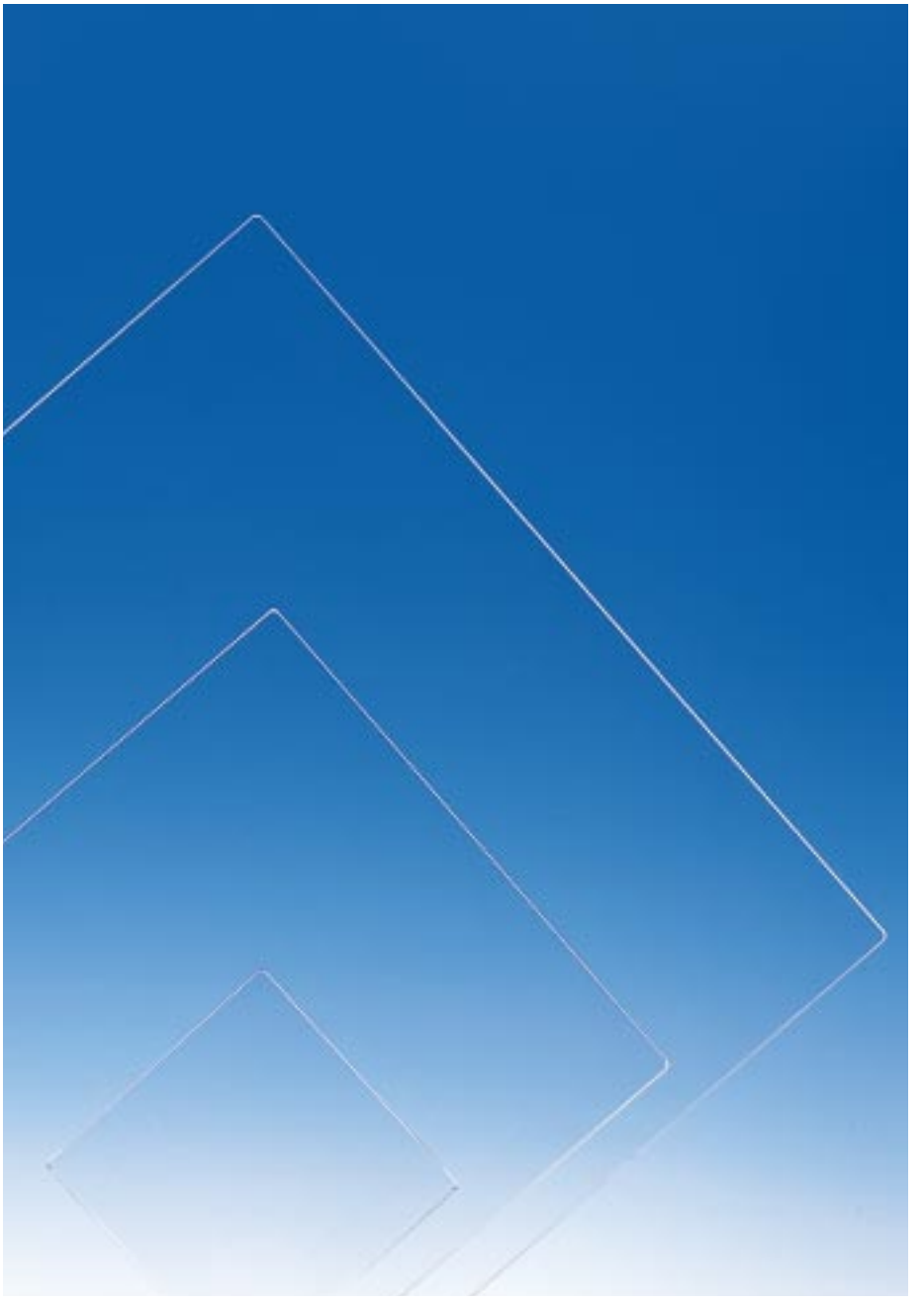
Dedicated to Growth, Shin-Etsu Invests to Build More Core Strengths

Synthetic Quartz—The Newest Cornerstone of Earnings

Shin-Etsu has targeted synthetic quartz as its next core business, behind PVC, semiconductor silicon and silicones. Strategic investments are transforming this goal into a reality. Silica Products Inc., a wholly owned subsidiary, was formed in April 1997 to build a synthetic quartz plant in the United States. Located in Freeport, Texas, adjacent to Shintech, Inc.'s PVC plant, the new facility is already shipping synthetic quartz to stepper lens manufacturers. The plant can also make synthetic quartz for photomask substrates.

