Nippon Carbon Technology

CARBON - the power to materialize of the future

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CARBON - the power to materialize the future

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CARBON – opening up the future

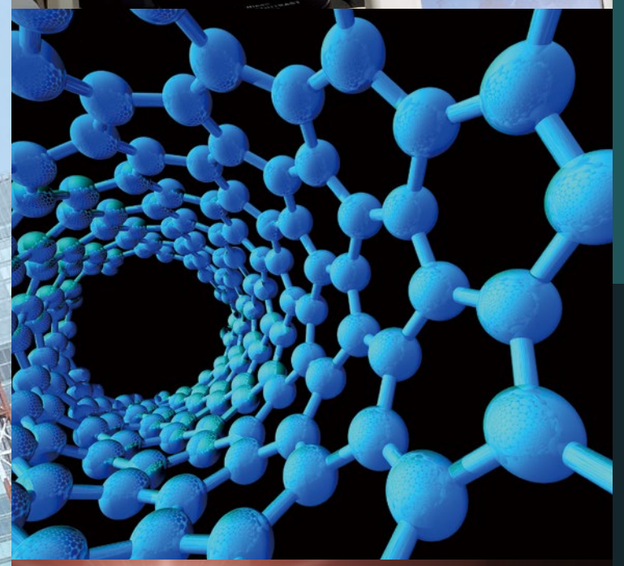
Nippon Carbon creates the future for today and tomorrow

Contributing to the development of Japanese industry as a pioneer in the carbon field

We at Nippon Carbon came into being in 1915 as a trailblazer of carbon industry in Japan. Since we founded, as a carbon pioneer, we constantly lead the way in the field of carbon and graphite industry in Japan.
We have been working through R&D, we work to make the most of carbon's diverse features, and industrialized many products by applying them to the needs of industry – such as: carbon fiber used widely in aerospace and manufacturing fields, high purity graphite used in the production of crystalline silicon and other purposes, anode material for lithium ion batteries, silicon carbide continuous fiber, impervious graphite for use in chemical plants, and flexible graphite. And, now, carbons are essential items not only in the world of manufacturing but also for people who are living today across the globe.

The power of carbon leads us to the future

Our carbon and graphite products are vitally linking in energy saving and recycling efforts that are needed to prevent global warming. They are playing vital roles in solar cells (widely notified reusable energy technologies), LED lighting (leading the way in energy saving), lithium ion batteries (that are gaining presence as a mighty innovation in reducing environmental burdens), which are being used in technologies such as mobile phones (that handle recharging again and again) and electric automobiles, and clean fuel cells (that do not emit CO2). carbon and graphite also is used for graphite electrodes for electric arc furnace steelmaking. Carbon and graphite are essential materials for future development on earth that should be taking into consideration the environment.



Superior R&D prowers continuously finding solutions to the needs of our days

R&D in pursuit of the limitless potential of carbon

Carbon and graphite have always answered to offer solutions amidst the myriad ongoing changes when we needed something new to match the world we live in.Thus, we at Nippon Carbon continually immerse ourselves in research and development in the assured belief of carbon's unknown potentialities.

The secrets of carbon is limitless potential

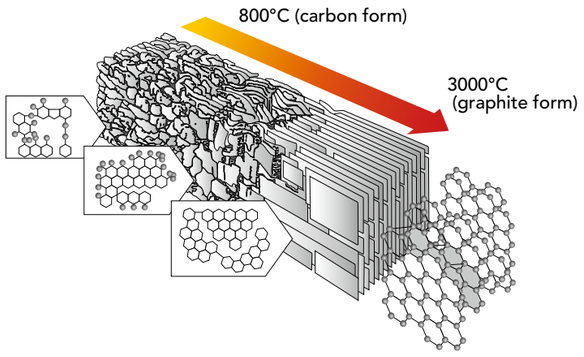
Bring out diverse ranges of characteristics by setting production conditions

Our carbon and graphite products are materials with a number of superb characteristics that have heat resistance, corrosion resistance, electric conductivity, thermal conductivity, wear resistance and self-lubricating properties. Our carbon and graphite products are made by baking raw materials such as coke, pitch, or organic fiber form to a high temperature. And, by setting different production conditions, carbon materials can be changed into a variety of products with various functions.

