Overview by Business Segment

Organic and Inorganic Chemicals

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 51 other companies

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

PVC and silicones are the largest components of this segment. Other important contributors to sales are cellulose derivatives, vinyl acetate monomer, polyvinyl alcohol, synthetic pheromones, chloromethanes, caustic soda and silicon metal. In fiscal 1999, segment sales decreased 3.3 percent to ¥328,925 million. In PVC, Shin-Etsu is the world's largest

Electronics Materials

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 25 other companies

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

Sales in this segment fell 13.4 percent to ¥214,605 million. The primary components of sales are semiconductor silicon, organic materials for the electronics industry (mainly epoxy molding compounds), rare earth magnets and photoresists. The 1998 global downturn in the semiconductor industry dealt a blow to semiconductor silicon results. In a

Functional Materials and Others

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.

Functional materials represents synthetic quartz, oxide single crystals, rare earth oxides and rare earth magnets for non-electronics industries. Sales in others are derived from construction, plant engineering and other services to support the operation of industrial facilities. In fiscal 1999, segment sales declined 5.9 percent to ¥99,266 million. Synthetic quartz optical fiber preform sales rose as gains in sales volumes outpaced a fall in prices. However, demand for synthetic quartz photomasks and stepper lenses fell in line with conditions in the semiconductor industry. Rare earth sales rose for use in magnets and in other applications like cathode-ray tubes, fluorescent lamps and ceramic materials. In a major technological

producer. Its wholly-owned subsidiary, Shintech Inc., plans to construct a second PVC plant in the United States. In silicones, where demand has been solid, production capacity was increased in the United States and Europe. Shin-Etsu is thus retaining its positions as the world's third-largest silicone producer. In other developments, a new production facility for cellulose derivatives was completed in the spring of 1998. Located at Shin-Etsu's Naoetsu plant, it has an annual capacity of 14,000 tons. The additional output will mainly target pharmaceuticals, a field where Shin-Etsu accounts for more than 60 percent of the global market. Building materials is another targeted field.

Cellulose derivatives for pharmaceuticals

move to gain more momentum in this still attractive market, Shin-Etsu acquired the silicon crystal operations of Hitachi, Ltd. on April 1, 1999. In organic materials, sales were lower as shrinking demand for semiconductor memories cut into EMC orders. Despite these difficulties, a newly introduced liquid EMC posted strong growth. In rare earth magnets, Shin-Etsu preserved its leading share in the critical HDD market, achieving a healthy gain in sales despite slowing growth in global shipments of HDDs. Sales of photoresists for excimer lasers advanced, supported by growing use among major clients in Japan and abroad as semiconductor device manufacturers continued to shift to finer design rules.

Photoresist

breakthrough, Shin-Etsu in March 1998 started producing sub-micron spherical rare earth oxide particles; the first applications were ceramic capacitors and fluorescent lamps. In oxide single crystals, there was a sharp increase in demand for lithium tantalate, chiefly for cellular phone SAW filters.

Shin-Etsu Engineering Co., Ltd. draws on extensive experience in mechatronics to develop and sell a variety of sophisticated production equipment. Currently, this company is placing particular emphasis on machinery needed to make flat panel displays such as liquid-crystal displays (LCDs) and plasma display panels (PDPs). The company is a leading supplier of auto alignment systems, having sold them to almost all of the world's leading manufacturers of LCDs, especially the high-precision, thin-film transistor (TFT) models and PDPs. The SE-LCAS-3 automatically positions LCD glass substrates at high speed with sub-micron accuracy. Recently, this equipment has been adapted to make glass substrates for large-size mother glass as well, thus making it possible to fabricate several large glass substrates at once. Furthermore, Shin-Etsu Engineering allows users to create an ideal cell gap formation system by pairing the remodeled SE-LCAS-7C seal processor with the SE-LCAS-3. This integrated system, extending from alignment through seal processing, is generating much interest from manufacturers of flat panel displays.

Lithium tantalate

Research & Development

Research activities at Shin-Etsu drive progress in the development of materials and innovative processes. Chemical synthesis, polymerization, single crystal growth, chemical vapor deposition and powder metallurgy are just a few of the fields targeted.

