

# Review of Operations

## ORGANIC AND INORGANIC CHEMICALS



PVC sheeting is now widely used in greenhouses as an alternative to glass.



The superior adhesiveness, durability and deep hardening qualities of silicone-based, elastic joint sealing material make it effective for aquariums and other large-size water tanks.

### Net Sales of Main Products

(Billions of yen)

	2006	2005	2004
Polyvinyl chloride (PVC)	345.3	296.5	254.9
Silicones	176.5	155.9	135.8
Cellulose derivatives and others	114.7	96.6	66.3
Total	636.5	549.0	457.0

### Polyvinyl Chloride (PVC)

PVC is a general-purpose resin that has many advantageous properties. It is easy to process and economical as well. Moreover, from the standpoint of its contribution to the quality of the environment, while other plastics depend 100% on petroleum, the manufacturing of PVC involves far less dependency on petroleum resources, with 60% of its material being salt and only 40% petroleum. With the progress of recycling, PVC makes a major contribution to the environment from the standpoint of life cycle assessment as well.

The superior qualities of PVC have received a high evaluation, backed by continuing growth in global demand of 3% to 4% annually. Demand for PVC is growing for applications in pipes and sidings in the U.S. and for pipes and window profiles in Europe and Asia. In particular, demand is growing strongly in China, mainly for construction materials and consumer goods. In addition, use of PVC window profiles has started to spread in Japan over the past few years because PVC's insulating effect prevents condensation in winter and contributes to the reduction of global warming while cutting air conditioning and heating costs.

PVC is an indispensable material that supports our daily lives in contemporary society. Strong future growth in demand is expected in various regions around the world. In anticipation of this trend, the Shin-Etsu Group, the world's largest manufacturer of PVC, is implementing major expansion plans at Shintech Inc. in the U.S. and Shin-Etsu PVC B.V. in the Netherlands, two core companies of its PVC business. When the expansion is completed, the combined production capacity of Shin-Etsu Group companies in Japan, the U.S. and Europe is expected to be about 4 million tons annually. In the future, the Group will utilize its world-leading production capacity and sales capabilities that were nurtured in global markets in order to continue to assure its world number-one position.

### Silicones

Shin-Etsu has been selling silicones for over half a century since it became the first company in Japan to commercially produce silicones in 1953. During these years, the Shin-Etsu Group has aggressively incorporated customer needs so that today it provides more than 4,000 different silicone products for applications in such fields as the electric, electronics, automotive, construction, cosmetics, toiletries and chemical industries.

Silicones combine organic and inorganic properties and can take forms including fluid, resin or rubber. Their numerous unique properties include electrical insulation and heat, cold and weather resistance. In each field, we are contributing in such ways as helping to improve product functions and to make production processes more efficient.

Among the wide range of application fields for silicones, one that has been steadily growing in recent years is in the automotive field, where high functionality is increasingly required. Silicones are becoming an essential material in various applications such as electronics equipment, interior finishes, airbags and inside engine casings. Furthermore, in the case of electrical and electronics devices, silicones serve application needs for an efficient heat transfer medium, and in cosmetics applications, silicones have attracted a great deal of attention for their ability to help make these products feel good on the skin and make them easier to apply. Silicones are a material with unlimited potential. In the future, we will continue to develop new products and new applications and endeavor to further create and expand global demand.

The Shin-Etsu Group is aggressively going forward on a global basis with the expansion of production and sales of silicones in the regions where demand is growing. In addition to its production bases in Japan, the U.S., the Netherlands, Korea, Taiwan and China, the Shin-Etsu Group has been working to expand the business by concentrating on stable operations at its integrated silicone monomer and polymer manufacturing facilities in Thailand since they began full-scale production.

### Cellulose Derivatives

Cellulose derivatives are an environment-friendly material made from a natural polymer. Shin-Etsu has developed a wide array of cellulose derivative products that are used in diverse fields.

Their broad range of applications includes construction, civil engineering, agriculture, additives for fine ceramics, paper processing and toiletries. Demand is particularly strong for applications of cellulose derivatives as pharmaceutical coatings and binders for tablets and granules and for industrial use as molding binders for ceramics that purify automobile exhaust emissions.

