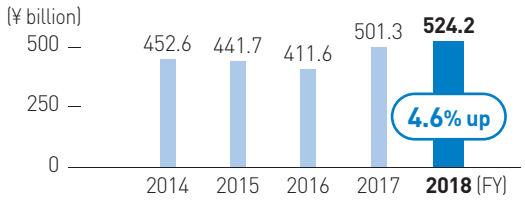
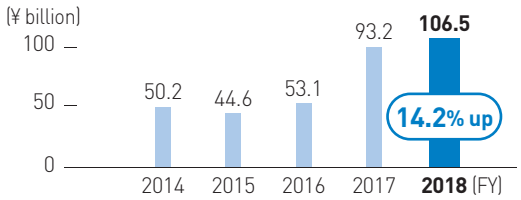
Business at a Glance

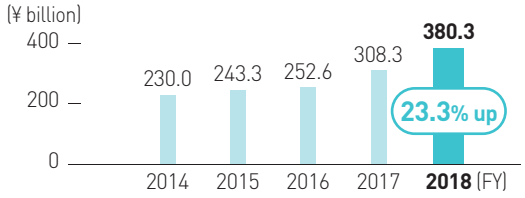
PVC/Chlor-Alkali Business

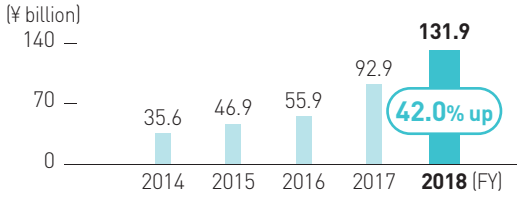




With regard to the PVC/Chlor-Alkali business, Shintech Inc. in the U.S. continued its shipments of both PVC and caustic soda at a high level, backed by the advantageous raw material procurement in the country, which resulted in its business performance growing. Further, the European bases enjoyed the increased sales volume thanks to the stable market. As for bases in Japan, shipments to overseas decreased due to the large-scale periodic maintenance that took place during the first quarter of the fiscal year.

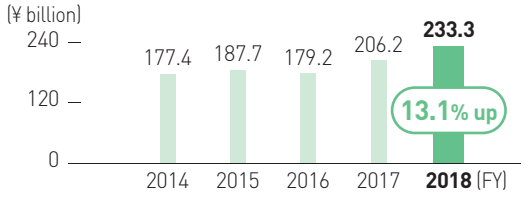
Semiconductor Silicon Business

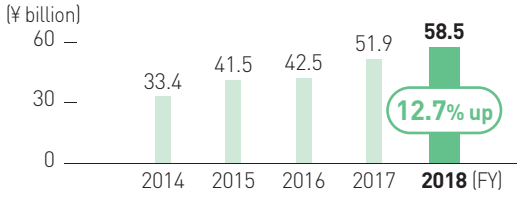




The semiconductor silicon business grew thanks to price corrections made for the products in addition to steady shipments.

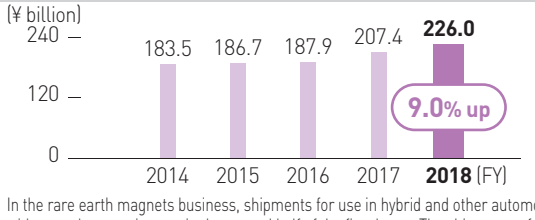
Silicones Business

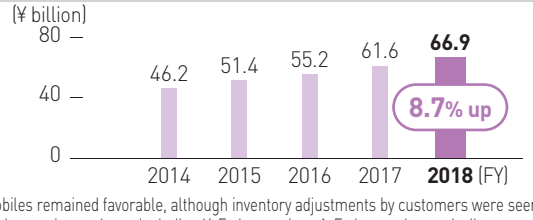




The silicones business grew as a result of having met the steady demand growth worldwide with full production and full sales, as well as revising its prices upward for both general-purpose products and functional products.

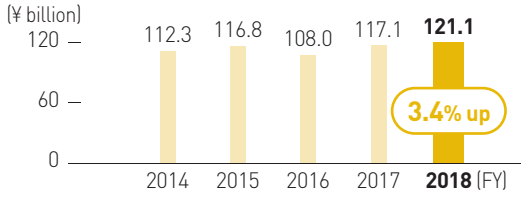
Electronics and Functional Materials Business

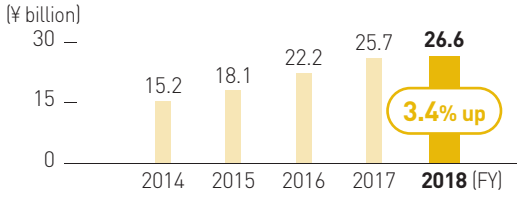




In the rare earth magnets business, shipments for use in hybrid and other automobiles remained favorable, although inventory adjustments by customers were seen with regard to certain uses in the second half of the fiscal year. The shipments of photoresist products, including KrF photoresists, ArF photoresists and trilayer materials, were all firm. Regarding photomask blanks, the sales of products in all range, in addition to ultra high-end products, increased and were favorable. In the optical fiber preform business, the demand for optical fiber was seen decelerating; however, sales by our joint-venture companies in China continued to be firm.

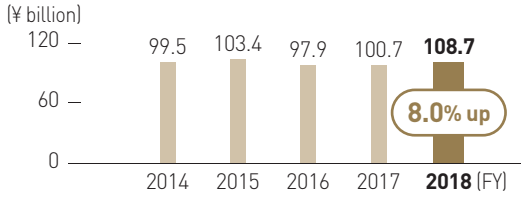
Specialty Chemicals Business

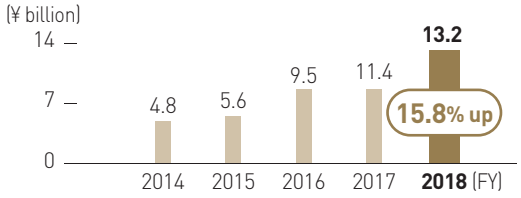




As for the cellulose derivatives business, the shipments of pharmaceutical products continued to be favorable, and the shipments of products for building, construction and coating applications also remained steady. The shipments of all other products, such as synthetic pheromone products and POVAL products, were also firm.

