

# NOVELLUS INTRODUCES VECTOR EXCEL - A MODULAR PLATFORM FOR ADVANCED DIELECTRICS THAT REQUIRE PRE- AND POST-PROCESSING

VECTOR Excel is a modular system (Figure 1) that has been developed to address the needs of advanced technology nodes that require pre- and/or post-processing of dielectric films, such as diffusion barriers. The new system incorporates an innovative interface engineering approach developed by Novellus that results in a significant reduction in the RC delay constant without needing to incorporate new materials into the back-end-of line (BEOL) integration scheme.

□

In technology nodes where the inter-metal dielectric (IMD) materials have a dielectric constant of 2.6 or higher, an in-situ plasma treatment using ammonia or hydrogen is typically used to prepare the surface for the deposition of the dielectric diffusion barrier by removing the copper oxide layer and any residue from the chemical mechanical planarization (CMP) slurry. With the emergence of porous, ultra-low k (ULK) materials at the 28 nm technology node, a new integration challenge has developed where the porous films are susceptible to carbon loss upon exposure to this in-situ plasma (see Figure 2). A corresponding increase in the effective dielectric constant has also been observed. To address this challenge, Novellus engineers have developed new interface engineering technologies that minimize the damage to ULK materials and have incorporated this technology into the new VECTOR Excel modular architecture. Available technologies include a remote plasma pre-treatment module (CLEAR™) and a dual pre-heat/pre-treatment spectral irradiance module (LUMIER™) that can be configured with a wide variety of lamps with different frequencies.

Figure 2 shows that the VECTOR Excel pre-treatment processing results in no carbon removal from the ULK layer. Data gathered also confirms that these pre-treatment options provide complete removal of copper oxide and CMP residue. The adhesion strength of the diffusion barrier to underlying layers is also equivalent to results obtained using a conventional in-situ plasma treatment. Figure 3 shows that the VECTOR Excel integrated process results in a 4 percent reduction in capacitance as compared to traditional in-situ plasmas. This "zero damage" process enables interconnect RC delay reduction (device speed increase) without introducing new materials into the BEOL dielectric stack, thereby reducing the risk of adoption to our customers.

□

The PECVD module of VECTOR Excel employs Novellus' proven multi-station sequential deposition (MSSD) architecture that results in best-in-class wafer-to-wafer, within-wafer and point-to-point repeatability, with each wafer progressing through a single deposition path. This new modular platform achieves a 15 percent capital productivity improvement over the competition by moving the pre- and post-processing steps out of the critical throughput path. The compact design of this new system has a footprint that is comparable to VECTOR Express, the industry leader in footprint productivity. A typical installation of VECTOR Excel systems for 20,000 wafer starts results in a 26 percent reduction in overall fab footprint as compared to competitive offerings with equal production output.

"The interface between diffusion barriers, IMD layers and copper interconnects is critical in determining the BEOL interconnect delay and reliability, including electromigration and time dependent dielectric breakdown," said Kevin Jennings, senior vice president of Novellus' PECVD Business Unit. "The new VECTOR Excel platform combines innovative interface engineering technology with the trusted productivity of Novellus' multi-station sequential deposition architecture to address the challenges associated with depositing these advanced films."

For more information about the new VECTOR Excel, please visit [www.novellustechnews.com](http://www.novellustechnews.com).

#### **About Novellus' PECVD Technology**

The new, modular VECTOR Excel platform features innovative interface engineering to reduce RC interconnect delay, coupled with industry-leading productivity. The VECTOR Excel deposition chamber employs the proven multi-station sequential processing (MSSP) architecture of the VECTOR platform. More than 1,000 VECTOR systems of various models have been installed in logic, memory and foundry fabs around the world.

#### **About Novellus**

Novellus Systems, Inc. (Nasdaq: NVLS) is a leading provider of advanced process equipment for the global semiconductor industry. The company's products deliver value to customers by providing innovative technology backed by trusted productivity. An S&P 500 company, Novellus is headquartered in San Jose, Calif. with subsidiary offices across the globe. For more information, please visit [www.novellus.com](http://www.novellus.com).

---

<https://newsroom.lamresearch.com/2011-03-14-NOVELLUS-INTRODUCES-VECTOR-EXCEL-A-MODULAR-PLATFORM-FOR-ADVANCED-DIELECTRICS-THAT-REQUIRE-PRE-AND-POST-PROCESSING>