Coke and pitch - the raw materials

The various characteristics of carbon are attributed to its crystal structure

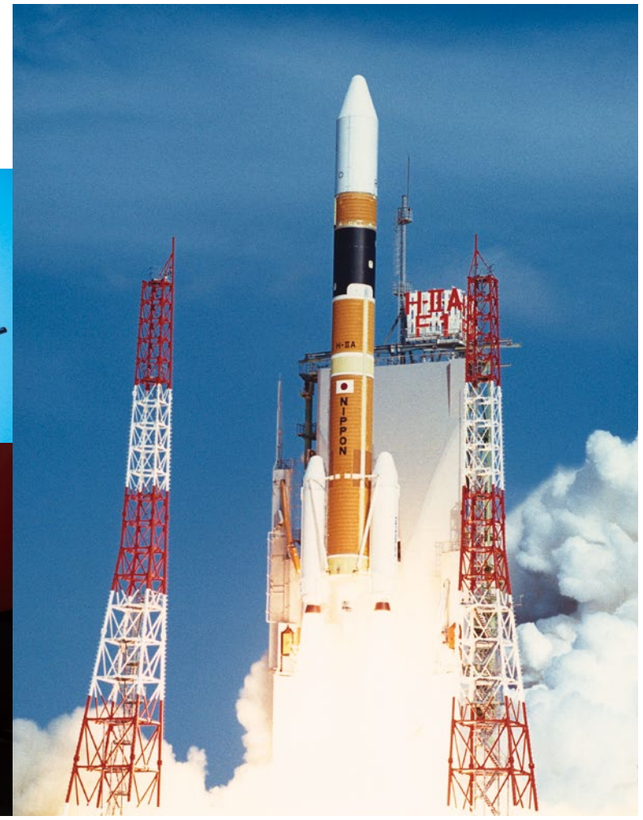
Crystal structures are the secret to the wide range of carbon characteristics. Graphite crystals are composed of accumulated layers of hexagonal flat planes made of carbon atoms. If heat treatment is low during production, the raw materials become carbonized with a disordered crystal structure, but, at high temperature, the raw materials become graphite with uniformed crystal structure. Carbon form is hard and has low electric conductivity, besides, graphite form is soft and has high electric conductivity.



■Ordered diagram of how the carbon structure develops in conjunction with heat treatment

Carbon in our daily lives

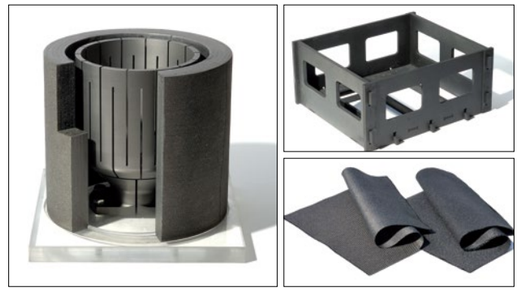
Various products exist around our belongings which involve carbon in pencil leads, golf clubs and car tires as well as the structural elements of airplanes, the heat-resistant components of rockets and the batteries for portable instruments.



Courtesy of JAXA

Carbon – diversity to vary its form

Another vital reason why carbon plays prevalently active roles in many fields is its ability of shapes into various forms upon requirements. Specialty carbon products can be formed into complicated shapes using precision machining. Carbon fibers which are flexible strand-form or, cloth-form or and felt-form can be layered, machined or even used for over wrapping. Thus, being able to shaping to satisfy market needs, the unique characteristics of carbon can be utilized to a wide range of applications.

