sustain a stable energy supply.

Ecology
Development and manufacturing products that contribute to environmental conservation.

Electronics
Development and manufacturing products that provide momentum to electronic evolution.
We offer an array of products to ensure a stable supply of electricity (surely the bedrock on which our communities and livelihoods are based) and contribute to energy conservation and sustainability.

- **Energy Infrastructure Business**
  - We offer ceramic catalyst carriers, filters, and high-precision sensors that are indispensable in cleaning vehicle exhaust gases, along with other products that help preserve the environment.
  - **Ceramic Products Business**
  - We offer the latest in fine ceramic technologies to help drive the technical innovation that makes electronics smaller and lighter yet more advanced.
  - **Electronics Business**
  - We provide products in a wide range of industries to meet diverse needs such as manufacturing process innovation, improving productivity, energy savings, and more.
  - **Process Technology Business**
  - We carry out research and development to look beyond the horizon of what is currently considered possible in the “triple E” areas (ecology, energy and electronics) with the aim of creating new technologies and products for a new age.

- **Research & Development**
  - We will remain committed to meeting the demands of the age by continuously refining our technology and achieving new levels of innovation.
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A product of NGK’s proprietary advanced ceramic technologies, the NAS battery was the world’s first commercialized battery system capable of megawatt-level electric power storage. The NAS battery system boasts an array of superior features, including large capacity, high energy density, and long service life, thus enabling a high output of electric power for long periods of time. NAS batteries can charge at night when power demand is low and provide power in the daytime to reduce peak power. Moreover, the NAS battery system can be used as an emergency power supply in power outages and during momentary drops in voltage. NAS batteries are increasingly being utilized in stabilizing output from wind and solar power generators while proving useful to the spread of renewable energies and establishment of the smart grid. These batteries can be incorporated in microgrids, small-scale localized power supply networks that feature reduced energy costs and environmental impact, in demand response programs that make effective use of stored electric power, and with other new energy solutions spreading throughout the world to contribute to their widespread use and development.

Proven technologies for a stable power supply, a clean earth and a bright future.

Electricity is the force that powers our daily lives and sustains our societies. We at NGK Insulators have striven throughout our company’s history to protect and uphold this vital lifeline by constantly seeking to make better quality insulators so as to provide the whole world with highly reliable insulators and other items related to energy supply. Moreover, we strive to have made a big contribution to the establishment of sustainable energy sources with the creation of the NAS battery system, a large-capacity storage system that dispelled the myth that electricity could not be stored. Far from resting on our laurels, however, we remain dedicated to creating ever more advanced products in anticipation of the demands of the coming age.
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The world’s first large-capacity battery energy storage system and a major leap forward in the ability to provide a stable supply of renewable energy.

NAS battery systems already have a record of operation in more than 200 locations worldwide. NAS batteries have sodium (Na) negative electrodes and sulfur (S) positive electrodes separated by a ceramic solid electrolyte. World’s largest battery energy storage facility. (300,000 kWh)

A cell battery (left) and a ceramic solid electrolyte.
Insulators

Uncompromising quality and advanced technology are why our insulators are chosen to sustain power supply the world over.

Insulators play an important part in maintaining the safety and stability of our energy lifeline by ensuring that transmission lines and steel towers and equipment are completely isolated. Given the magnitude of their task—even the slightest defect could have massive consequences—insulators are required to be impeccably reliable. We at NGK Insulators are the insulator specialists; since the company’s inception in 1919, we have consistently developed our own unique technologies and created products with the durability and quality to perform without fail even in harsh environments that suffer from earthquakes, typhoons and heavy snowfall. Among the world-beating products we have developed and made are the world’s strongest insulators for UHV (1 million volts) power transmission and the bushings using the world’s largest hollow insulators. We also boast the world’s largest production capacity—which is just as well, because our products are used in at least 100 countries. Backed by uncompromising quality and advanced technology, our products continue to make power supply safe and secure.