When Shin-Etsu acquired the cellulose business of Clariant AG at the end of December 2003, establishing SE Tylose GmbH & Co. KG in Germany, the Shin-Etsu Group became the world's largest manufacturer of methylcellulose. Demand is projected to increase

steadily in the future. Therefore, the Shin-Etsu Group expanded production capacity at the Naoetsu Plant in Japan and will complete expansion at SE Tylose's facilities in fall 2006. In the future, the Shin-Etsu Group will use the advantages of this bipolar production system to strengthen its methylcellulose business.

### Organic and Inorganic Chemicals and Other Related Products

Insects secrete pheromones as part of their reproductive cycle. Synthetic pheromones were developed for the purpose of suppressing the birth of the next generation of harmful insects using a technique known as "mating disruption." In Europe and North America, they are now used in apple and peach orchards and other crops. In Japan, they are mainly used in fruit orchards as well as for vegetables such as cabbage, and in tea orchards. Mating disruption is now being focused on as an innovative method that will replace the use of insecticides. The Shin-Etsu Group has the world's number-one market share of synthetic pheromones. In addition, the Group supplies a large number of acetylene derivative products such as synthetic aroma chemicals, which are widely used in perfumes and food flavorings.

The Shin-Etsu Group also manufactures silicon metal, an essential raw material in such products as silicones, semiconductor

silicon, and synthetic quartz, which are among the Group's core businesses. Simcoa Operations Pty. Ltd., a wholly owned subsidiary in Western Australia, has long-term mining rights to high-quality silica, and produces 30,000 tons of silicon metal annually from this raw material. Simcoa contributes to securing a stable, long-term supply of quality silicon metal raw material.

#### Topics

#### Conductive Silicone Rubber for Electronic Keypads (Rubber Contact)



As the pioneering developer of conductive silicone rubber and keypads, Shin-Etsu Polymer Co., Ltd. uses its strengths in advanced design capability and processing technologies to develop products with enhanced operability and functionality.

Shin-Etsu Polymer's keypads hold the top share in the global market, and are used in a variety of input devices in products including mobile phones, digital cameras, automobiles, personal computers and medical equipment. In response to continued growth in sales of keypads for use in mobile phones and automobile electronic components, Shin-Etsu Polymer established a production base in Hungary in 2004, and currently produces keypads in six countries.

## ELECTRONICS MATERIALS



Silicon wafers boast a degree of evenness to within 100 nanometers.



Epoxy molding compounds, which are silicone variations, are necessary materials for high-intensity LEDs.

### Net Sales of Main Products

(Billions of yen)

	2006	2005	2004
Semiconductor silicon	305.7	256.6	214.1
Others	55.7	50.3	48.1
Total	361.4	306.9	262.2

### Semiconductor Silicon

The Shin-Etsu Group, as a world leader in the silicon wafer business, constantly works to achieve the world's highest quality products and highest level of customer satisfaction. The Group has been developing the world's most advanced technologies to produce larger-diameter, super-smooth silicon wafers with the lowest defect rate. Demand for semiconductor devices has been expanding for a wide range of applications, including personal computers, mobile telephones, digital home appliances and automobiles. Amid significant growth in the silicon wafer market

in recent years, the Shin-Etsu Group has been providing a stable supply to users from its silicon wafer production bases in Japan, Malaysia, the U.S., the U.K. and Taiwan.

The Shin-Etsu Group is the world's leading silicon wafer supplier with a world market share of approximately 32 percent, and is the undisputed leader in the steadily expanding 300mm wafer segment. In the future, the Group will increase production capacity in Japan and the United States to respond to growing demand for 300mm wafers, and is structuring a stable supply system based on multiple production bases.

Shin-Etsu had been commissioning Mimasu Semiconductor Industry Co., Ltd. in Japan to process its semiconductor silicon wafers. In fiscal 2006, Shin-Etsu obtained a large percentage of shares in this company by underwriting a full third-party allocation of newly issued shares and additionally acquiring shares through a tender offer bid. By strengthening its capital relationship with Mimasu, which has high-level processing technology, the Shin-Etsu Group is working to strengthen this wafer production base, which will become even more important in the future.

The Group is also focusing on expansion of sales of such newer products as SOI wafers and annealed wafers, used for applications in highly functional devices. For existing wafer products of up to 200mm, the Group will pursue greater competitiveness through rationalization of production, product quality improvement efforts and product differentiation, as it works to strengthen its systems for meeting any and all requests of customers.

