

Segment Profile

Products

Polyvinyl chloride, silicones, vinyl acetate monomer, polyvinyl alcohol, methanol, caustic soda, chloromethanes, cellulose derivatives, synthetic pheromones, lime nitrogen, fused phosphates, alloys, silicon metal, plastic products and others

Major Contributors

Manufacturing and sales:

Shin-Etsu Chemical Co., Ltd.

Shintech, Inc.

Simcoa Operations Pty. Ltd.

Shin-Etsu Polymer Co., Ltd.

Nissin Chemical Industry Co., Ltd.

Manufacturing:

Shin-Etsu Vinyl Acetate Co., Ltd.

Kashima Vinyl Chloride Monomer Co., Ltd.

and 49 other companies

Note: The above list includes non-consolidated subsidiaries and affiliated companies.



Pipes are one of the largest applications of PVC.

Steady Growth in Core PVC and Silicones Sectors

The Chemicals Business Segment encompasses a broad range of products. Polyvinyl chloride (PVC) and silicones account for a large share of segment sales. In fiscal 1998, segment sales advanced 9.7 percent to ¥340,051

million. While PVC sales were higher, growth was limited by softening demand in Japan in the second half of the year. PVC demand rose steadily in the United States during the year, posting an increase of 5.6 percent. Expansion of demand in this region, the world's largest PVC market, is expected to continue. Silicones sales also increased. Performance was strong in Japan and overseas during the year's first half. In the following months, domestic demand slumped and the Asian currency crisis, among other factors, exerted downward pressure on prices.

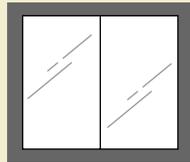
Organic and Inorganic Chemicals

Polyvinyl Chloride(PVC)

0.4 kg

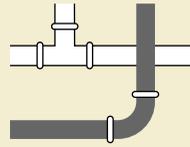
Just what is PVC?

Salt provides the ingredients for about 60 percent of PVC, a widely used type of plastic. The remainder comes from petroleum. That means only 0.4 kilograms of petroleum is needed for each kilogram of PVC consumed. Compared with the many other synthetic resins made entirely from petroleum, PVC conserves petroleum and energy. As such, it is firmly positioned as an indispensable element of our everyday lives.



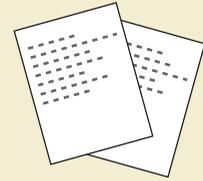
PVC is kind to trees.

The world needs less wood and oil thanks to PVC. Building materials are the single largest application of PVC: interior and siding products, windows and floors. Without PVC, many of these items would need to use wood instead. An excellent insulator, PVC profile and other materials cut energy consumption for heating and cooling.



A material for the ages.

Compared with most other plastics, PVC has an extremely long life. PVC excels with regard to durability, the ability to withstand the elements, and resistance to fire. This makes PVC an economical choice for water and sewer pipes, greenhouses, electric wire sheathing and many other punishing applications.



The Vinyl Environmental Council is born.

In January 1998, Shin-Etsu and 16 other Japanese manufacturers of PVC and vinylchloride monomer formed the Vinyl Environmental Council. Shin-Etsu President Chihiro Kanagawa was named chairman. The following May, this council merged with the Japan PVC Association to form the Vinyl Environmental Council, also led by Mr. Kanagawa. The new council is carrying on the original mission of promoting an accurate understanding of PVC among the public, as well as supporting research in PVC recycling and other subjects related to the PVC business.



Silicone sales have risen steadily as new uses are found for this versatile material.

silicone industry. Worldwide, Shin-Etsu has captured a large share of the Asian market and ranks third among silicone producers. Essential to adding desirable characteristics and functions to products, silicones have many applications. Many types of shampoo and rinse incorporate silicones. In fact, silicones play a central role in all kinds of toiletries and cosmetics.

A highly versatile substance, silicones can take the form of a fluid, resin or rubber. In any form, silicones offer excellent resistance to weather, heat and cold, as well as desirable electrical and interfacial properties. Cosmetics, automobiles, construction, data and communications are just a few of the countless industries where these qualities are needed. This breadth means that silicone demand is not susceptible to cycles in any one client industry. Shin-Etsu takes full advantage of this diversity by catering to specific customer requirements. This is evidenced by the more than 4,000 products currently incorporating Shin-Etsu silicones.