Processing, Trading & Specialized Services Business





Shin-Etsu Polymer Co., Ltd. continued its shipments of semiconductor wafer-related containers at a high level, which led to keep favorable business performance.

PVC/Chlor-Alkali Business

Business Overview

Polyvinyl chloride (PVC) resins are general-purpose resins used in a wide range of applications, from everyday products to all kinds of industrial materials. This is one of the Group's core businesses. The Group became one of the first Japanese chemical manufacturers to establish a polyvinyl chloride manufacturing base overseas. Shintech began operating in the U.S. in 1974 at a production capacity of 0.1 million tons per year. Since then, Shintech has undergone expansions and today is the largest PVC manufacturer in the world, with an annual production capacity of 2.95 million tons. Shintech is further increasing this capacity by establishing a new ethylene plant with the goal of achieving stable procurement of raw materials and constructing an integrated PVC complex that conducts processing starting from the raw materials stage. The Group is stably supplying products to customers throughout the world with a combined annual production capacity of 4.15 million tons in the U.S., Europe and Japan, the world's three largest markets.

Contributing to the Achievement of Sustainable Development Goals (SDGs) Through Product Supply

Approximately 60% of the raw materials used in PVC are salts that are practically an inexhaustible resource. Compared to other general-purpose resins, the merits of PVC include a low dependence on petroleum resources, placing a relatively small burden on the environment. The process of manufacturing PVC from raw materials uses only 60% of the energy required to make other general-purpose resins. Highly durable and easy to recycle, PVC is used for a wide range of social infrastructure materials, including vinyl windows, water and sewerage pipes, construction and civil engineering.