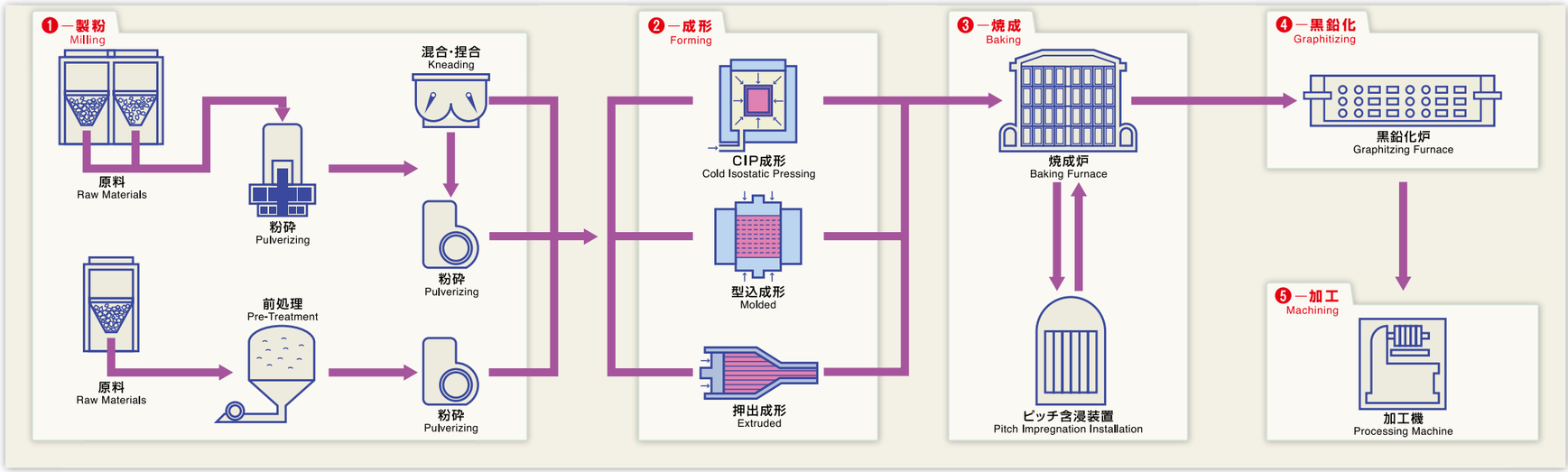


Carbon and graphite products machined to finishing shapes

Carbon potentiality on much more broadening

We, Nippon Carbon are carbon specialists. We have made good use of carbon across a broad spectrum of fields, creating various products used for diverse applications. Potentialities for such applications are still limitlessly broadening.

■Manufacturing process chart of carbon and graphite pro ducts



Products 1

Carbon Fiber Products

Carbon fiber – broadening carbon potentialities

Making carbon fiber involves heat treating special organic fibers and then graphitizing them. And, while these fibers have all the diverse qualities of carbon, they also are flexible, which means they can be used for various applications in manufacturing industries, such as aviation, aerospace, electronic, automobile and energy ones.

Carbon fiber
CARBOLON®

CARBOLON® is the first carbon fiber that we at Nippon Carbon successfully industrialized in 1962 in Japan.
It is formed into felt, fiber cloth and paper, etc., to meet application needs.
CARBOLON® felt has a low bulk density, making it light and easy to handle, which is why it is used extensively as an insulation material for high-temperature furnaces.
Fiber-formed insulation materials which are formed CARBOLON® felt are widely used for high-temperature furnaces with vacuum or inert gas atmospheres, single crystal silicon CZ furnaces and sintering furnaces used for ceramics products.

Carbon fiber-reinforced carbon composite material
CCM®

CCM® is a material of high strength and elasticity that is reinforced with carbon fiber.
As CCM® is composed by all carbon (graphite) reinforced carbon fibers in carbon matrix , it has excellent properties such as being stronger, more elastic and lighter than conventional carbon materials.
Making good use of all of these characteristics, CCM® is broadly used in various manufacturing industries as an ultra heat resistant material – thus, it is put to good use as a component for crystal silicon production employed in the solar cell industry.