Insulators for power transmission
Here at NGK Insulators, we produce an extensive line-up of multi-functional insulators that are resistant to dirt and lightning damage. We constantly seek to innovate, and have succeeded in making our insulators more compact without compromising strength or isolation capacity. Thus, our suspension insulators for UHV power transmission are only 41 cm in diameter but can withstand a load of 84 tons.
10 Corporate Profile

Equipped with the world's largest insulator testing facility, the High Voltage Laboratory is an internationally accredited testing laboratory—the first high-voltage testing facility to be accredited in Japan. The institute evaluates and tests insulator devices at actual scale; it is responsible for innumerable achievements in the research and development of insulators for substation, power transmission and other power supply devices, and its contribution to the energy industry is invaluable.

We manufacture devices to prevent power outages when something happens to transmission lines. In particular, our line arresters, which have built-in functional ceramic (zinc oxide elements), make a huge contribution to blackout prevention by selectively discharging the large fluxes in current caused by lightning strikes.

Switches, cut-outs, lightning resistant equipment and voltage regulators are just some of the reliable distribution devices we supply, and make a genuine contribution to the maintenance and efficiency of power supply equipment.

High Voltage Laboratory

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Supplying the world with people-friendly, environment-friendly, advanced technologies.

As more and more priority is placed on ensuring sustainable use of resources, manufacturing industries will face ever greater demand for technologies. At NGK Insulators, we continue to develop technologies aimed not just at enabling people to live in comfort, but also at taking care of our planet to create societies where natural resources are used sustainably. For example, by making products that help automobiles and industries become more eco-friendly, our company contributes to the comfortable and abundant lives we enjoy. We always endeavor to use our unique fine ceramic technologies to help overcome challenges to the earth's environment. We are proud that our pioneering work and reliability is now recognized the world over.
Ceramic substrates for automotive catalytic converters

HONEYCERAM®

NGK Insulators’ fine ceramic technology appreciated by worldwide automotive manufacturers.

HONEYCERAM is a ceramic catalyst carrier, which neutralizes the harmful substances in automotive exhaust. HONEYCERAM’s honeycomb design results in a large surface area — the area that comes into contact with exhaust — with a very compact installation. In fact, the coating of gas-purifying catalyst total surface on a palm-size HONEYCERAM would cover an area equivalent to two soccer grounds.

For maximum exhaust gas cleaning efficiency, HONEYCERAM was designed with minimum weight and wall thickness: the 0.05 mm walls minimize loss of engine power. The remarkable properties of cordierite ceramics — of which HONEYCERAM is — enable it to withstand the high temperatures as well as sudden and sharp temperature changes of exhaust gas with ease.

HONEYCERAM

With a choice of square or hexagonal cell configurations (the latter being highly effective in conserving the volume of catalyst used), HONEYCERAM is used by auto manufacturers worldwide. Total production of HONEYCERAM recently exceeded 1.5 billion units.

Large-size HONEYCERAM (LSH)

Designed for large diesel vehicles, this model of HONEYCERAM carries catalyst that removes the nitrogen oxide (NOx) contained in diesel exhaust gas.

Square-cell HONEYCERAM (left) and hexagonal.

HONEYCERAM for gasoline-powered vehicles (left) and LSH.
Diesel particulate filters
Gasoline particulate filters

Developing purification technologies designed to meet stricter exhaust gas regulations and help preserve the environment.

As the world hurries to regulate diesel exhaust gases, NGK Insulators has been busy developing a range of state-of-the-art products designed to satisfy stringent new standards. Diesel particulate filters (DPF) incorporating our porous ceramic filter technologies are effective in catching particulate matter (PM) in their fine pores. As the only manufacturer to mass-produce two kinds of diesel particulate filters, cordierite and silicon carbide, we use our ceramic technologies to support even cleaner diesel vehicle emissions. We also offer gasoline particulate filters that remove particulate matter emitted from direct-injection gasoline engines, as we continue to respond to rapidly-evolving environmental requirements worldwide.