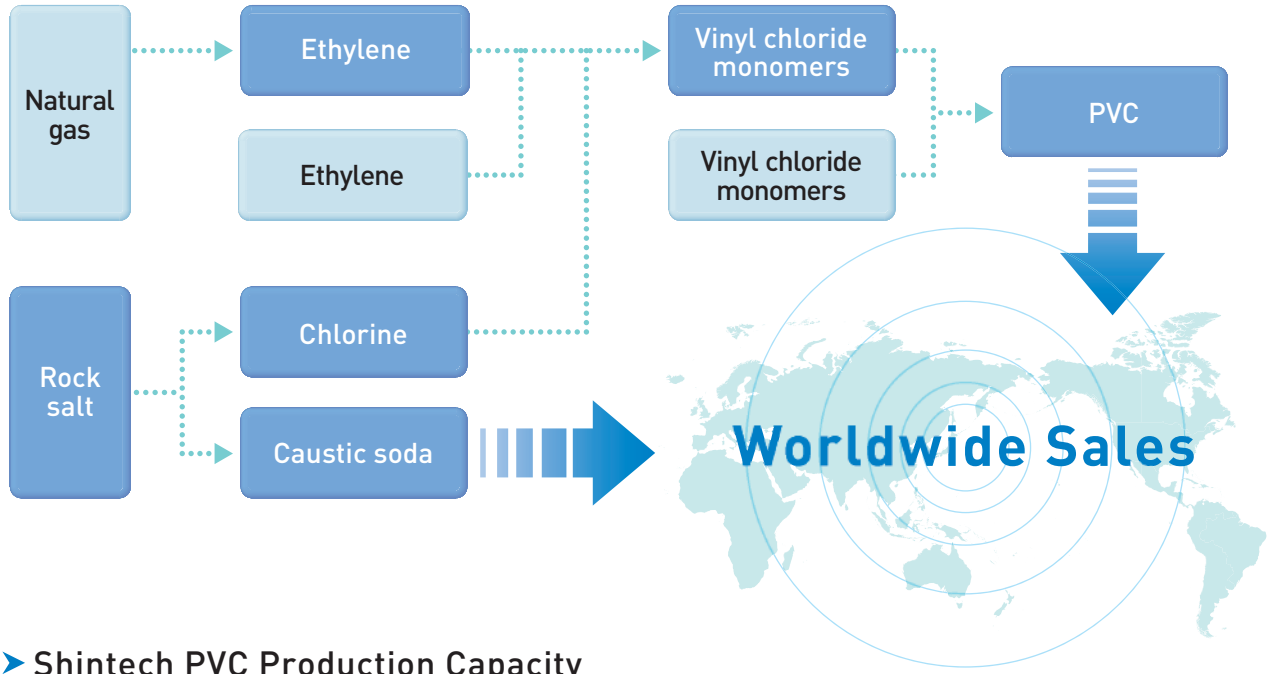
PVC/Chlor-Alkali Business

Shintech's Integrated Production Facilities

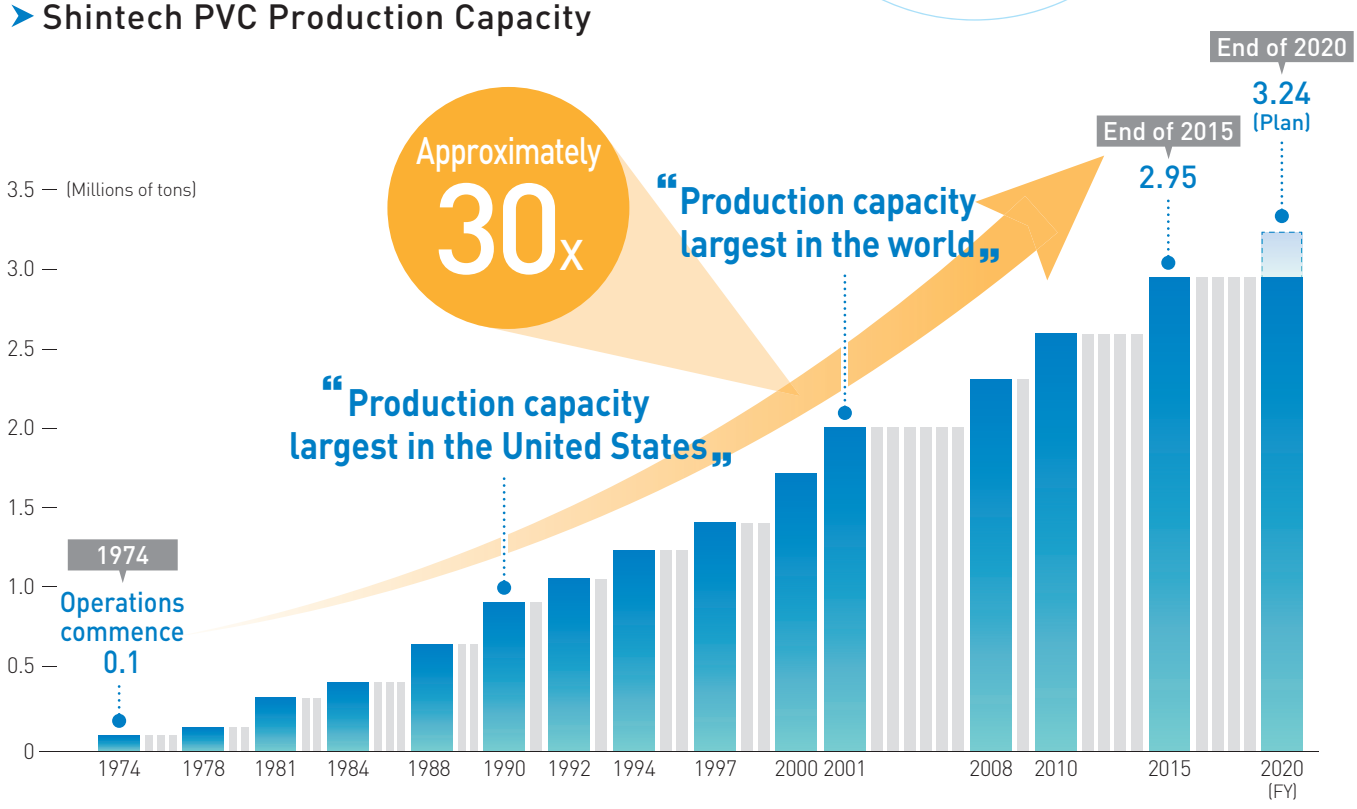
Integrated Production Begins with Raw Materials

In-House Production External Procurement

Focus As with vinyl chloride monomers, an in-house production system will be established for ethylene. (To be completed in 2019)



Shintech PVC Production Capacity



Application

PVC

PVC pipes

PVC water and sewerage pipes can be used for more than 50 years without requiring replacement, contributing to a long working life for this infrastructure.

Plastic greenhouses for agriculture

PVC is easy to recycle and thus helps save resources. In Japan, more than 50% of the plastic used for agricultural greenhouses is recycled.

Electric wire coating material

PVC, which is superior in insulation properties, durability and pliability, and is difficult to damage, is used as a sheathing material for electric wires.

Vinyl windows

This material is an excellent insulator that can reduce the amount of heat lost through windows by 71%, contributing to reductions in energy consumption as well.

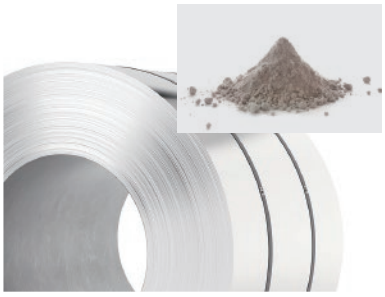
Siding materials

These decorative materials made from PVC are lightweight and easy to use for construction. They also provide excellent resistance to weather, shocks, rust and deterioration.

Caustic Soda

Alumina

Aluminum hydroxide, made by dissolving bauxite with caustic soda, is a raw material for alumina (aluminum oxide).



Paper and pulp

Caustic soda is used for digesting and bleaching wood chips in the dissolved pulp manufacturing process.

Soaps and detergents

Caustic soda reacts with fats and oils to become a raw material for soap or a raw material for synthetic detergents.

Super-absorbent polymers

These absorption agents are an essential element of paper diapers. Caustic soda is one of the raw materials used to manufacture these polymers.

Sodium Hypochlorite

Sodium hypochlorite

As a chemical for protecting the safety of foodstuffs and tap water, this substance contributes to a safe and comfortable lifestyle.

Semiconductor Silicon Business

Business Overview

As the world's leading manufacturer providing silicon wafers for integrated circuits, the Shin-Etsu Group continues be in the technological forefront with regard to cutting-edge large-diameter and super-flat wafers. We have succeeded ahead of others in the mass production of 300mm wafers and silicon-on-insulator (SOI) wafers that realize high speed and low power consumption, and we are stably supplying these superior products. In addition to our company's high-precision single-crystal technology and high-level processing technology, our high-quality epitaxial growth technology for cutting-edge image sensor devices and our systems for product quality control and evaluation analysis are highly valued by our customers around the world. We will continue to provide a stable supply of the silicon wafers that support the development and manufacture of semiconductor devices.

Contributing to the Achievement of Sustainable Development Goals (SDGs) Through Product Supply

As a basic material supporting our modern high-speed information society, silicon wafers contribute to society by reducing the size and weight of electronic equipment, reducing power consumption, improving automobile fuel efficiency, driving support systems and other safety controls and contributing to advancements in medical equipment. Furthermore, they are useful for the stable supply of electric power mainly to electronic equipment, as power semiconductors can minimize power consumption and accommodate high voltage and high currents. Group products are also used to accurately regulate motor drive controls from high to low speeds and as power-saving transistors enabling the efficient transfer of power from generators to transmission lines.

Semiconductor device installed in a final product

Silicon wafers

Electrical components for digital equipment and automotive parts

Used as a substrate material for semiconductor devices in electronic devices such as personal computers, smartphones and televisions, as well as automobiles.