In Japan, Shin-Etsu produces synthetic quartz at two locations: the Gunma complex makes preform for optical fibers; at the Naoetsu plant, synthetic quartz for stepper lenses and photomask substrates for LCDs and ICs are produced. A second plant, completed in March 1998, was added to the Naoetsu facility to supply synthetic quartz for photomask substrates. These plants serve two purposes. First is meeting rising demand. Second is to allocate production among different locations, thereby reducing risks and ensuring a reliable supply for customers.

Shin-Etsu handles the main stages of synthetic quartz production, from raw materials onward. One more competitive advantage is the company's expertise in silicon chemistry. Integration and silicon expertise together form the groundwork for skill in producing large lots of synthetic quartz while closely controlling its structure. This makes synthetic quartz a field where Shin-Etsu's pride as a chemical company shines brightly.



This substrate derived from synthetic quartz is used as a photomask for semiconductors.

Preform for optical fiber is one of the main applications of synthetic quartz. Shin-Etsu is by far the largest supplier of preform to the global optical fiber industry. Concentrating on this product rather than the entire fiber process gives Shin-Etsu a critical competitive edge. Large capacity permits Shin-Etsu to capitalize on merits of scale.

More valuable still is knowledge about chemical synthesis that makes Shin-Etsu the supplier of choice for the top grades of preform. By tapping this prowess, Shin-Etsu has forged relationships with most of the world's leading optical fiber makers, some of whom do not produce preform at all. The outlook is excellent. As the information age progresses, optical fiber networks are now reaching the home.

In the market for IC photomask substrates, Shin-Etsu is the undisputed world leader. Demands for better technology continue to rise. Finer semiconductor lithography mandates the use of excimer lasers. Only the most transparent and durable substrates can withstand the laser's powerful beams. Conventional glass is no longer up to the task. Silane is now essential as a raw material. While other companies purchase silane, Shin-Etsu has its own supply of this material. Experienced in many semiconductor-related products, Shin-Etsu also boasts powerful sales channels to many prominent manufacturers.

Synthetic quartz has been identified as Shin-Etsu's next major growth field. The material is used as preform for optical fiber.

Emerging Applications for Synthetic Quartz

Rare Earth Magnets: On a Growth Curve

Among the world's rare earth magnet suppliers, Shin-Etsu stands alone with its fully integrated production system. Operations begin with the separation and refining of rare earth elements from ore. This is followed by the formation of magnets, surface processing and final assembly. All steps take place at a Shin-Etsu facility. Furthermore, Shin-Etsu is the world's sole producer of all three major categories of rare earth magnets: neodymium, samarium and cerium.

