

Novellus Systems Develops XMM™ Technology For In-Line Isotropic Copper Overburden Reduction

San Jose, California - June 17, 2010 - Novellus Systems today announced that it has developed patent-pending XMM technology that complements the company's SABRE® Electrofill® copper electrochemical deposition (ECD) process. XMM is an innovative, in-line isotropic wet etch process that significantly reduces post-plated copper overburden on via or trench only structures. This new technology provides independent control of overburden deposition and feature fill, resulting in a wider process window and improved integration for copper fill applications like Through Silicon Vias (TSV).

In order to provide void-free fill of vias and trenches, a certain amount of excess copper is deposited on the horizontal surfaces of a wafer. This excess copper, or copper "overburden", is then removed during the subsequent CMP process. Chemical reduction of the copper overburden layer can be performed prior to the CMP step to decrease the overburden thickness and can result in a significant reduction of the CMP process time and consumables. Conventional copper etch processes employ chemistries that attack the copper film at the grain boundaries, with etch rates that are dependent upon local concentrations. This variation in etch rate produces feature-dependent copper thicknesses with high surface roughness, resulting in high post-etch non-uniformity and preventing effective use of defect metrology.

Novellus' newly-developed XMM technology prevents chemical attack at the grain boundaries, resulting in a smooth, highly reflective copper surface. The process is kinetically limited, ensuring a uniform etch regardless of feature size or density (see Figure 1). In addition, XMM technology decouples control of the overburden deposition from feature fill, allowing copper fill and overburden to be individually optimized, which in-turn widens the process window and improves integration. With XMM technology, plated overburdens on large features can be controlled to thicknesses of less than one micron, with the potential for full field copper removal. This ensures that thick film stress-induced wafer bow can be eliminated during the pre-CMP anneals used to control the copper microstructure. One application of this technology is in the area of TSV filling. While some TSV features can be filled using a low overburden process, others require high overburdens to obtain the necessary copper microstructure within the feature. In the case of high overburden processes, implementation of XMM technology results in up to a 70 percent reduction of CMP cost of consumables (see Figure 2).

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"Controlling copper overburden is critical to minimizing film stress, managing thermo-mechanical reliability, and ensuring robust integration with the subsequent CMP removal process," said Sesha Varadarajan, vice president and general manager of Novellus' Electrofill business unit. "Novellus' SABRE XMM technology overcomes these technical challenges while significantly reducing our customer's costs."

About Novellus' Electrochemical Deposition Technology

For high-volume manufacturing applications at 45 nm and beyond, Novellus' advanced copper electrochemical deposition hardware, processes and chemistries combine industry-leading throughput while providing bottom-up, void-free filling of advanced device structures. Nine out of 10 copper wafers in the world are manufactured on Novellus' SABRE Electrofill® systems.

About Novellus

Novellus Systems, Inc. (NASDAQ: NVLS) is a leading provider of advanced process equipment for the global semiconductor industry. An S&P 500 company, Novellus is headquartered in San Jose, Calif. with subsidiary offices across the globe. For more information, please visit www.novellustechnews.com

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