**Diesel particulate filters**
These remove up to 99 % of particulate matter. Featuring superior heat resistance, silicon carbide filters (center of photo) are used in passenger cars, while lightweight cordierite filters are used mainly in heavy duty vehicles.

**Gasoline particulate filters**
These are particulate filters for gasoline-powered vehicles, used in direct-injection gasoline engines that provide horsepower along with fuel economy performance on par with that of hybrid vehicles.
NOx sensors

The world’s first sensor capable of measuring real-time NOx concentrations in vehicle exhaust.

Our in-vehicle high-precision NOx sensor is the world’s first vehicle-mounted sensor capable of measuring the concentration of NOx (nitrogen oxide) contained in automotive exhaust gas at the ppm (parts per million) level. Measuring real-time NOx concentrations and feeding back that information to the engine controls enables precise control of the exhaust gas purification system to reduce NOx emissions. The zirconia-based ceramic element, which passes oxygen ions when a voltage is applied under high temperatures, can be inserted directly into high-temperature exhaust gases and exhibits both superior responsiveness and stable long-term performance. In response to more stringent regulations on marine vessel exhaust gases, the sensor is increasingly being utilized for monitoring and reducing NOx concentration in vessel exhaust gas purification systems as well.

In-vehicle high-precision NOx sensors
These sensors contain elements that utilize zirconia's oxygen pump function. These are now incorporated in clean diesel vehicles around the world because of their superior detection capabilities and greater durability.

O2 sensors for industrial facilities
Trace O2 sensors are used in controlling and monitoring processes in the manufacturing of semiconductors, precision instruments, and other products. High-precision sensors contribute to improved product quality.
Manufacturing that accelerates the advancement of electronics.

The development of AI (artificial intelligence), the IoT (Internet of Things), and other technologies has brought us to the start of an advanced information and communications society. Supporting this accelerating communications infrastructure is NGK Insulators, right at the forefront of our remarkable and continuous technological evolution with proprietary technologies featuring ever better performance and greater precision. We are expanding the new dream of electronics with a diverse range of products that lead the way to future generations, including materials used for smartphones, home appliances, automobiles, and other products and components that enhance the capabilities of electronic and electrical devices.
Beryllium copper

Superior strength, fatigue resistance and spring performance help make electronic devices smaller, lighter and more reliable.

By adding a small percentage of beryllium to copper, the resulting alloy adds the strength and durability of special steel to copper’s characteristic heat and electrical conductivity. Strip and fine wires made from beryllium copper alloy are resistant to fatigue and have a long service life, making this the ideal material for reliable conductive springs and contact points in a broad range of applications, including mobile phones, household appliances, cars and industrial machinery. Here, the alloy makes a big contribution to improving reliability while reducing product size and weight. Here at NGK Insulators, we have beryllium copper alloy production, processing and sales bases in the USA, Europe and Asia, where advanced production technologies and uncompromising quality control create products that have become sought after by the world’s industries.

Beryllium copper alloy

From 0.045 mm sheets and coils to bars and wire of a mere 0.05 mm in diameter, we can provide the right alloy mix to suit your needs. Beryllium copper alloys boast outstanding strength, conductivity, fatigue resistance and high temperature characteristics, workability and resistance to corrosion.

Copper-nickel-tin alloy

In 2016, NGK launched mass production of copper-nickel-tin products. Our copper-nickel-tin alloy, strengthened by spinodal decomposition, is high performance copper alloy which has excellent characteristics such as high strength, heat resistance and wear resistance comparable to beryllium copper alloy.
Today, we are witnessing the emergence of AI, the IoT and a succession of other new technologies. NGK Insulators is supporting the evolution of electronics with advanced ceramic technologies. Our bonded wafers enable smartphones and other devices to achieve higher quality in communications and higher speeds compatible with next-generation LTE (high-speed data communications standard) and fifth-generation (5G) mobile communications systems. Developed by utilizing NGK Insulator's proprietary ceramic technologies and featuring high heat resistance, the "EnerCera" series is an entirely new kind of battery that can be treated as an electronic component. These batteries are expected to power IoT devices, smart cards, and other next-generation devices. NGK Insulators continues to contribute to the advancement of electronics with our innovative electronic materials and components.