Carbon fiber packing materials
CARBEST®

CARBEST® – developed by Nippon Carbon – is a material with heat resistant resin impregnated into carbon fibers. Thus, it has excellent properties such as heat resistance, corrosion resistance, self-lubrication, sealing, wear resistance and high themal conductivity. And, it is used as a non-asbestos material for gland packing in plunger pumps and rotary pumps.

Products 2

Specialty Carbon Products

Versatile materials actively used for various scenes at manufacturing industries

Specialty carbon products are highly-functioning products that support development in all fields of industry from key industries including electrical, machinery and metallurgy right through to leading edge industries including semiconductor, aviation and aerospace.

Isotropic graphite

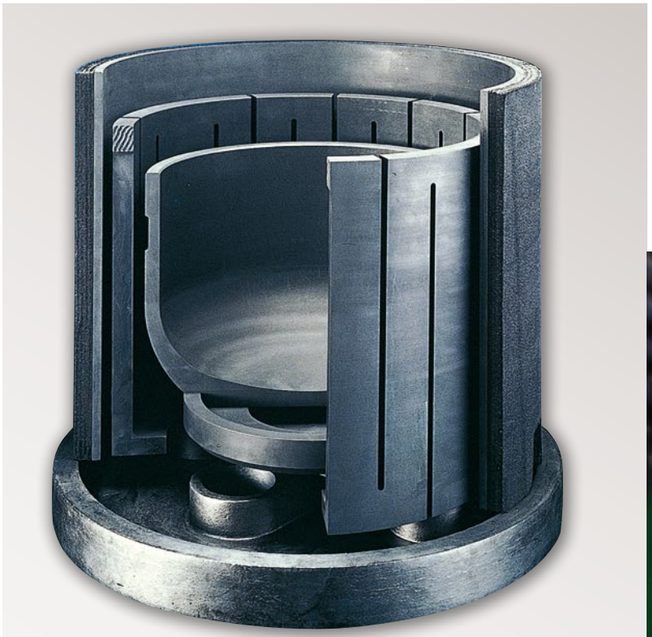
With superb processing qualities, isotropic graphite is a graphite material made using cold isostatic pressing (CIP), and is used for a broad range of manufacturing applications.
And, thanks to our technical development, the world's largest block of isotropic graphite exceeding one meter in diameter can be provided commercially – what is more, we are keeping up with demands in leading-edge fields.