Compound semiconductor products

LED components

Used in a wide range of applications including outdoor displays, traffic lights, in-vehicle stop lamps and sensor light sources.

Application

Communication/Computers


Smartphones


Tablet-type devices


Personal computers


Data center

Automobile


Hybrid cars


Electric vehicles


Car navigation systems


Electronic toll collection system

Consumer


Televisions


Game devices


Smart watches


Digital cameras


Drum-type washing machines


Energy-saving air conditioners


Rice cookers


Microwave ovens

Industry


Industrial robots

Other


Bullet trains

Bank ATMs


Vending machines

Silicones Business

Business Overview

The Group was the first to commercialize silicones in Japan in 1953. Since then, we have captured more than a 50% share in Japan through strong technological capabilities and detailed support for market needs. Silicone is a highly functional material that has both organic and inorganic characteristics and has many superior distinguishing features. The Shin-Etsu Group currently provides more than 5,000 silicone products to a wide range of sectors from electronics and electric to automobiles, construction, cosmetics, chemicals, health care and food.

Contributing to the Achievement of Sustainable Development Goals (SDGs) Through Product Supply

Using silicones has the effect of reducing greenhouse gas emissions. It is estimated that the effect is nine times as large as the emission volume of silicone production and waste disposal, according to a study commissioned by the Global Silicones Council in 2012. Among these, the use of silicones for automobile, construction and solar cell applications account for a large proportion of greenhouse gas emission reductions from the silicone product cycle. This constitutes a substantial contribution toward the realization of an environmentally friendly and sustainable society.

TOPICS

Silicone Rubber Materials that Have Been Certified with the European Railway Standard for Fire Safety

The Company's silicone rubber materials have been found compliant with EN 45545-2 which is said to be the strictest railway standard for fire safety in the world. Fire disasters on railway cars sometimes occur both inside and outside of Japan, and our silicone rubber materials are expected to contribute to carriage safety. In addition, these materials can be applied to automobiles, aircrafts, buildings, and various other commodities for which safety is in high demand.

ST-DGE series of heat-shrinkable silicone rubber tubing

■ Silicone rubber materials deemed to be compliant with EN 45545-2

Silicone rubber compound KE-1734-U, ST-DGE series of heat-shrinkable silicone rubber tubing

Silicone Representative Configurations

Major Characteristics of Silicone

- Heat resistance
- Cold resistance
- Electrical insulation properties
- Release properties
- Adhesion properties
- Defoaming properties
- Water repellency
- Weather resistance

Application

Cosmetics

Improving the usability and functionality of various cosmetics to meet the diverse needs of the marketplace.

Buildings

Widely used as waterproof sealing material around window glass.

Bullet trains

Used as an insulating oil material for the transformers of bullet trains and contribute to the safe operation of these trains.

Electronic devices

Thermal interface materials for electronic devices widely used in such areas as electronic products.

Contact lenses

Essential as a material for contact lenses because of its oxygen permeability characteristics.

Herbarium

Silicone oil is clear, colorless and unaffected by temperature changes. For this reason, it maintains the quality of herbarium specimens.

Nursery items

Durable and safe with no rubber-specific odor. Used in various products for babies such as the nipples of baby bottles and pacifiers.

Textile treatments

Add various advantageous properties such as softening, water repellency, etc.

Eco Tires

Silicone-enhanced tires can lower rolling resistance and help improve fuel efficiency.

Swimming gear

Our silicone is used in swimming gear such as caps, goggles and ear plugs because it provides a gentle fit for human skin.

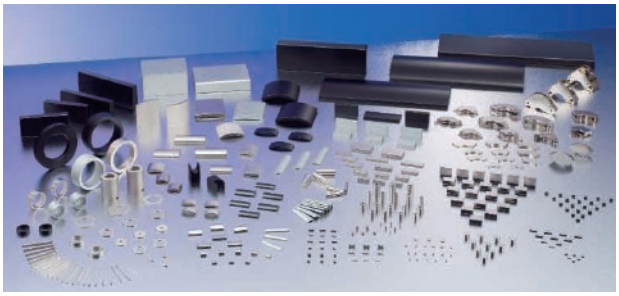
Electronics and Functional Materials Business

Business Overview

Our rare earth magnets are essential for reducing the size and weight of motors used in a variety of devices, including hybrid cars, electric vehicles, industrial equipment and home appliances. In addition, we supply photoresists, photomask blanks, encapsulation materials, pellicles and other products used in the semiconductor manufacturing process. Furthermore, we respond to the needs of advanced information societies by providing products such as preform for optical filters and high-grade synthetic quartz used in large-scale photomask substrates for LCD and other flat-panel displays.

Contributing to the Achievement of Sustainable Development Goals (SDGs) Through Product Supply

Rare earth magnets have about 10 times the magnetic force of conventional ferrite magnets. Even small rare earth magnets generate a powerful magnetic field. They are used in hybrid and electric cars to realize smaller size and weight as well as increased power regeneration. Rare earth magnets are also used in compressors for energy-saving air conditioners. They raise electric power efficiency in a variety of products and contribute to the reduction of greenhouse gas emissions.



Various types of rare earth magnets in shapes such as squares, rings and cylinders

TOPICS

Established First Overseas Base in the Photoresists Business

In November 2018, we established our first overseas photoresist production plant, Shin-Etsu Electronics Materials Taiwan Co., Ltd., in Yunlin County, Taiwan, in addition to the Naoetsu Plant in Niigata Prefecture, Japan. Our photoresists business was launched in the 1990s and we have increased our market presence while enhancing our R&D capabilities and manufacturing technologies in the 2000s. Afterward, taking advantage of our world-leading global share in silicon wafers, our photoresists business grew so much that we are now recognized as the leading group in the industry.

This new plant has been established in Taiwan, where major device makers have also set up their own bases. This location will enable the new plant to take responsibility for stable supply chains that will provide semiconductor device support, primarily in Asia.