## Rare Earth Magnets for the Electronics Industry

Rare earth magnets are high-performance, permanent magnets that have about 10 times the magnetic force of ferrite magnets. They have been contributing to the development of more compact and lightweight electric and magnetic components for products that have more highly specialized functions and are more energy efficient. The Shin-Etsu Group has the largest global market share for rare earth magnets for voice coil motors (VCM) for hard disk drives (HDD) used in computers and consumer electronics, for which demand is strong. To meet this demand, the Group is working to successively expand production capacity. The Shin-Etsu Group is the only manufacturer in the world to carry out integrated production of high-quality rare earth magnets starting from high-purity rare earth. Starting by developing materials with the characteristics that customers demand, the Shin-Etsu Group then uses its ability to move quickly from prototype to commercial production and provide a stable supply of products, with product development to meet application requirements and thorough product quality control to respond to customer needs.

## Epoxy Molding Compounds

Demand in the semiconductor device market for thinner and smaller devices is driving the development of chip-size packages and the system-in-package trend in which multiple large-scale integrated (LSI) chips are stacked and installed in a single package. Amid these trends, the Shin-Etsu Group is working aggressively to meet diversified needs for semiconductor packaging.

Employing cutting-edge technology accumulated through the development of various silicone products, the Shin-Etsu Group supplies a line-up of unique products that are differentiated from those of other companies. These include Green EMC products, which incorporate a flame-retardant system that responds to recent environmental concerns, and moldable silicone products for high-power LEDs, for which applications have rapidly grown in recent years.

## Photoresists and Pellicles

Shin-Etsu Group is developing a system to supply the principal materials needed in the lithography process for manufacturing semiconductor devices. We have commercially produced and marketed photoresists compatible with KrF (krypton fluoride) excimer lasers as a photo-sensitive material used in imprinting semiconductor circuits, next-generation ArF (argon fluoride) resists, and I-line resists for thin-film magnetic heads and for wafer-level chip-size packaging (WLCSP). The Group has also succeeded in developing pellicles, which are the protective dust covers used for photomasks in excimer laser lithography.

As it capitalizes on its leading market share in the global silicon wafer market, and makes use of its close ties with the semiconductor industry, the Group's efforts to prepare for the next generation of semiconductor devices include collaboration with users to develop ArF excimer lasers for photoresists.

### Topics

## Shin-Etsu Underwrites Third-Party Allocation of Shares in Mimasu Semiconductor Industry Co., Ltd. and Obtains Shares in Public Offering



Shin-Etsu has long outsourced wafer processing of silicon wafers to Mimasu Semiconductor Industry Co., Ltd. In order to further strengthen this alliance, in August 2005 Shin-Etsu underwrote the third-party allotment of shares of Mimasu Semiconductor, thereby making

it an affiliate. In addition, Shin-Etsu acquired shares of Mimasu Semiconductor by way of a tender offer from December 2005 to February 2006 and now has a 41.3 percent stake in Mimasu Semiconductor (as of March 31, 2006).

As an important company in the Shin-Etsu Group's semiconductor silicon business, Mimasu Semiconductor will continue to work intensively with Shin-Etsu on projects including joint development of cutting-edge wafer processing technologies.

# FUNCTIONAL MATERIALS AND OTHERS



Shin-Etsu's rare earth magnets are used in motors for hybrid cars, reducing energy consumption and environmental impact.



Synthetic quartz photomask substrates act as a negative for production of LCD panels. Shin-Etsu is responding rapidly to larger-sized LCD panels.

## Synthetic Quartz Products

The Shin-Etsu Group, with its know-how in silicon chemistry, is the first in the world to mass produce super-high-purity

## Net Sales of Main Products

(Billions of yen)

	2006	2005	2004
Synthetic quartz products	34.5	26.5	25.7
Rare earths and rare earth magnets, etc.	30.6	28.2	26.5
Others	64.9	56.9	61.4
<b>Total</b>	<b>130.0</b>	<b>111.6</b>	<b>113.6</b>

synthetic quartz, which is higher in purity than natural quartz. With silicon metal refined to a high degree of purification as a raw material, the Group established a manufacturing technology

for super-high-purity synthetic quartz that holds impurities to the level of 1 ppb (one part per billion).