Expanding the World's No. 1 PVC Market Share

Shin-Etsu manufactures PVC in the United States, Japan and Portugal. The U.S. facility, Shintech, Inc., located in Texas, is the world's largest single PVC plant with an annual output of 1.27 million tons. With demand on the increase, construction of a second PVC plant in the United States is now in the planning stage. In May 1997, approval was granted by the State of Louisiana, where the new facility is to be located. However, the U.S. Environmental Protection Agency subsequently asked the state government to reexamine the proposal. The U.S. PVC market is roughly three times larger than Japan's. Higher output in the United States will bolster the company's ranking as the world's largest PVC supplier.

PVC is a general-purpose material used to fabricate a wide variety of products. Unlike other general-purpose materials, PVC quality differs considerably depending on the production processes and polymerization technology of individual manufacturers. Shin-Etsu's number-one position in this market testifies to the company's ability to maintain this level of consistently high quality, as well as providing a reliable supply capability. The rapid response of sales and research professionals working together ensures that customer expectations are fully met.

More Applications Spur Demand for Silicones

Shin-Etsu began selling silicones in 1953. Sales have climbed ever since, keeping Shin-Etsu at the top of Japan's



The world's largest single PVC facility is the Freeport, Texas plant of Shintech, Inc.

Silicones



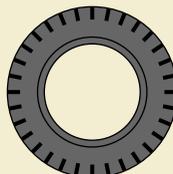
What's inside silicones?

Silicones are made by creating a repetitive molecular structure made up of siloxane (Si-O-Si) with organic radicals. This compound can be produced in many forms: fluid, resin and rubber.

4000

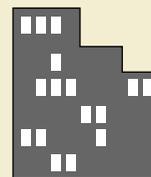
Thousands of applications

Shin-Etsu's silicones are used to produce more than 4,000 different products. Powerful siloxane bonds make silicones resistant to heat and the elements. Silicones also possess good electrical properties. Its molecular structure enables this material to be formulated to be water repellent, resist low temperatures, and have antifoaming properties. This makes silicones suitable for use under a variety of conditions.



Where silicone never tires

In tires, a special grade of silicone boosts performance. Durability rises. And better tire resilience greatly improves braking performance while cutting fuel consumption.



Going to the top

Look around. The buildings and other structures you see may incorporate Shin-Etsu's new *Sealant Master 300*, which has exactly the right adhesive properties needed for sealing materials. Market response has been strong. *Polymer Ace*, made by Shin-Etsu Polymer Co., Ltd., is a revolutionary tape-like sealing material. No follow-up smoothing or finishing is needed, and stains can be removed with ease.

Future advances in products of all types spell even more potential for Shin-Etsu's silicones business. In fact, global sales continue to rise at a near double-digit pace. To meet this demand, Shin-Etsu in 1998 embarked on a plan that will raise output capacity in Japan.

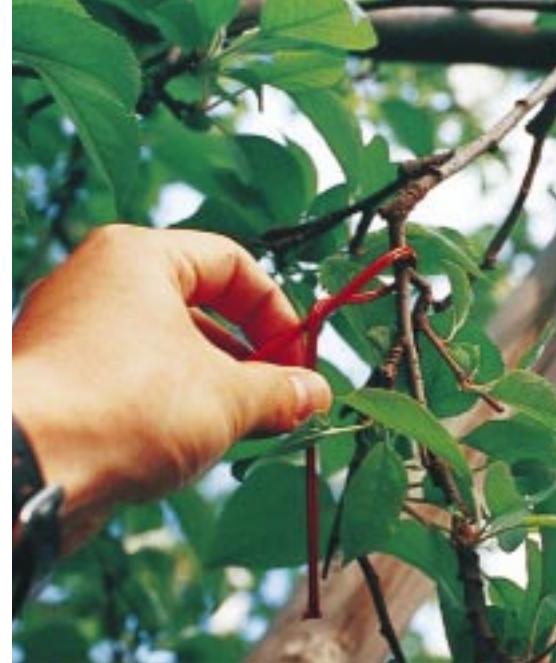
Rubber Contacts Link Shin-Etsu to Growing Markets