Opening ceremony for Shin-Etsu Electronics Materials Taiwan Co., Ltd.'s new plant (February 2019)

Major Products and Application

Rare earth magnets

Rare earth magnets are used in such products as automobile motors and generators, compressor motors for air conditioners, industry robots and motors for the hard disk drives of digital home appliances, thus helping to contribute to saving energy. Shin-Etsu Chemical is engaged in the manufacture of these magnets from separation and refinement to processing of the rare earth raw materials. Furthermore, Shin-Etsu is reliably supplying high-quality rare earth magnets with highly advanced features by means of the development of its own grain boundary diffusion method, which reduces the amount of heavy rare earth used, while keeping the high performance level of the magnets.

Industrial robot

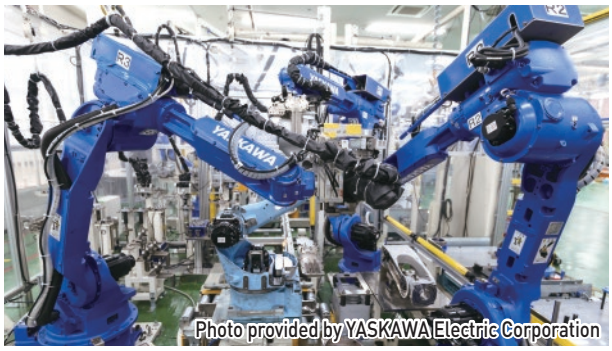
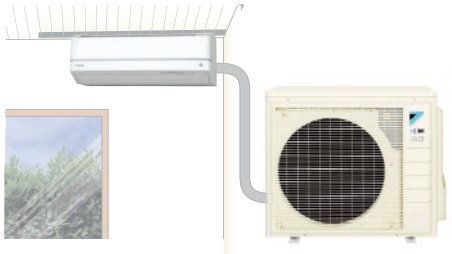


Photo provided by YASKAWA Electric Corporation

Energy-saving air conditioner

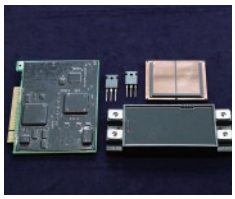


Hard disk drive

Plug-in hybrid car (Mercedes-Benz s560e)

This plug-in hybrid car achieves lower fuel consumption thanks to an external charging function. Its drive motor is equipped with rare earth magnets, which contribute to energy conservation and CO_2 reduction.

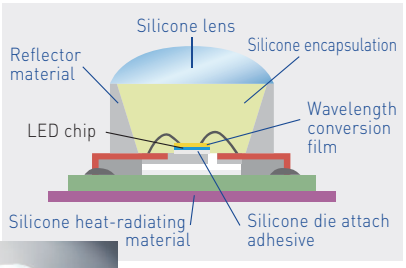
Epoxy molding compounds



Based on its high technologies that were cultivated through the development of various kinds of silicones, Shin-Etsu has developed encapsulating materials for applications in semiconductor devices. In recent years, epoxy molding compounds are being usefully applied not only in general-use semiconductors but also as a highly reliable encapsulating material in power modules for automobiles and various sensors.

Coating resin and die attach adhesive for LEDs

Shin-Etsu's various silicone encapsulation materials for LED lights feature such superior characteristics as being heat-resistant, high transparency and preventing a decline in brightness for a long period of time.



LED Structure (blue characters are products provided by Shin-Etsu)

Reflector for LEDs

Shin-Etsu's reflector material for LEDs greatly improves brightness, and such reflectors are superior in heat resistance and weatherability, thus contributing to the long operating life of LED lighting. With Shin-Etsu's high-level processing technologies, our reflector material for LEDs makes it possible to freely design packaging shapes.

Wavelength conversion film

Wavelength conversion films are adhesive film materials that mix silicones with a fluorescent substance. By attaching it to the LED chip surface, the blue color light that LEDs emit can easily change to various colored lights, including white light, and can make a uniform color. In addition, the films are superior in heat-resistant and light-stability properties and it is possible to use them for long-term usage applications.

Optical fiber coatings

Extremely fine optical fibers have a cross-sectional diameter of only 125 microns. Optical fiber coatings provide a protective coating for these fine optical fibers to protect the surface while providing greater strength.

High-purity silane for semiconductors

We provide high-purity silane that is used in such products as insulating film for semiconductors and epitaxial wafers. We meet the various needs of our global customers by providing a stable supply and a high level of product purity, which are supported by strict product quality and container control in addition to our own high-level refining technology.

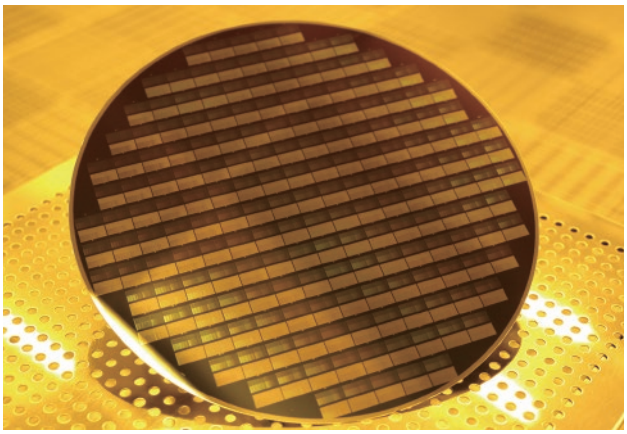
Electronics and Functional Materials Business

Main Products and Applications

Photoresists

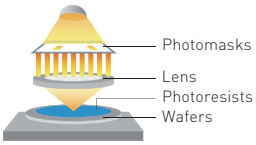
Shin-Etsu Chemical, by utilizing its strengths as a materials maker, carries out integrated manufacturing from raw materials' polymer synthesis to compounding. We make photoresists (KrF, ArF) for excimer lasers that are used as photosensitive material for etching on semiconductor circuits, and our thick film I-Line photoresists are used widely for thin-film magnetic heads and MEMS applications. Furthermore, for cutting-edge miniaturization processes we have lineups of multilayer material products. These are used as essential key materials in lithography processes for semiconductor manufacturing, and they help to enable the high integration, high speed and high functions of semiconductors. To steadily capture the growth of the photoresist market, we established a new plant in Taiwan, one of the main areas of demand.