SIFEL®—A Material With the Advantages of Fluoropolymer and Silicone

After seven years of research, Shin-Etsu succeeded in developing a new class of fluoroelastomer. Named SIFEL, the revolutionary material exhibits the properties of both perfluoroether and silicone compounds, thus offering improved characteristics under low temperatures and better resistance to a wide range of fuels, solvents and chemicals compared with other high-performance fluoroelastomers. One obvious use is as a molding material. Available as a liquid or a paste, SIFEL is

Offering the advantages of both perfluoroether and silicone, SIFEL has properties that are ideal for a broad range of products.

The Environment

Formulation of Environmental Charter

To promote better understanding among the public of its environmental activities, Shin-Etsu in August 1998 formulated an Environmental Charter. There are two elements. One is an environmental philosophy: "Based on the recognition that preserving the environment is a vital issue facing all mankind, Shin-Etsu is committed to reflecting environmental considerations in all aspects of its operations and to fostering a society that can support sustainable development." The second element is five guidelines to translate these principles into action. They cover areas such as forming an effective environmental management organization, making continuous improvements in environmental protection and pollution prevention, strictly complying with laws and regulations, and conducting life cycle assessments for products and technologies.

Having obtained ISO 14001 certification at domestic plants and other locations, Shin-Etsu plans to earn certification for all its facilities.

Concrete goals have been established as well. Regarding greenhouse gases, Shin-Etsu is working toward fulfilling the COP3 goal of reducing emissions by 6 percent during the period from 1990 to 2010. Increasing cogeneration, reducing waste volumes through recycling, and managing hazardous chemicals are other objectives. Additionally, Shin-Etsu has a program to acquire ISO 14001 certification for all its facilities.

PVC and Environmental Issues

In Japan, Shin-Etsu and 16 other manufacturers of PVC and vinyl chloride monomer compose the Vinyl Environmental Council (VEC), which disseminates environmental information about PVC. Shin-Etsu plays a leading role in the VEC. The council is led by Chihiro Kanagawa, Shin-Etsu's president, and its staff includes a number of Shin-Etsu executives. The council maintains ties with The Vinyl Institute in the United States and the European Council of Vinyl Manufacturers.

also well suited for adhesives/coatings, potting gels for electronic components and a variety of other products. Hopes are high for sales to members of the automotive, aerospace, electronics, semiconductor, chemical and many other industries.

A Magnetic Circuit for Insertion Devices

Synchrotron radiation is an extremely intense and tightly focused light source used in physics research and the analysis of materials. For a number of years, Shin-Etsu has been producing a magnetic circuit for the insertion devices, which apply an alternating magnetic field to electrons as they pass by. This circuit draws on Shin-Etsu's knowledge of rare earth magnets as well as skill in magnetic field analysis, magnetic circuit assembly and magnetic field adjustments. The Shin-Etsu circuit's excellent performance and reliability is leading to steady growth in interest in this technology.

Variable polarizing undulators, in which rare earth magnets are a critical component, are used as the light source for synchrotron radiation.

VEC programs stress the importance of PVC and educate the public of the fact that dioxins from incinerators can be eliminated through high-temperature combustion regardless of the presence of discarded PVC. Through these programs, the VEC is addressing common misconceptions about PVC among the public and fostering a more accurate understanding of this widely used material. In 1999, VEC started a high-profile recycling campaign. One element is joint research with NKK Corporation, Japan's second largest steelmaker, in the use of discarded PVC as a reductant in shaft furnaces, recycling hydrochloric acid.

The Vinyl Environmental Council and NKK Corporation, a large Japanese steelmaker, are studying PVC recycling techniques. Shown here is a hydrochloric acid recycling system.

Research in Global Environmental Engineering

Since 1997, Shin-Etsu has been sponsoring a chair at the University of Tokyo's Global Environmental Engineering Laboratory. One ongoing project is the formulation of software to simulate future environmental changes to find ways to reduce CO_2 gas emissions. The technology reflects a variety of social and economic variables. Population, food production, climatic changes, disease prevention and other items all have a bearing on CO_2. This software can evaluate the intricate effects of all these factors at once. Studying ways to utilize fuel cells and solar cells are other projects at the laboratory.

In 1999, Hiroshi Takahashi was newly appointed to the Shin-Etsu sponsored chair. Upon assuming this post, Prof. Takahashi stated his intention of marshalling the laboratory's resources to take on environmental challenges by studying a broad range of technologies. Experienced in aeronautics, nuclear fuel, fiber optics and other disciplines, Prof. Takahashi has a strong grounding in fields needed to pursue this goal.