Pressing of isotropic graphite

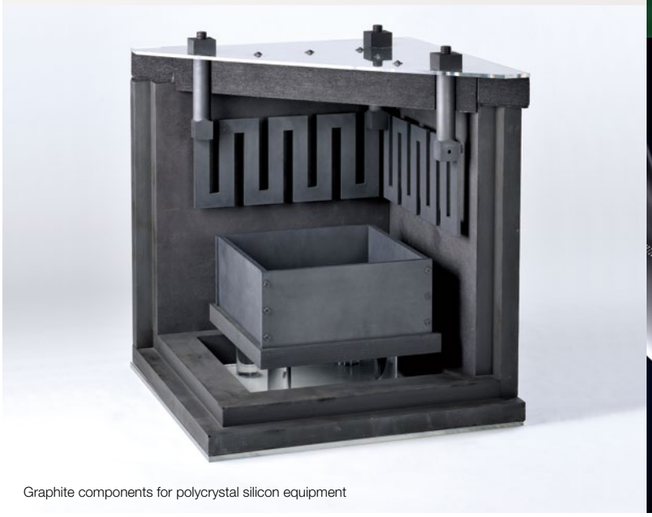
Baking furnace

Highly purified graphite

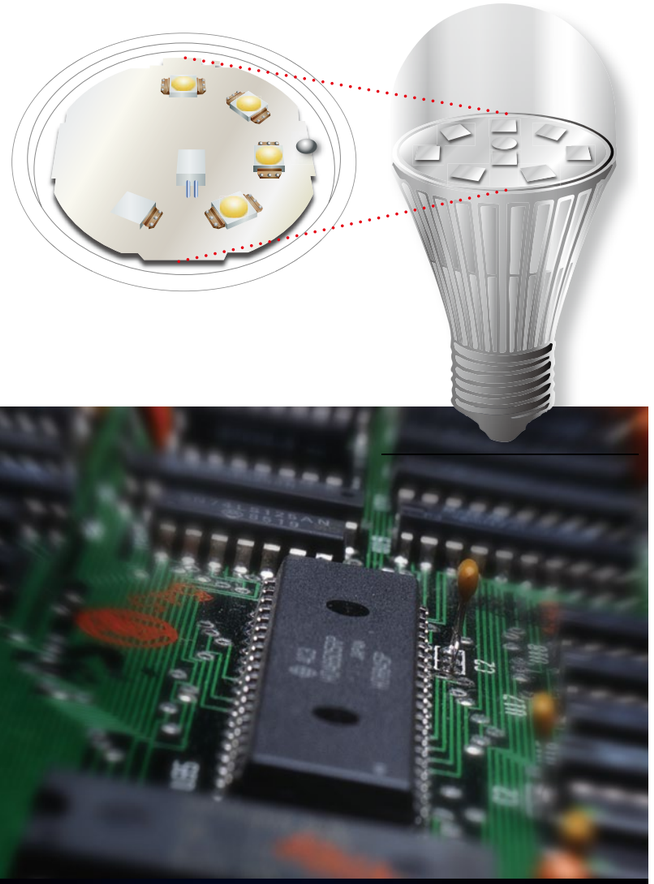
A clean environment is required for the production processes of crystal silicon, which are used for semiconductors and solar cells. Highly purified graphite, which impurities has been removed, are used for such applications.

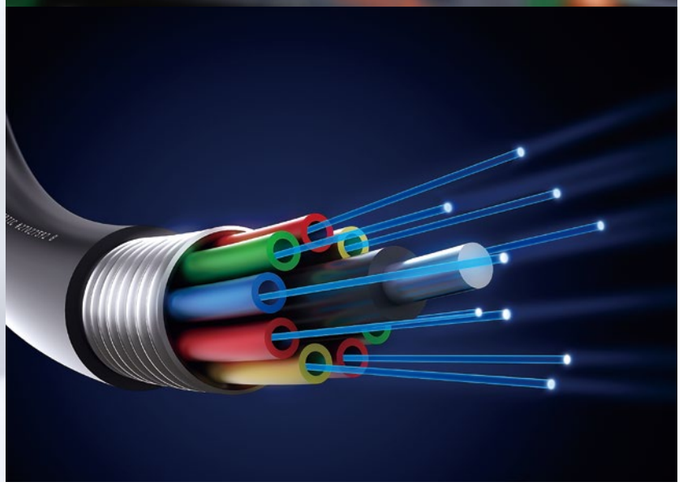


Graphite components for single crystal silicon CZ equipment



Graphite components for polycrystal silicon equipment





Carbon products for mechanical purposes

Making the most of the excellent features, such as self-lubrication, chemical resistance and heat resistances, these carbon products are widely used for many fields including electrics, machinings and metallurgy.

Silicon Carbide coated products (VESCOAT®)

VESCOAT® is a product using high purity graphite material that has been coated on the surface with high-purity silicon carbide (SiC).
This material has favorable oxidation resistance and corrosive resistance. It also has numerous other distinctive features, such as thermal conductivity, dimensional accuracy and flatness of the surface. The products are to be used for equipment components for various production lines including silicon semiconductors, LEDs and optical fibers.