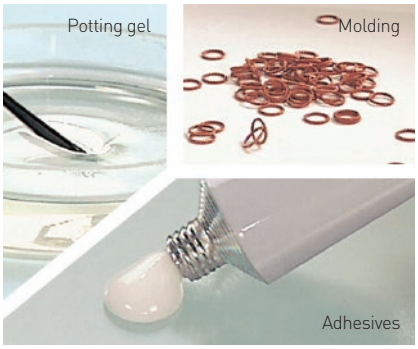
In combination with our existing Naoetsu Plant, we now have two production bases. As a result, we will be able to disperse business risk and strengthen our business foundation.



Photomask blanks

Photomask blanks are the base material of photomasks that are used as the patterning templates when IC patterns are printed on silicon wafers during the semiconductor lithography process. The light-shading layer is formed on the surface of synthetic quartz, which is the substrate of photomask blanks. Instead of the chromium (Cr) used for the conventional light-shading layer of photomask blanks, Shin-Etsu has developed new manufacturing processes that use cutting-edge molybdenum-silicon binary (OMOG: Opaque MoSi on Glass) for the light-shading layer. Shin-Etsu has established the mass-production technology of these advanced photomask blanks with its superior etching characteristics. Shin-Etsu's photomask blanks are highly evaluated by customers as an essential material for cutting-edge semiconductor manufacturing processes. In addition, Shin-Etsu supplies attenuated phase-shift photomask blanks for ArF and KrF, to meet customers' needs.



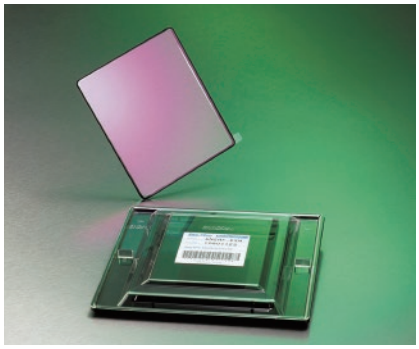


Liquid fluoroelastomers SHIN-ETSU SIFEL®

Shin-Etsu Chemical was the first company in the world to succeed in developing the liquid fluoroelastomers SHIN-ETSU SIFEL®, which by using silicone addition-reaction technology can be made into a form that hardens into a flexible, solid synthetic rubber upon heating. SHIN-ETSU SIFEL® possesses excellent process ability and such superior properties as resistance to oils, solvents and chemicals together with good durability against heat and stability at cold temperatures. SHIN-ETSU SIFEL® contributes to the improvement of products in a wide range of fields, including the automotive, aircraft, electronics, office equipment and petrochemical industries.

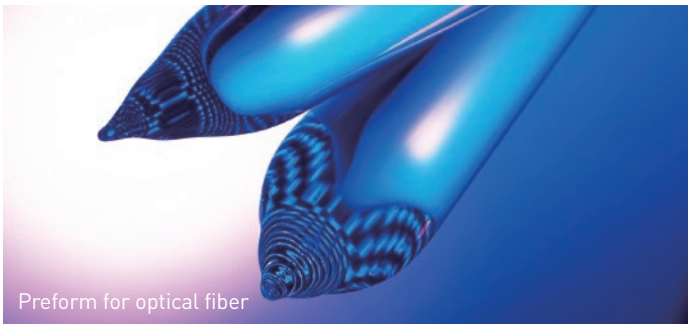
Fluorinated anti-smudge coating

Shin-Etsu's fluorinated anti-smudge coating is applied to the surface of eyeglasses and cover glasses/protective films for smartphones. A nano-scale fluorinated thin layer formed on the surface repels water and oil, and stains such as fingerprints can be wiped off easily. Due to its low dynamic friction, fluorinated coating contributes to improving the operability of smartphones. In addition, Shin-Etsu supplies a fluorinated anti-smudge additive that can obtain excellent surface properties by adding to hard coatings.

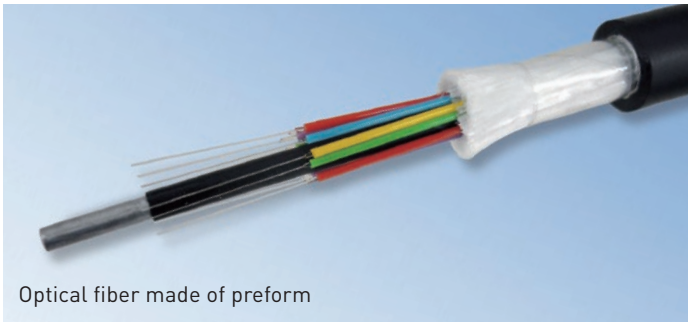


Pellicles

Shin-Etsu Chemical supplies high-quality pellicles for ArF and KrF excimer laser lithography. Shin-Etsu pellicles support customers' semiconductor device production with their excellent performance, such as high light resistance, good transmission uniformity and low outgassing. In addition, Shin-Etsu has succeeded in the development of super-large-size pellicles for the production of liquid crystal display (LCD) panels.



