Applied Materials Makes the Transistor Cool Again with Integrated High-k/Metal Gate Technology

July 17, 2007

SANTA CLARA, Calif.--(BUSINESS WIRE)--July 17, 2007--The time has come to make dramatic changes in the transistor - to integrate new materials and processes in its gate structure to make chips faster and more power-efficient, enabling Moore's Law to continue. Applied Materials, Inc. today unveiled the technologies to help customers make it happen - a comprehensive portfolio of fully characterized processes for building high-k/metal gate (HK/MG) structures in high volume production.

Starting at the 45nm node for logic chips, transistors are so small that conventional gate materials are no longer effective, allowing excessive current leakage that heats up the transistor and consumes excessive power. HK/MG structures can offer greater than 100x reduction in gate leakage and significantly faster switching speed. To illustrate the energy savings, if all the microchips shipped in 2006 had used HK/MG technology, the total power saved(1) could provide electricity to over 4.5 million homes for a year. But using new HK/MG materials to make the transistor "cool" again solves only part of the problem. The real challenge is integrating these HK/MG materials into the device to create optimized gate structures having atomically-engineered interfaces with the performance needed for volume manufacturing.

"For years, integrating new gate materials has been viewed by our customers as the most formidable roadblock to scaling. We want to help them minimize this risk by providing integration-proven HK/MG technologies to make their transition faster," said Tom St. Dennis, senior vice president and general manager of Applied's Silicon Systems Group. "Applied has a strong history of helping customers integrate new materials into their process flow, most recently with the transition to low k dielectrics. Since we have the upstream and downstream technologies, we can optimize the process sequence and help customers successfully integrate HK/MG technology to fabricate their most advanced transistors."

There are several approaches to manufacturing HK/MG structures and Applied has a solid lineup of systems that support customers' different approaches. These fully characterized processes are integration-tested to reduce customers' time to achieve fully-optimized HK/MG structures. Rather than providing just a high-k film, Applied delivers an integrated dielectric stack solution on a single Centura(R) platform that combines four critical processes (high-k deposition, oxidation, nitridation and anneal). For the challenging metal gate stack, Applied builds on years of leadership in metal deposition technology to offer a portfolio of integration schemes on its Endura(R) platform using ALD(2) and PVD(3) technologies to address a variety of customer designs. Applied's new innovative high temperature etch technology delivers the critical profiles needed for production etching of HK/MG stacks. With 25nm defect sensitivity and automated FIB(4), Applied's defect inspection, review and analysis systems accelerate critical defect and process learning for HK/MG structures.

Applied characterized its HK/MG technology at its Maydan Technology Center, one of the world's most advanced semiconductor process laboratories. Using the company's systems and technologies, Applied engineers successfully demonstrated and tested HK/MG structures for both logic and memory (charge trap Flash) devices down to the 22nm design node. These structures can give customers a head start on their next-generation process flows. For details on Applied's HK/MG solutions, visit www.appliedmaterials.com/Highk_MetalGate.

Applied Materials, Inc. (Nasdaq: AMAT) is the global leader in Nanomanufacturing Technology(TM) solutions with a broad portfolio of innovative equipment, service and software products for the fabrication of semiconductor chips, flat panels, solar photovoltaic cells, flexible electronics and energy efficient glass. At Applied Materials, we apply Nanomanufacturing Technology to improve the way people live. Learn more at www.appliedmaterials.com.

(1) Estimate based on one year, 12-hour/day chip usage. For consumers this means longer-lasting batteries in laptops and more functionality in computers.

(2) ALD: atomic layer deposition

(3) PVD: physical vapor deposition

(4) FIB: focused ion beam

MULTIMEDIA AVAILABLE:
http://www.businesswire.com/cgi-bin/mmg.cgi?eid=5448963

CONTACT: Applied Materials, Inc.
Betty Newboe, 408-563-0647 (technical media)
David Miller, 408-563-9582 (business media)
Randy Bane, 408-986-7977 (financial community)

SOURCE: Applied Materials, Inc.