The Shin-Etsu Polymer Group manufactures silicone rubber contacts. As electronics find their way into more products, rubber contacts are needed in everything from automobiles and home appliances to cellular phones and computers. With market conditions vibrant, Shin-Etsu Polymer (Malaysia)

Sdn. Bhd. completed expansion work on its plant in November 1997 that raised output capacity. The increased capacity is in response to demand from home appliance and communications equipment makers that have relocated to Asia to produce high-end products. The same month, Shin-Etsu Polymer Mexico, S.A. de C.V. commenced rubber contact operations at a new plant in Reynosa, Mexico. The plant took over the manufacturing facilities of Shin-Etsu Polymer America Inc., which now concentrates on rubber contact sales. Shin-Etsu can now better serve the growing number of rubber contact clients in Mexico following the NAFTA agreement, which affords special tax



Silicone rubber contacts are used in a vast array of products. Shin-Etsu Polymer's overseas plants are increasing production of these materials.



Use of synthetic pheromones is expanding, since they are not harmful to the environment, unlike conventional insecticides.

concessions, as well as customers throughout North America.

Other Chemicals

Collectively, other chemical products continue to post stable sales and earnings. Shin-Etsu has more than 30 years of experience making methylcellulose derivatives, versatile compounds used in high-performance building materials, improvement materials for unsteady ground, automotive exhaust cleansers, pharmaceutical tablets and granules, and soaps, among others. Synthetic pheromones are a key building block of insecticides that prevent harmful insects from reproducing. This substance is attracting much attention as an environmentally compatible replacement for conventional insecticides. Backed by other promising applications as well, Shin-Etsu has captured a sizeable share of the world market. Synthetic pheromones are likely to keep recording double-digit sales gains.

Segment Profile

Products

Semiconductor silicon; organic materials for the electronics industry; rare earth magnets for the electronics industry

Major Contributors

Manufacturing and sales:

Shin-Etsu Chemical Co., Ltd.
Shin-Etsu Handotai Co., Ltd.
Shin-Etsu Handotai America, Inc.

Processing and sales:

S.E.H. Malaysia Sdn. Bhd.
Shin-Etsu Handotai Europe, Ltd.

Processing:

Naoetsu Electronics Co., Ltd.

and 24 other companies

Note: The above list includes non-consolidated subsidiaries and affiliated companies.

Through the Shin-Etsu Handotai Group, Shin-Etsu is the world's largest manufacturer of semiconductor silicon. Recently, shipments of prototype 300mm wafers were initiated.



Continuing to Grow as a Comprehensive Maker of Semiconductor Materials

The Electronics Materials Business Segment is involved in the production and sale of semiconductor silicon, organic materials and rare earth magnets for the electronics industry.

In fiscal 1998, the segment posted sales

of ¥247,708 million, a jump of 10.3 percent over the previous year. Through the Shin-Etsu Handotai (SEH) Group, Shin-Etsu is the world's largest manufacturer of semiconductor silicon. Epoxy molding compounds, which protect and encapsulate semiconductor devices, are another area of strength. With an array of related products as well, the company is unrivaled in the world as a comprehensive supplier of materials used to fabricate semiconductor devices. Expansion is continuing in the global semiconductor market. Output of 16M DRAM memory chips roughly doubled in 1997. Furthermore, the rise in output of 64M DRAM devices is expected to accelerate. Rare earth magnets, currently used mainly in hard disk drives, are in increasing demand for a wide range of applications including motors in home appliances.

Electronics Materials



A Shin-Etsu technician manufactures epitaxial wafers by growing a microscopic layer of silicon on the surface of a silicon wafer.

prototypes of next-generation 300mm wafers to makers of semiconductor production equipment.