Preform for optical fiber



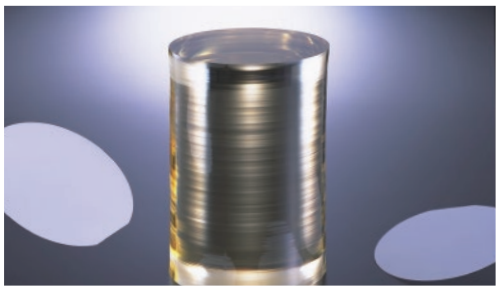
Optical fiber made of preform

Synthetic quartz photomask substrates for LSI and FPD lithography

Large photomask substrate for FPD

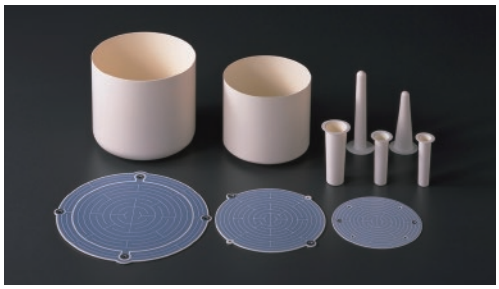
Synthetic quartz

Synthetic quartz, the key raw material of optical fiber, has the characteristic of superior light transmission. In an ordinary glass sheet, light attenuates in about 2 meters. However, in the case of synthetic quartz, light can reach a distance of about 100 km. The Shin-Etsu Group was the first in the world to mass-produce synthetic quartz that is higher in purity than natural quartz. So it is used as a preform for optical fiber, a photomask substrate for semiconductor lithography and a stepper lens for semiconductor lithography. In addition, it is used as a large-scale photomask substrate for flat-panel display (FPD) lithography. It is supporting the development of the advanced information society.



Oxide single crystals (Lithium Tantalite: LT)

Lithium tantalite (LT) is used in mobile communication devices as SAW devices that screen electromagnetic waves and pick up only specific frequencies. Oxide single crystals are currently contributing to the popularization of mobile phones and smartphones and serve an important role in the modern information society.



Pyrolytic boron nitride (PBN)

PBN is a high-purity ceramic with excellent chemical resistance and strength at high temperatures. Shin-Etsu Chemical was the first company to successfully produce PBN domestically. In addition to making use of PBN's excellent characteristics in crucibles for compound semiconductors and molecular-beam epitaxy, PBN's application fields are expanding to such areas as MOCVD systems and organic EL systems.

Anode material of lithium ion batteries

SiO is a greatly promising material as an anode material of next-generation lithium-ion batteries that have high capacity and excellent power properties. Shin-Etsu has succeeded in putting electrical conductivity on SiO particles via our own proprietary method. Shin-Etsu's anode material is highly evaluated by our customers.

Specialty Chemicals Business

Business Overview

Our main specialty chemical products are cellulose derivatives, environmentally friendly materials made from natural polymer cellulose. Cellulose derivatives have several versatile applications in a variety of fields, ranging from pharmaceuticals and foods to construction materials, engineering projects, coatings, ceramics, paper processing, cosmetics and toiletries. The Shin-Etsu Group began manufacturing cellulose derivatives in 1962. Currently, we have the largest share in Japan and meet global needs as the world's foremost manufacturer with bases in Japan, Europe and the United States. In addition, we provide synthetic pheromones used for agricultural pest control and functional resin POVAL. We also provide a variety of other products, including silicon metal, a main ingredient in silicones and synthetic quartz.

Contributing to the Achievement of SDGs Through Product Supply

Industrial cellulose derivatives reduce the separation of concrete in water, enabling concrete to be poured without polluting water. This contributes to environmental preservation by preventing water pollution. Synthetic pheromones are very safe, environmentally friendly and eliminate agricultural pests. They are useful for making food safer through the reduction of insecticides and agricultural chemicals sprayed in fields.

Cellulose derivatives

Major Products and Application

Cellulose derivatives

Provide a variety of functions such as controlling the location in the body where drugs dissolve and slowing the rate at which they dissolve.

Used as a binding agent for the molding process to manufacture exhaust gas purifiers for automobiles, technology that contributes to the prevention of global warming.

Synthetic pheromones

Synthetic pheromones prevent male pests from finding their partners. Obstructing their mating process in this fashion reduces the volume of agricultural pests.

Aroma chemicals

Leaf alcohol is widely used in a variety of products, including aroma products, cosmetics and foodstuffs.

Silicon metal

Silicon metal is a key raw material of silicone, semiconductor silicon, synthetic quartz and solar cells. Simcoa Operations, our group company, manufactures silicon metal in Australia.

Polyvinyl alcohol (POVAL)

JAPAN VAM & POVAL CO., LTD., manufactures and sells this material. Due to its properties as a water-soluble synthetic resin, it is used in a wide range of applications such as adhesives, various types of films, fiber treatment agents, paper processing agents, and additives for cosmetics and pharmaceuticals.

SOLBIN

This is a denatured resin supplied by Nissin Chemical Industry Co., Ltd., with excellent adhesion and solubility. Used in products such as paints inks and adhesives.

Processing, Trading & Specialized Services Business

Business Overview

Shin-Etsu Polymer Co., Ltd., develops and supplies highly operable and functional products making use of materials processing technologies.

Shin-Etsu Engineering Co., Ltd., which is involved in the design and construction of the Group's product manufacturing plants, has a strong reputation for engineering with customers outside the Group.

Contributing to the Achievement of Sustainable Development Goals (SDGs) Through Product Supply

The construction material (corrugated rigid polycarbonate sheets) manufactured by Shin-Etsu Polymer Co., Ltd. is used as an exterior roofing material.

Using more than 50% reclaimed raw materials, this product contributes to recycling.

Major Products and Application

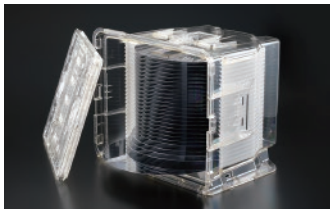
Shin-Etsu Polymer Co., Ltd.

Input devices

Providing input devices such as automobile dashboard audio and air conditioners.

Wafer cases

Providing containers used for transportation from silicon wafer makers to device makers and silicon wafer transport containers within the device manufacturing process.



Shupua

Glasses made of silicone rubber.

Various rollers for OA equipment

Providing semi-conductive developing rollers and fuser rollers making use of proprietary processing technologies including conductivity, foaming and compositing using silicone rubber.

Silicone catheters

Making use of the silicone processing technology we have developed, we provide catheters that offer important advances in their application.

Shin-Etsu Engineering Co., Ltd.

Engineering

The engineering business of Shin-Etsu Engineering Co., Ltd., is involved in the design, construction and maintenance of various Shin-Etsu Group product manufacturing plants.