Sliding composites (SC CARBON®)

SC CARBON® has an excellent self-lubrication property - so that it slides smoothly on the contacting surfaces without the aid of lubrication agent such as oil. Likewise, as SC CARBON® also has wear resistance and heat resistance qualities, it is used widely as sliding materials for bearings, mechanical seals and alike in machines that run at high temperatures.

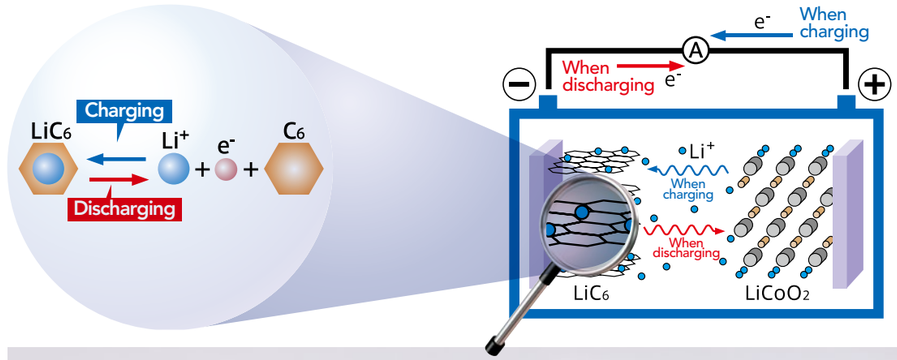
Products 3

Battery Materials

Contributing to the reduction of environmental burdens by developing anode materials for use in lithium ion batteries

Applications for lithium ion batteries are spreading widely from mobile phones through to automobiles. Nippon Carbon is proud of supplying top-ranking anode products in terms of quality in these markets.

■ Model chart of charging and discharging in lithium ion battery



Lithium ion battery is smaller and lighter than conventional batteries, besides it has excellent capacity.
Applications for this battery are growing because it can be repeatedly recharged and used.

Thanks to large-scale facilities in an integrated manufacturing infrastructure, we can achieve stable supply of products.

Based on our technical expertise cultivated in manufacturing carbon products, and our integrated manufacturing at large-scale facilities, we are able to produce battery materials that are to be shipped globally for both domestic and overseas.

We develop the optimum anode materials to satisfy customer needs

Lithium ion batteries are used in products such as mobile phones, laptop computers, electric tools, hybrid cars and electric automobiles.
We at Nippon Carbon offer anode materials to meet these applications. We set up R&D team which can respond promptly to further requests from our customers.

Electrode terminals and experimental batteries

Laboratory scale experimental equipment

Products 4

Artificial Graphite Electrodes

A pioneer in the area of artificial graphite electrode business with superb technologies and good reputation

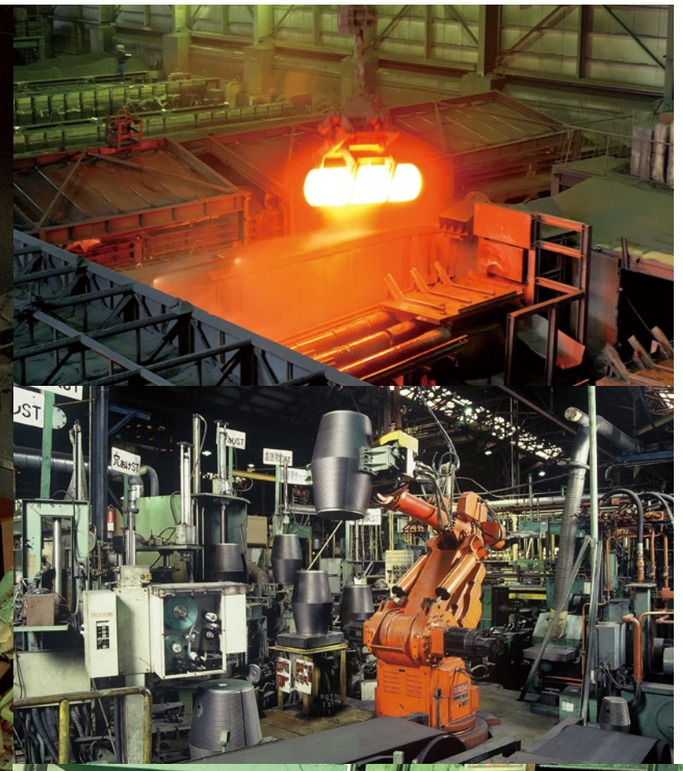
Artificial graphite electrodes are used for arc discharging to melt scrap iron in electric arc furnace steelmaking. Such steelmaking is environmentally friendly as it is used to recycle iron. Thus, in these days of greater ecological awareness, we at Nippon Carbon continually strive to supply high quality artificial graphite electrodes in order to contribute to steel industry.

