## Commercial Production of Photoresists for Excimer Lasers

Finer circuit lines are driving advances in semiconductor devices. Etching these lines demands higher resolution in photoresists. To meet this need, Shin-Etsu developed a KrF photoresist that is suitable for the powerful beams of excimer lasers. Full-scale production began in December 1997 at the Naoetsu plant. Operations extend from the base polymer onward. Currently, this revolutionary photoresist is used by major manufacturers worldwide in the production of 64M DRAMs, which have circuit lines of under 0.25 microns.

The same technology holds the promise of creating photoresists for 0.20- and 0.18-micron rules as well. Furthermore, sensitivity is high enough for compatibility with next-generation, scan-type exposure machines. The long-term outlook is excellent. Shin-Etsu's advanced photoresists have the properties that will be in demand as 256M DRAM and 1G DRAM processes require even smaller circuit width.

Photoresist skills extend to giant magneto-resistive (GMR) heads, too. Shin-Etsu has devised the world's first high-resolution, thick-film photoresist for these heads, which are used to increase the capacity in computer hard disk drives. Sales have already begun.

Orders are likely to rise steeply along with demand for GMR heads. The Shin-Etsu resist is designed for i-line processes. This yields sub-micron-order resolution for thick films, which measure about 10 microns, or 10 times more than a semiconductor photoresist. Shin-Etsu is supplying this product to GMR head makers in Japan and overseas. All indications point to robust sales growth.

## Pellicles Crafted From Proprietary Technology in Semiconductor Materials

Pellicles are one more way in which Shin-Etsu serves the semiconductor industry. With outstanding transparency and durability, these pellicles can be used with excimer lasers. Mass production has already started.

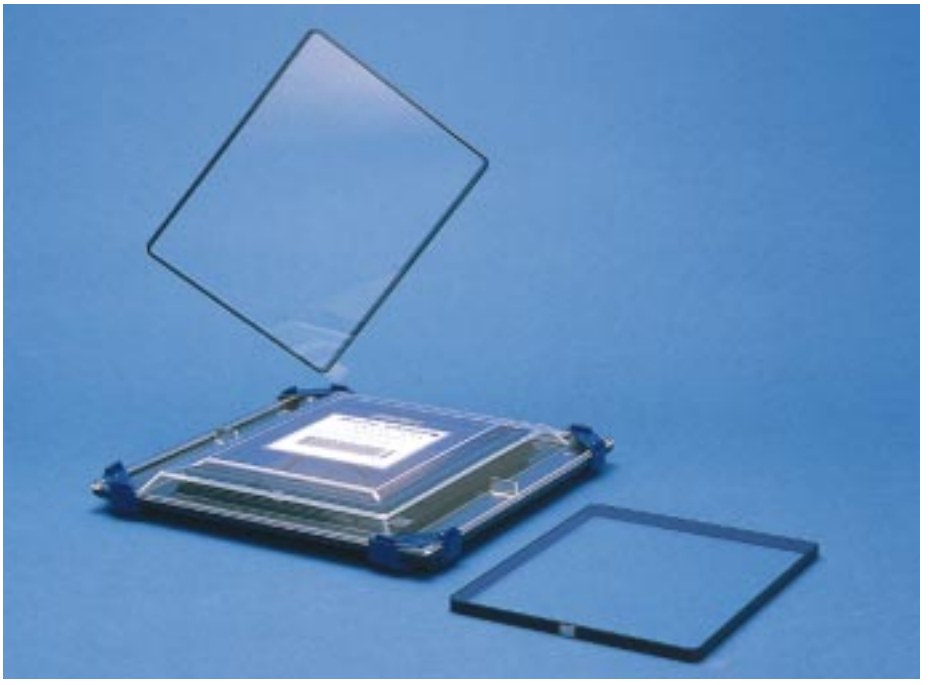
Pellicles basically consist of a thin film encased in an aluminum frame measuring about 5mm in height. Their primary function is protecting photomasks from dust and other impurities. Fabricating pellicles calls for extensive knowledge of electronic materials and processes.

Shin-Etsu's new pellicle incorporates a film with a fluorine polymer and an exclusive fluorine adhesive. This greatly improves the link between the film and frame.

Guarding against microscopic particles is critical as the complexity of semiconductor devices climbs. Here, the Shin-Etsu pellicle is clearly superior to those of competitors.

To affix the pellicle to a photomask, Shin-Etsu developed a new silicone-based adhesive that is highly resistant to light. Pellicles draw on experience in cleanliness and inspections gained from fabricating semiconductor materials. Shin-Etsu's silicone adhesive, pressure adhesion and formation technology were also instrumental in the development of this revolutionary adhesive. Even the storage container incorporates exclusive Shin-Etsu features.

Photoresist in the photolithography process. Photolithography for semiconductors requires high resolution of photoresist chemicals.



Pellicles—a thin film encased in an aluminum frame—protect photomasks from dust and other impurities.