Vacuum superposition equipment

Shin-Etsu Engineering Co., Ltd., carries out the design and manufacturing of the alignment machines for LED panels that support large-scale liquid crystal panel production.

Semiconductor Manufacturing Process and Products of the Shin-Etsu Group

From raw materials to completed semiconductor devices

Raw materials

Polysilicon is produced from silicon metal (Si), made by removing the oxygen from quartzite, as the base material.

Single crystal silicon

Single crystal silicon is produced in a cylindrical format by melting polysilicon.

Cutting and polishing

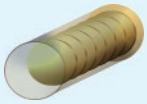
Single crystal silicon is cut into thin slices and polished to a mirror finish.

Silicon wafers

The processes above are used to create silicon wafers.

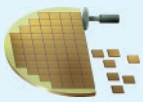
Wafers are shipped to device manufacturers.

Wafer cases are also used for transporting materials within the device manufacturers' production line.

Oxidation

Wafers are put into a high-temperature furnace to produce a thin oxidation film on their surface.

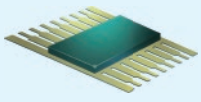
Pattern formation

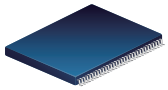
Special sensitive materials (photoresists) are applied, circuit patterns are baked in and developed, and the surface is processed.

Dicing

Individual wafers are cut away and made into integrated circuit chips.

Assembly

Using wire, the chips are connected electrically to a circuit board.

Resin sealing

The chip is coated in resin to protect it from heat and shocks.

Semiconductor devices

The completed semiconductor device is now embedded in the final product.

Final product


Products supplied by the Shin-Etsu Group

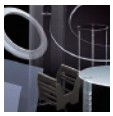

Silicon metal


Quartz glass crucibles

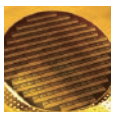

Silicon carbide fine-ground powder

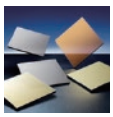

Silicon wafers

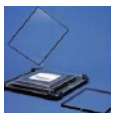

Wafer cases


Quartz glass for use in the semiconductor manufacturing process


Synthetic quartz photomask substrates


Photoresist


Photomask blanks


Pellicles (dust protection covers for photomask substrates)


Encapsulating materials


Heat releasing silicone rubber products

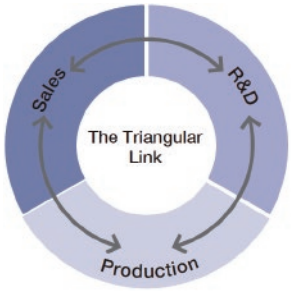
R&D and Quality Management Initiatives

R&D

Without new challenges, a company cannot grow. Shin-Etsu Chemical values the power of R&D as an important asset, carving a path into the future. Based on questions such as "What is future society looking for?" we conduct research and development to fulfill the demands of the times; tackle seed research that explores brand-new materials and systems; and actively perform research aimed at further raising productivity and the quality of our products.

The Triangular Link: Sales, R&D and Production

Shin-Etsu Chemical's R&D is managed in a way that closely suits our customers' needs. What makes this possible is Shin-Etsu's R&D system, which integrates Sales, R&D and Production.



Market demands generated by our business activities are relayed to our development divisions to establish research themes. The development divisions follow these themes as they progress with development, while at the same time on the basis of close ties with the manufacturing divisions, they conduct practical R&D aimed at utilizing our plants and facilities for mass production. To do this efficiently, Shin-Etsu Chemical has established R&D centers at each plant.

Creating New Value with Original Material Development

When conducting R&D, we narrow down themes of focus based on our own unique guiding principles. The first of these principles states that themes of focus must respond to needs of the next generation. The second requires that they must possess an originality that has not been produced by anyone else. The third and final stipulates that these themes must contribute to the resolution of future issues. Thanks to the application of these principles, several of our carefully selected development themes have resulted in first-ever materials that have resolved problematic issues in a variety of industrial fields with their unique characteristics and features while giving rise to rapid innovation. This is why we will continue to take on the challenge of developing new materials as long as the need for them exists.

Quality Management

As a materials manufacturer, we believe that stably supplying the quality products that we have promised our customers is our most important obligation.

We deliver many products with a wide variety of uses, including as raw materials for industrial products and as materials for state-of-the-art goods. To respond to the unique demands related to each of these products, we have adopted the latest analytical devices and evaluation equipment and are developing our own original quality control technology. At the same time, we are revising our manufacturing processes and employing a statistical methodology to reduce fluctuation in quality. Moving forward, we will continue to swiftly respond to a diverse range of needs while aiming to regularly and stably supply quality products to our customers as an ideal partner.

Persistently Striving to Eliminate Quality Issues

We regularly conduct quality audits with the goals of eliminating quality issues and improving the quality of products and customer services. These audits also enable us to improve our quality control activities and mechanisms. In addition, they provide us with the opportunity to evaluate our quality improvement efforts from a customer point of view and from the standpoint of quality cost. Through these measures, we are working to pin down and study the true causes of quality issues and work out recurrence prevention measures. Furthermore, we are applying our Six Sigma activities* companywide in pursuit of an even higher level of quality.

* Six Sigma activities: A quality improvement method developed by Motorola (of the US) in the 1980s. These activities involve focusing on processes that produce uneven quality and inhibiting the occurrence of material defects by reducing these fluctuations in quality. We are applying these activities throughout the Group.

Further Improving Quality by Combining Automation and IT

"Quality" represents an agreement with our customers, and we must reliably abide by this agreement based on a spirit of compliance. We believe raising quality is the wellspring of cost competitiveness. Our process and product analyses and our analyses concerning the root causes of process defects and quality trouble are based on test data, and we are aware of the importance of regularly conducting measurements using the same terms and requirements. The Company believes that mechanisms that do not involve people, from sampling to chemical and instrumental analyses, are ideal in this regard and is actively implementing automation initiatives. In the future, we will continue to aim for higher quality from a variety of angles, including adopting AI and taking advantage of the latest IT through measures such as the utilization of big data.