Always striving to improve our artificial graphite electrodes to create better products

Since successfully making the first ever artificial graphite electrode in Japan in 1927, we at Nippon Carbon have worked to develop and produce our artificial graphite electrodes to become more mechanically robust and stronger against thermal impacts, so as to meet the tough conditions in high-power electric arc furnaces.

At present, we are providing ultra high- power electrodes with 32 inches (81.28cm) diameter, the largest one in the world. Nippon Carbon's artificial graphite electrodes are acknowledged for its high quality using around the globe.

Artificial graphite electrodes in operation at an electric arc furnace steelmaking



Our production plant is one of the largest scale in Japan

Our Toyama Plant is proud of an eminent position in production scales in Japan where we manufacture our artificial graphite electrodes. Working hard to achieve customer satisfaction that includes, our Toyama Plant was approved ISO9001 Quality Management System certification in 1993 for better quality control. This was followed by ISO14001 Environmental Management Standard in 1998, which recognizes our ongoing efforts to meaningfully reduce environmental burdens.

Our supports and services also setup well equipped and fully prepared

Quality of artificial graphite electrodes manufactured by Nippon Carbon is not just the "quality" of the product, it also is the "quality" we promise the customer in terms of customizing the product to meet the structure and operating conditions of the electric arc furnace to our customers, and we provide consultations to ensure that our products are used efficiently.

We offer and supply comprehensive services to be worthy to our name as a pioneer in the field of artificial graphite electrodes.

Products 5

R&D products, Others

Silicon carbide continuous fibers

NICALON® Hi-NICALON®

Both NICALON® and Hi-NICALON® are silicon carbide continuous fibers developed by Nippon Carbon using our own exclusive technologies. NICALON® can withstand high temperatures up to 1300°C and Hi-NICALON® up to 1700°C, both retaining high strength and elastic modulus. Thus, these heat resistant materials achieve excellent stability even under very severe conditions. Therefore, as a reinforcing fiber in ceramic composites, these carbon products are expected as heat resistant materials for components in industries such as aerospace and power-generating gas turbines. Moreover, both of these materials have electrical resistivity in the range of semiconductors, which means they can be used for various demands in the area where it is required certain electrical applications.

Cloth product

Impervious graphite RESBON®

RESBON® is an impervious graphite made by artificial graphite impregnated with thermoset resin. These products are widely used as heat exchangers in those fields such as chemical industries including synthetic hydrochloric acid production equipments, where excellent anti-corrosion and heat conductivity properties are required. Our RESBON® products have top domestic share in the area of heat exchangers .

Flexible graphite sheet NICAFILM®

NICAFILM® is a flexible graphite sheet, which features flexibility in addition to all characteristics of carbon, which can be used for various applications for gaskets and sealing materials.