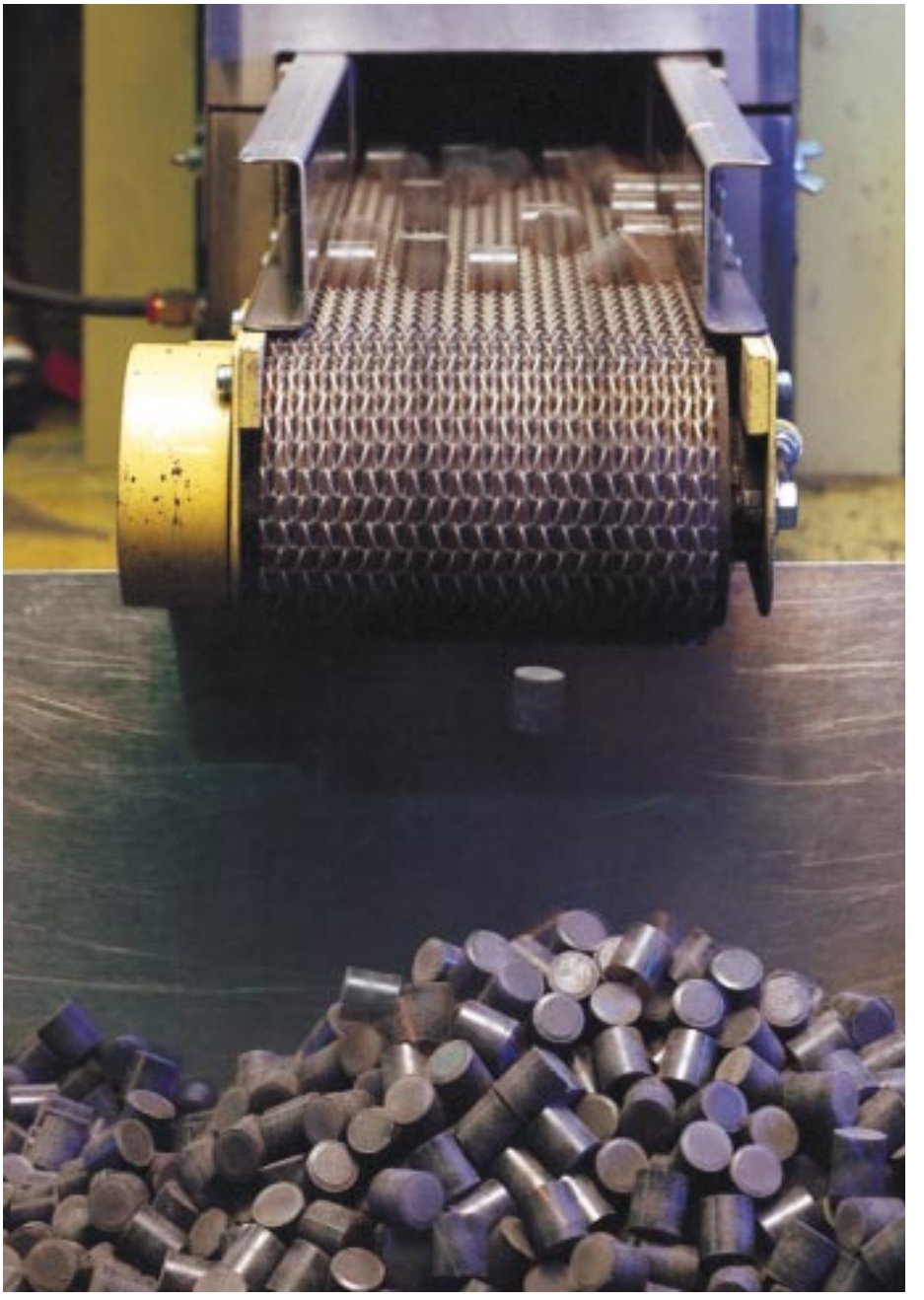
These unique strengths add up to a formidable position in the rare earth magnet marketplace. In particular, Shin-Etsu ranks first in supplying these magnets for hard disk drives, the largest single market. Rare earth magnets are also found in small motors for office equipment, automated production systems, automotive sensors and many other applications. Recently, makers of air conditioners and other home appliances have been turning to rare earth magnets to cut power consumption. The conclusion is inescapable: demand for rare earth magnets will keep climbing.

Shin-Etsu is one of the world's largest makers of rare earth magnets, used primarily in computer hard disk drives.

Leveraging its knowledge of silicon chemistry, Shin-Etsu ranks among the world leaders in the field of epoxy molding compounds (EMC), which encapsulate and protect LSIs and other semiconductor devices. Excluding epoxy resin, which the company purchases, Shin-Etsu develops and produces all key ingredients: silica, silicones and the silane coupling agent. Today's LSI packages are becoming thinner and smaller.

Withstanding heat requires certain physical characteristics of the encapsulation material and the chip inside. In particular, the chip must be protected from heat-induced stress during soldering. Naturally, the encapsulation material too must withstand this heat. To fulfill this role, the material needs to conduct and dissipate heat from the chip efficiently. By meeting these exacting demands, Shin-Etsu's EMCs are helping raise the speed and density of semiconductor devices.

With the advent of the 64M DRAM, semiconductor makers are demanding EMC grades that can handle more stress. Shin-Etsu's solution is a proprietary technique for adding silica to the EMC, thereby accurately controlling the heat expansion rate and realizing low-stress properties. One more advance is an EMC in which spherical silica accounts for more than 80 percent of the ingredients. Viscosity is reduced, further enhancing performance and raising production efficiency of this material as well.



Epoxy molding compound cylinders roll off the production line. They are used to encapsulate and protect LSIs and other semiconductor devices.

More Advances in Semiconductor Encapsulation Technology