SEMATECH Demonstrates Mask Pattern Alignment and Registration to Enable Double Patterning Lithography

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SEMATECH and the Semiconductor Metrology Systems division from Carl Zeiss announced today that Zeiss' next-generation photomask registration and overlay metrology system has successfully passed a key development milestone. The jointly developed system, called PROVE, demonstrated the measurement capability for advanced photomasks for the 32 nm node and below. In a series of test runs, the key specifications -- 0.5 nm repeatability and 1.0 nm accuracy in image placement, registration and overlay measurement -- were verified.

“The mask pattern placement metrology tool project builds upon an already successful partnership between Carl Zeiss SMS and SEMATECH for past work on mask Aerial Image Metrology Systems (AIMS) tool platforms. The partnership has resulted in a working metrology tool that is meeting specifications for repeatability, reproducibility, and accuracy at the 32 nm half-pitch node,” said Bryan Rice, director of Lithography at SEMATECH.

“The industry now has the capability to determine smaller image placement errors than could be measured before. Achieving these specifications is a major milestone toward enabling the ITRS (International Technology Roadmap for Semiconductors) mask requirements for the 32 nm node and below. This accomplishment will help to advance the development of photomasks with tighter overlay requirements, demanded by memory devices and double patterning

methods," he added.

The performance targets of the tool were driven by the requirements for advanced memory and double exposure/double patterning mask pattern placement and overlay that will help extend 193 nm lithography according to the ITRS.

"To achieve the performance specification of the PROVE system is a major milestone in the project and crucial for our customers in the mask making industry," said Dr. Oliver Kienzle, managing director of Carl Zeiss SMS. "The system is based on a completely new developed platform enabling in-die and sub-nanometer pattern placement metrology in a most versatile way. The measurements can be done on arbitrary production features in the active area of the photomask for accurate and cost-efficient metrology and is extendable to EUV technology. We will now roll-out the PROVE product with deliveries to our customers."

This technology represents a significant improvement over previous capability due primarily to the incorporation of high-resolution 193 nm wavelength imaging optics, a flexible illuminator that maximizes image contrast, a highly versatile in-die registration analysis algorithm, and a state-of-the-art metrology platform. The system can be fully extended to measure EUV photomasks. The tool will play a vital role in enabling next-generation mask-making technology.

Provided by SEMATECH