Faster, smaller, more beautiful. Supporting evolution in electronics.

Ceramics for electric and electronic machinery

Bonded wafers

Bonded wafers are substrates for electronic devices developed by proprietary bonding technologies and ultra-high-precision wafer polishing technologies that have been cultivated in the ceramics business. Combining different materials enables bonded wafers to deliver performance and functionality that cannot be achieved with wafers made from a single material.

Bonded wafer for Surface Acoustic Wave (SAW) filter that eliminates noise in smartphones, tablets, and other mobile devices
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Ceramics for electric and electronic machinery

Bonded wafers

Produced through high-density sintering of high-purity alumina (Al2O3), this ceramic achieves superior translucency and reliability. This product is applied in arc tubes for high-intensity discharge lamps used in outdoor facilities, commercial facilities, factories, and other large-scale spaces, and as substrates during semiconductor packaging process.

Translucent alumina ceramics HICERAM®

Produced through high-density sintering of high-purity alumina (Al2O3), this ceramic achieves superior translucency and reliability. This product is applied in arc tubes for high-intensity discharge lamps used in outdoor facilities, commercial facilities, factories, and other large-scale spaces, and as substrates during semiconductor packaging process.

Gallium nitride (GaN) wafers

NGK Insulator’s original crystal growth technology has resulted in wafers featuring low defect density across the entire wafer surface, enhancing the luminous efficiency of LEDs and increasing the output of semiconductor lasers. Achieving unprecedented ultra-high brightness, these wafers can be used as light sources for lighting, projectors and other applications.

Micro-lenses for ultraviolet LEDs

Ultraviolet LEDs are used in sterilizing and hardening resins. NGK Insulators has developed an extremely small lens with a reduced irradiation range that improves the LEDs’ sterilizing effect. These lenses utilize quartz glass with superior transparency and durability, allowing them to produce complex shapes that were formerly difficult to achieve.

Ceramic packages / DCB® and AMB® substrates

We offer a variety of electronic components, with the world’s top share in ceramic packages for high-frequency devices (top left), as well as crystal packages (bottom left), optical communications packages, and DCB (Al2O3: Zirconia Doped Alumina) and AMB (Si3N4) substrates for power semiconductor modules (right).

Lithium-ion rechargeable batteries, “EnerCera”™

The EnerCera series is a line of compact, thin, high energy density lithium-ion (Li) rechargeable batteries utilizing NGK Insulator’s proprietary Crystal Oriented Ceramic Plate as electrodes. One of the particular features of these batteries is their high heat resistance. The series is offered in two types: “EnerCera Pouch,” which can be embedded in IC cards using hot lamination; and “EnerCera Coin,” the world’s first Li-ion battery that can be reflow-soldered to circuit boards and is capable of high current discharge.

These innovative power storage devices are highly regarded, winning multiple awards at CES, the world’s largest digital technology trade show, and CEATEC JAPAN.
Processes that create increased value and spur innovation.

Ceaseless evolution is now a requirement in semiconductors, electronics, chemistry, medicine, foods, and every other field. Imparting new value and creating competitive products requires dynamic innovation in the manufacturing process. NGK provides robust support in reaching the next level of manufacturing, integrating our proprietary technologies and spurring evolution through specialty products and plant engineering to meet every challenge, from improving productivity and quality to reducing costs and saving energy.
Ceramics for semiconductor manufacturing equipment

High-performance fine ceramics are revolutionizing semiconductor production.

