KlA-Tencor Unveiled Atomic Force Line Monitoring Solution For 90-/65-nm IC Production

June 28 2004

KLA-Tencor unveiled the AF-LM 300—the first true line monitoring solution for trench depth and surface planarity process control based on atomic force microscopy (AFM). Until now, traditional AFMs have lacked the throughput and reliability needed for many inline process monitoring applications. Delivering high reliability, unmatched ease of use and significantly increased throughput compared to traditional AFMs, the AF-LM 300 enables chipmakers to support up to 100 percent lot sampling on the production floor at the 90-nm and 65-nm nodes—providing tighter process monitoring, which in turn helps chipmakers produce better performing and higher yielding devices. Leading IC manufacturers like Infineon Technologies have installed the AF-LM 300 in their advanced fabs for evaluation, and KLA-Tencor has received multiple orders for the new system.

The AF-LM 300 leverages KLA-Tencor's 25-plus years of fab environment experience to provide a high reliability, low-risk alternative to traditional AFMs for critical front-end process monitoring. The system is based on
KLA-Tencor's production-proven Archer 10 overlay metrology platform, which offers excellent stage speed and accuracy, and unparalleled industry reliability. The system also incorporates an AFM head developed jointly with
SII NanoTechnology Inc., a subsidiary of Seiko Instruments, and a leading supplier of scanning probe instruments. This production-proven

foundation, combined with the AF-LM 300's ability to provide direct, non-destructive, within-die measurements, makes it an essential tool on the fab floor.

"At Infineon, AFM has become an indispensable technology for monitoring trench depths and chemical mechanical planarization (CMP) processes at the 90-nm node and below," stated Dr. Ulrich Mantz, director, UPD (Unit Process Development) Metrology and Inspection, at Infineon Technologies' Memory Division. "When ramping new processes, nearly 100 percent lot sampling is needed to accurately monitor several critical front-end-of-line (FEOL) process steps, since depth and step-height variations of only a few nanometers can affect device yield. From initial results, Infineon anticipates doubling sampling rates using KLA-Tencor's new AF-LM 300—achieving better process monitoring."

Designed for high throughput
The AF-LM 300's stage, optics and scanners work together to achieve a move-and-measure data acquisition time of less than 30 seconds—more than twice as fast as that of traditional AFMs. In addition, the Linnik interferometer from the AF-LM 300's pattern-recognition system feeds forward the wafer surface position to the AFM head, enabling rapid tip-to-surface approach. Powerful algorithms enable the minimum number of line scans to locate and measure the feature of interest quickly and efficiently.

Hands-free AFM tip exchange and characterization
The most difficult aspect of operating AFMs—replacing the nanometer-scale tips that trace the device surface to take measurements—has been automated into a fully robust, hands-free process in the AF-LM 300. Pre-qualified and pre-aligned self-sensing cantilevers are supplied in easy-to-load cartridges. Instead of having to manipulate individual tips with tweezers, AF-LM 300 operators handle self-aligning cassettes the size of

a cell phone. Each system contains a reservoir of six cassettes of 10 tips each. Automatic tip exchange is typically accomplished in less than six minutes, including tip characterization and calibration.

"For today's advanced semiconductor processes, nanometer-level process variations can affect transistor quality and have a significant impact on our customers' ability to command higher ASPs with their leading-edge products," stated Sergio Edelstein, vice president and general manager of KLA-Tencor's Film and Surface Technology Division. "With the AF-LM 300, we provide our customers with a tool that can cost-effectively and reliably meet their production monitoring requirements for critical front-end structures, enabling them to achieve higher margins and lower cost of goods on their advanced devices."

Key applications include shallow trench isolation (STI) etch and CMP, trench capacitor recess, and interconnect etch and CMP control. Volume shipments are expected to begin in the second half of CY 2004.

Source: www.kla-tencor.com/

Citation: KlA-Tencor Unveiled Atomic Force Line Monitoring Solution For 90-/65-nm IC Production (2004, June 28) retrieved 22 May 2024 from https://phys.org/news/2004-06-kla-tencor-unveiled-atomic-line-solution.html

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