Corporate Profile

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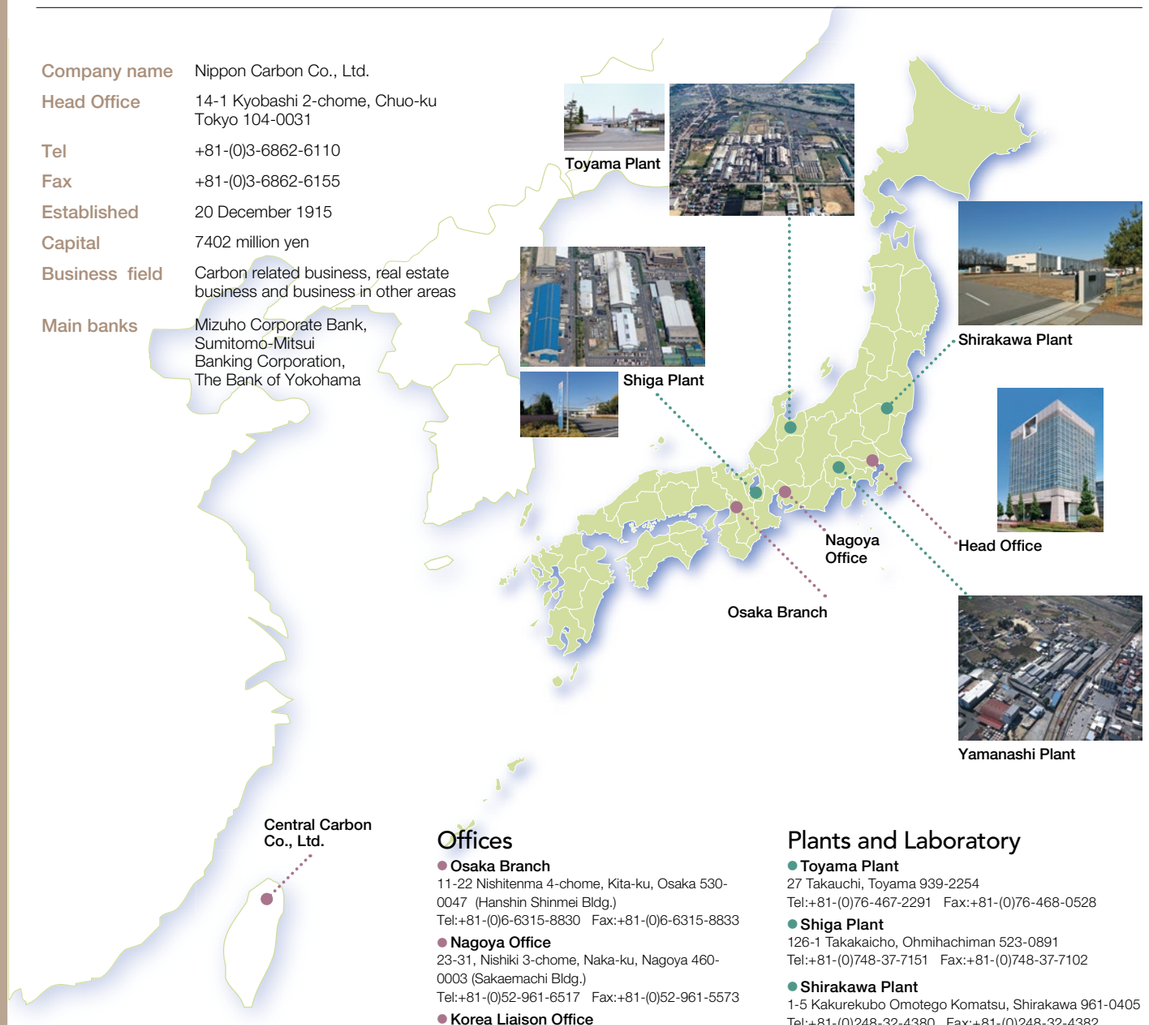
Established	20 December 1915
Capital	7402 million yen
Business field	Carbon related business, real estate business and business in other areas
Main banks	Mizuho Corporate Bank, Sumitomo-Mitsui Banking Corporation, The Bank of Yokohama



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