Fine ceramics boast outstanding heat resistance, corrosion resistance, and durability. We at NGK Insulators leverage these features to make a range of ceramic products for semiconductor manufacturing processes that are exposed to high-temperature corrosive gases and plasma. Our fine ceramics contain virtually no impurities which may adversely affect the semiconductors’ performance using our original hot press sintering method. The high-purity, ultra-fine crystals have outstanding dielectric strength and serve to improve semiconductor productivity. In addition to ceramic heaters and electrostatic chucks, we also manufacture chamber components made of aluminum nitride, aluminum oxide, and other materials for a range of applications.

Ceramic heaters
These are used to keep the temperature of silicon wafers constant during the membrane formation process. Our unique heater structure features a shaft attached to the underside of the heated stage on which wafers are placed. This way, we can protect terminals and conducting wires from halogen gas.

Electrostatic chucks
These are used in etching and other processes for the adsorptive immobilization of silicon wafers. At NGK Insulators, we are able to adapt electrostatic chucks to suit their intended use and exponentially improve the semiconductor production process. For instance, we can integrate them with high-precision heaters and attach cooling plates.
Industrial process products

Utilizing the technology and expertise developed in manufacturing ceramics, generating greater dynamism in the field of industrial processes.

“Want to make dramatic improvements in production efficiency and in their products’ quality and features.” “Want to achieve significant energy savings.” In response to various desires from companies, NGK Insulators offers equipment and production facilities that bring greater dynamism to the manufacturing process such as heating technologies including firing and drying, membrane separation technologies that enable precise filtration, separation, refining, and concentration, and other proprietary technologies cultivated through our long history in manufacturing ceramics. In addition, our advanced engineering technologies enable us to provide customized design, manufacturing, installation, and long-term maintenance. We support the evolution of chemistry and fine chemicals, pharmaceuticals, semiconductors, and a wide range of other industries with sophisticated solutions matched to our customers' particular needs.

**Industrial heating systems (kilns and drying furnaces)**

Our high-precision, energy-efficient heating technologies, which were honed over long years of experience in producing ceramics, have enabled us to develop a tremendous lineup heating devices and refractories. These are widely used in all sorts of industries, from the cutting edge (solar cells and lithium-ion batteries) to the traditional (pottery).

**Low-level radioactive waste treatment systems**

At NGK Insulators, we design, build and assess low-level radioactive waste treatment plants. Our treatment systems are used at nuclear facilities throughout Japan, and are rated highly for their outstanding dust removal performance and steadfast safety. What is more, they make a real contribution to waste reduction.
Refractory products
Our incredibly thin and lightweight refractories help to improve productivity and to save energy. We offer the industry’s greatest lineup of firing jigs, which are indispensable in firing electronic components and ceramic products.

Corrosion-resistant equipment and systems
We manufacture an extensive range of corrosion-resistant products, including pumps and valves exhibiting excellent resistance to high-temperature acids and organic solvents, glass linings that prevent electrostatic charges and ensure safety, and other products used in processes involving chemical reactions in the chemical, medical, steelmaking and other industries.

Reusing valuable resources systems
High-temperature dust collectors
This filter system is capable of separating and recovering rare metals, silica, and other valuable resources contained in high-temperature exhaust gases. The system is also used for removal of black smoke in diesel engine exhaust gas from generators and ships, collecting 99% or more PM (particulate matter) in black smoke.

Ceramic membranes & separators
At NGK Insulators, we are skilled in advanced membrane engineering using all kinds of separation membranes. Our highly efficient separating systems are prized for use in a range of applications, including the purification of water for use in pharmaceutical production, food and beverage filtration and the treatment of wastewater and gas in chemical and electronics plants.

Drying system uses light instead of heat, improving product quality and contributing to energy savings.

