Applied Materials Launches Revolutionary Low k Barrier Film for Copper Chips

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BLOk(TM) Barrier and Etch Stop Film Dramatically Lowers k Value
of Overall Copper Damascene Structure to Enable Faster Devices

Applied Materials, Inc., the industry's leading supplier of equipment to manufacture copper chips, announces its breakthrough BLOk (Barrier LOw k) dielectric CVD (chemical vapor deposition) film. BLOk provides an alternative to silicon nitride films, enabling chipmakers to reduce the dielectric constant (k) of their overall copper damascene structures to achieve faster, more powerful devices.

Silicon nitride (SiN) films are currently used as a copper barrier and etch stop in combination with low k dielectrics to form insulating film "stacks" between the chip's copper circuitry. "However, silicon nitride's high k value (greater than 7) significantly limits the effect of many low k dielectric films, increasing the stack's effective k by up to 20 percent," said Kevin Fairbairn, general manager of Applied Materials' PECVD product unit.

"In addition to having a dielectric constant of less than 5, BLOk addresses the many integration challenges that are key to successful damascene processing, offering up to twice the etch selectivity of SiN, better copper barrier properties and good adhesion to other films. Used with a low k dielectric like our Black Diamond(TM) film, BLOk can enable a stack with an effective k value of 3.0 or below, simplifying the challenges of achieving gigahertz-level device speeds," stated Fairbairn.

Although silicon carbide-based films traditionally exhibit poor electrical integrity and have been difficult to etch, BLOk, which is a proprietary amorphous film composed of silicon, carbon and hydrogen, actually exceeds the performance of nitride as a diffusion barrier and demonstrates leakage that is six to seven orders of magnitude better than conventional silicon carbide material.

Applied Materials has already characterized BLOk on its Dielectric Etch IPS(TM) Centura(R) system to provide an integrated process that first etches through the primary intermetal dielectric, Black Diamond, and then stops on the BLOk layer before proceeding with a soft etch to break through the BLOk and stop on the copper. This two-step process prevents sputtering of the copper onto the dielectric sidewalls and eliminates copper contamination to the device.

The BLOk process uses Applied Materials' industry-leading DxZ CVD chamber, enabling chipmakers to rapidly integrate the process into their production lines using proven, well-known hardware. The process can also be retrofitted on existing DxZ chambers for copper pilot lines. BLOk will also be available later this year on the company's Producer(TM) platform to provide even greater throughput and cost of ownership advantages.

Multiple customers in the U.S., Asia and Europe are using the BLOk process in copper device development, including work that combines it with the company's Black Diamond low k dielectric film. Black Diamond, a silicon oxide-based CVD film with k less than or equal to 2.7, provides a low-risk, cost-effective solution for intermetal dielectric structures that is easily integrated into the dual damascene process flow. Applied Materials is the only company that offers products for all of the key process steps required for dual damascene copper interconnect fabrication.

Applied Materials, Inc. is a Fortune 500 global growth company and the world's largest supplier of wafer fabrication systems and services to the global semiconductor industry. Applied Materials is traded on the Nasdaq National Market System under the symbol "AMAT." Applied Materials' web site is www.appliedmaterials.com.

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