Synthetic quartz products such as preforms for optical fiber, photomask substrates for LSI and large-size photomask substrates for LCDs have become essential materials for the development of the high-level information society. Optical fiber is key to the further advance of broadband, and demand is projected to continue growing constantly. The Shin-Etsu Group is striving to further improve product quality and expand supply capabilities for preforms for optical fiber to prepare for future business growth. In addition, the Group has the top global market share for large-size photomask substrates, and orders from LCD panel manufacturers remain robust. We will endeavor to accurately anticipate and be ready to cope with the expansion in future demand.

### Rare Earths and Rare Earth Magnets for General Industrial Use

The Shin-Etsu Group possesses its own original proprietary high-level separation and refining technologies and physical property control technologies. We use them for the separation and refining of various kinds of rare earths with a high purity of 99.9999%. The Group's rare earths are widely applied in such products as plasma display panels, LCD TVs and fluorescent lights, luminescence for medical equipment, oxygen sensors in automobile engines, catalytic converters and capacitors. In addition, applications in various other fields are expected to expand.

By maximizing strong magnetic force, the Group's rare earth magnets for general industrial use help to enable the introduction of products that are lighter in weight, smaller in size, and higher in output for such equipment as motors. Shin-Etsu offers a group of rare earth magnet products that have the world's highest magnetic force level. Our extensive product line-up consists of both samarium-cobalt magnets and neodymium magnets, both of which are gaining a high level of trust from users. The range of applications is vast. Rare earth magnets are used in such product areas as household appliances including energy-efficient air conditioners and washing machines, and various motors for automobiles. In addition, rare earth magnets have begun to be used in such energy-saving and environmentally friendly applications as motors for fuel-cell cars, motors for hybrid cars, which are rapidly spreading throughout the market, and motors for wind-power generators.

### Liquid Fluoroelastomer SHIN-ETSU SIFEL®

SHIN-ETSU SIFEL® is a revolutionary liquid fluoroelastomer that Shin-Etsu was the first in the world to develop. Its form before hardening is either a liquid or a paste, and after heat curing, it becomes a flexible synthetic rubber material. SHIN-ETSU SIFEL® is superior in resistance to cold, keeping its elasticity even at minus 50°C. In addition, it has such desirable characteristics as resistance to oils, solvents, chemicals, heat and excellent electrical insulation properties. Accordingly, it is used as rubber

molding, adhesive sealant material and filler in a wide range of application fields including the automotive, aircraft, electric, electronics, office equipment and petrochemical industries. It is contributing to the improvement of product reliability in many application areas.

### Flexible Copper-Clad Laminates

Shin-Etsu's flexible copper-clad laminates are used as materials for thin, lightweight flexible printed circuit (FPC) boards because of their superior flexibility. FPC boards are used in such electronic products as mobile phones, digital cameras, video cameras and DVD recorders and players, and are contributing to making these products lighter and more compact.

In addition to its existing three-layer flexible copper-clad laminates, Shin-Etsu started marketing two-layer flexible copper-clad laminates (FCLs) it developed using its proprietary technology. Moreover, Shin-Etsu has responded to rising concerns about the environment by developing and launching a halogen-free cover layer with excellent properties.

### Other Products

Shin-Etsu Engineering Co., Ltd., a Shin-Etsu Group company, celebrated its 30th anniversary in 2006. It consists of the Plant Division, which mainly handles the integrated design and construction of various types of plants, and the Electro-Mechanics Division, which handles the development designing and manufacturing of mechatronics equipment for electronics-related industries that manufacture such products as semiconductors and LCDs. Both divisions also receive a large number of orders from companies outside of the Shin-Etsu Group. In particular, with the rapid spread in popularity of flat-panel TVs, the demand for LCDs and plasma display panels (PDPs) has grown, and sales of Shin-Etsu Engineering's panel alignment machine are increasing. The key to demand expansion for flat-panel TVs is increasing panel size, and Shin-Etsu's timely supply of panel alignment machines meets this need.

#### Topics

### New High-Performance Technology for Neodymium Rare Earth Magnets



In 2005, Shin-Etsu developed a binary alloy method enhanced by grain boundary diffusion, a new high-performance technology for neodymium rare earth magnets, and began sample shipments. With this production method, Shin-Etsu has realized the world's highest

heat-resistance characteristics for neodymium rare earth magnets. The new technology helps to achieve both high heat-resistance and high performance, which were difficult to obtain simultaneously with conventional production methods. The technology is expected to find applications in areas where growth is expected, such as automobile motors, which require high heat resistance, and motors for air conditioners and other home appliances.