Wavelength-control drying systems
Having developed various heating systems, including devices using hot air and far infrared rays, in 2012, NGK Insulators announced a new light-based drying system. By selectively irradiating light at specific wavelengths, the unit can dry at low temperatures (approximately 40 °C) while limiting thermal damage to products, helping to enhance product quality and to improve productivity.

Glass-lined detachable mixing blades feature glass-coated metal surfaces for excellent corrosion resistance.

This refractory is five times stronger than conventional refractories.

Heat-resistant to 600 °C, the system is capable of separating solids down to the submicron level.

Ceramic membrane filters exhibit robust performance even in severe environments with superior resistance to heat, chemicals, and friction.

Enables to reduce the drying time by 50 % compared to conventional methods, significantly saving energy.

Fine ceramic filter technology is also used at home.

Home-use water purifier
We create new global standards for a better world and a better future.

At NGK Insulators, we conduct research and development in the fields of energy, ecology, and electronics as part of our mission to address the challenges facing our societies, meet new global needs, and discover new possibilities for ceramics. Through our broad-ranging research into ceramic material, and our unrivalled analytical, evaluation, and production technology, we strive to create the kind of products that will set new global standards and spark further innovation.
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**Research & development**

**Zinc rechargeable batteries**

Zinc is widely used for primary battery electrodes due to its abundance as a resource and its electrochemical reactivity. However, it causes short-circuiting problems during charging when used in rechargeable batteries. NGK has solved the problem by utilizing our proprietary hydroxide ion conducting ceramics. We are now developing a zinc-based rechargeable battery with these ceramics. This battery—without flammable electrolyte—features high capacity and inherent safety, and thus offers the optimal energy storage solution for indoor installations.

**Subnano-ceramic membranes**

Ceramic filters have proven their performance and reliability in cutting-edge fields such as the pharmaceutical and chemical sectors. At NGK Insulators, we have further improved on their performance with the development of subnano-ceramic membranes, which are able to separate specific molecules from mixed liquids or gases. These new ceramic filters, in which membranes with pores less than a nanometer (a billionth of a meter) in diameter are formed on ceramic porous supports with 1 meter in length and 18 cm in diameter, make possible innovative separation processes that have the potential to save energy and reduce costs.

**Wafer products for electronic devices**

NGK Insulators' proprietary high-performance wafer products fully exploit our crystal growth technologies and dissimilar material bonding technologies. These wafers will further revolutionize fields such as power semiconductors and high-capacity data communications. We are now developing gallium nitride (GaN) wafers, which contribute to greater compactness and energy savings in power ICs for high-power and high-frequency applications, and multilayered bonded wafers that enable higher performance in next-generation high-speed wireless communications and optical communication devices.
Taking our unrivalled technology and quality to the world. NGK’s reliable global network of partners.

NGK Group has production and sales bases worldwide and offers state-of-the-art technologies and top-quality products. As a truly global company, we are committed to leveraging our network to contribute to the betterment of the whole world.
NGK INSULATORS, LTD.
www.ngk-global.com
2-56 Suda-cho, Mizuho, Nagoya 467-8530, Japan

NGK Insulators sites, main office, branch & sales offices
Nagoya Site / Tokyo Main Office / Osaka Branch / Chita Site / Komaki Site
Ishikawa Plant / Sapporo Sales Office / Sendai Sales Office / Hokuriku Sales Office
Hiroshima Sales Office / Takamatsu Sales Office / Fukuoka Sales Office

Japan
ENERGY SUPPORT CORPORATION / KANSAI ENERGYS CORPORATION
KYUSHU ENERGYS CORPORATION / HOKURIKU ENERGYS CORPORATION
ENERGYS SANGYO CORPORATION / AKECHI INSULATORS, LTD.
NGK OKHOTSK, LTD. / NGK METEX CORPORATION
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As a signatory to the United Nations “Global Compact” initiative, the NGK Group pledges to contribute to the realization of a sustainable society through business activities that conform to the compact’s ten principles covering human rights, labor standards, the environment, and anti-corruption policies.