A Bright Future for Blue LEDs

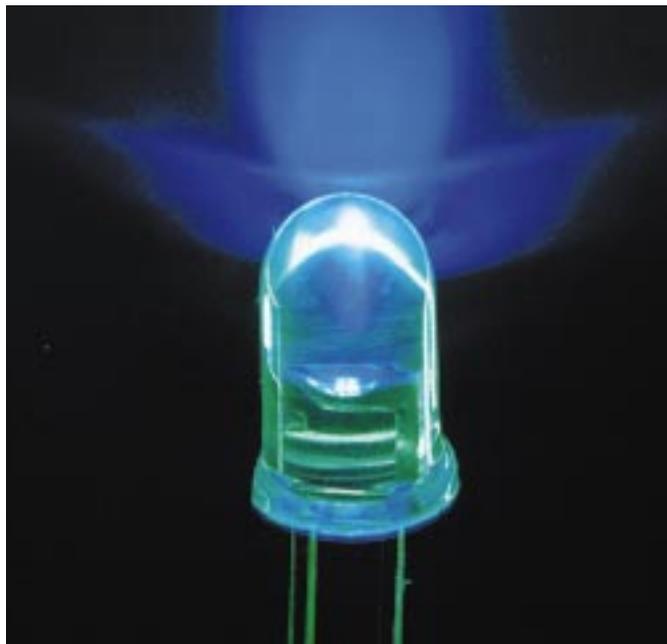
The SEH Group has an agreement with U.S.-based Cree Research, Inc., one of the world's leading SiC wafer companies, to gain access to that company's chip production and epitaxial wafer technology for blue LEDs. Construction has commenced in Japan on state-of-the-art production facilities. The SEH Group is already a major manufacturer of red and green LEDs. With the addition of blue light to the picture, the company is now capable of supplying LEDs for all three primary colors.

High-Quality 200mm Wafers Leading the Way

The focal point of the wafer market is shifting from 150mm to 200mm technology. Currently, almost all SEH plants are producing these larger wafers. Along with larger diameters, chip makers are asking for wafers that are completely free of imperfections down to the atomic level. This uncompromising quality is becoming essential as circuit density rises just as the size of semiconductor devices fall. Epitaxial wafers are one answer. These wafers are made by growing a microscopic layer of silicon on the surface of a silicon wafer. The productivity of wafer manufacture is greatly enhanced. At present, roughly 20 percent of the SEH Group's 200mm wafers are epitaxial. Plans call for members of the SEH

Group in Japan, the U.S. and Europe to raise production capacity of epitaxial wafers fivefold in the near future.

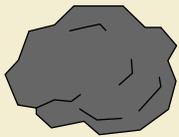
Furthermore, SEH has started shipping



A blue LED. Already a major maker of green and red LEDs, the Shin-Etsu Handotai Group will soon commence production of their blue counterpart, permitting supply of all three primary colors.

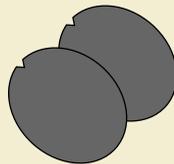
Semiconductor Silicon

400%



Silica— You may have some on your finger right now

Oxygen is the most abundant component of the earth's crust, accounting for 47 percent of all elements. Silicon is second at 27 percent. Most of this silicon exists in the form of silica, a mineral consisting of silicon and oxygen. Quartz and opals are two examples. Semiconductor silicon and other types of silicon are produced from high-purity silica.



Epitaxial wafers? Why bother?

Epitaxial wafers are made by growing an epitaxial layer of single crystals of silicon on the surface of a silicon wafer. Through this process, any microscopic imperfections present on the surface are covered over. While these wafers have started to be used in microprocessors, most are shipped to producers of 64M DRAMs.

On the horizon:

The 300mm wafer

Why make wafers larger? Simple. Doubling the diameter, for example, means that four times as many chips can be squeezed onto the surface. Production efficiency rises dramatically. Naturally, semiconductor makers are investing more in facilities to cash in on these benefits.



Silicon-on-insulator (SOI) wafers

SOI wafers are made by oxidizing the surface of a silicon wafer. An extremely thin film of pure silicon is then added. Outstanding electrical insulation is the main benefit. As such, they are ideal for products such as portable phones where power consumption must be minimized. High-speed microprocessors are another SOI application with immense potential.



