

SEMATECH Achieves Single Digit EUV Mask Blank Defect Goal

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Technologists at SEMATECH have successfully demonstrated world-class results in low defect density for mask blanks used in extreme ultraviolet lithography (EUVL)—pushing the technology another significant step toward readiness for advanced manufacturing.

In demonstrating a world's best defect density of $0.04/\text{cm}^2$ for EUV mask blanks—with a total of only 8 defects combined from the substrate and the multilayer—the SEMATECH team surpassed the consortium's published commercial EUV mask blank roadmap target for the end of 2007. The roadmap was first developed in 2002 to chart SEMATECH's multiyear strategy to achieve the defect-free mask blanks needed for high volume EUVL manufacturing.

The technical achievement was reported at SEMATECH's Mask Blank Development Center (MBDC), one of several major R&D centers within the College of Nanoscale Science and Engineering (CNSE) of the University at Albany.

“SEMATECH's comprehensive program to provide manufacturing-ready infrastructure for EUV lithography includes a major focus on the very difficult challenge of mask blanks,” said Michael Lercel, director of Lithography at SEMATECH. “We've met and exceeded this critical milestone, and we will continue to push ahead on this and other components that our members and the industry will need for successful EUV lithography manufacturing.”

“The success of the partnership between SEMATECH and the UAlbany NanoCollege is further illustrated by the latest breakthroughs made by SEMATECH researchers and engineers working at CNSE’s Albany NanoTech Complex,” said Dr. James G. Ryan, professor of nanoscience and associate vice president of technology at CNSE. “Advances such as these are critical to the development and commercialization of EUVL technology, which is vital for the manufacturing of future nanoelectronics devices that will impact all areas of society.”

To achieve manufacturing capability, EUV lithography must clear several technology hurdles including mask blanks, reticle handling, sources, and resists. The mask blanks are the starting material used to make the reticle that contains the device pattern, and are particularly challenging because of the need to accurately deposit more than 80 layers to form the multilayer reflector—while keeping the mask blank defect-free. Low defect mask blanks are essential for cost-effective manufacturing.

The SEMATECH milestone was achieved through the combination of efforts in multilayer deposition, substrate cleaning, improved substrates from suppliers, and state-of-the-art mask blank defect inspection capability. SEMATECH’s previously announced partnership with Lasertec Corporation of Japan provided the inspection capability to find defects as small as 53nm on the mask blanks, which was instrumental in providing cycles of learning to reduce defects.

SEMATECH established the Mask Blank Development Center in Albany in 2003, as the world’s only research facility devoted to bringing together the critical capabilities needed to enable manufacturable EUV mask blanks.

“This mask blank achievement is a result of the great cooperation of the MBDC team. The Center’s unique structure—with core participation

from key partners such as Lasertec, New York’s Veeco Instruments, and the glass material suppliers—provides the entire infrastructure needed to drive defects to single digit levels,” said Chan-Uk Jeon, the SEMATECH MBDC program manager. “We and our commercial partners are committed to keeping this vital effort on track.”

Source: SEMATECH

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