Three rare earth magnets on a bed of rare earth powder. Such products have a wide array of applications in the electronics field.

in CRTs, especially computer monitors. When applied to the inside of a CRT's screen, rare earths enhance color-emitting properties. Other important applications for rare earths are as an additive for sintering fine ceramics and an additive to enhance the performance of multilayer ceramic chip capacitors. By utilizing sophisticated separation and refining techniques, Shin-Etsu is producing a variety of value-added rare earth products that offer consistently high quality. This focus on high-end grades sets Shin-Etsu apart from other rare earth suppliers, such as those in China, that sell primarily general-use grades.

A Major Breakthrough—Spherical Rare Earth Oxide Particles

Shin-Etsu has succeeded in mass producing spherical rare earth oxide particles. In March 1998, keying off this success, the company started full-scale marketing of these materials. Shin-Etsu discovered a way to produce spherical particles in the laboratory some time

Segment Profile

Products

Functional Materials:

Synthetic quartz products (photomask substrates, etc. and optical fiber preform); oxide single crystals; rare earth and rare earth magnets for non-electronics industries

Others:

Export of technology and plants, export and import of goods; construction and plant engineering, and information processing

Major Contributors

Manufacturing and Sales:

Shin-Etsu Chemical Co., Ltd.

Shin-Etsu Quartz Products Co., Ltd.

Engineering:

Shin-Etsu Engineering Co., Ltd.

Sales:

Shin-Etsu Astech Co., Ltd.

and 38 other companies

Note: The above list includes non-consolidated subsidiaries and affiliated companies.

In fiscal 1998, sales for the Functional Materials and Other Businesses segments combined rose 17.5 percent to ¥105,516 million.

Functional Materials

Demand and Applications Expand for Synthetic Quartz

Synthetic quartz continues to perform well. Fiber-optic preforms, photomask substrates, and lens materials for steppers all enjoyed robust demand. Rare earths also played their part in boosting sales, chiefly because of higher orders for use in cathode-ray tubes (CRT) and fluorescent lamps.

A Broad Range of Rare Earth Oxides

Shin-Etsu's high-quality rare earth oxides rank with the best in the world. Applications for these compounds include red, blue and green phosphors in fluorescent lamps and red phosphors

Functional Materials and Others

ago. However, the feat could not be replicated on the production floor. The need to find ways to facilitate the further downsizing of electronic components while boosting performance changed all that. Electronics makers sought ways to create uniform applications for rare earth oxides with microscopic precision. This was impossible with conventional powders; mechanical pulverization yields particle diameters of several microns. Shin-Etsu's spherical particles were the answer. The technology was first applied to yttrium oxide and other single rare earth oxides. At present, Shin-Etsu is also able to supply yttrium-europium compound oxide and other compound rare earth oxides in spherical form.



Shin-Etsu Engineering designs chemical plants and production equipment for the processes used to make electronic components.

Other Businesses

Activities in the Other Businesses Segment center on exports of plants and technologies, and construction-related business as well as engineering. All these businesses are capitalizing on proprietary technology in the company's core fields of chemicals and electronics. In the construction-related business, Shin-Etsu has many achievements in chemical plants. The company is designing and constructing cutting-edge process lines for electronics-related production facilities. Shin-Etsu's accomplishments in offering proprietary knowledge in both hardware and software are not limited to within the Shin-Etsu Group. In countries throughout Europe, in the U.S. and across Asia, the company has made a name for



Shin-Etsu Engineering takes pride in its high market share in LCD alignment systems in Japan and overseas.

itself. Polyvinyl chloride plants, silicon production plants, semiconductor and magnetic materials-related facilities are but a few of the diverse areas where the company is front and center. In the engineering business, optical technology, precision equipment and computers have been fused to enable the development and production of mechatronics products.

The outlook for growth is excellent in the fields of semiconductors, electronic components and electronic materials, where manufacturers are seeking ways to raise quality while holding down production costs. Shin-Etsu Engineering addresses these needs by integrating various technologies to produce automated inspection and production equipment that meet sub-micron tolerances. This company takes pride in its high market share in LCD alignment systems in Japan and overseas. In this way, Shin-Etsu is contributing to progress in a number of other industries.