



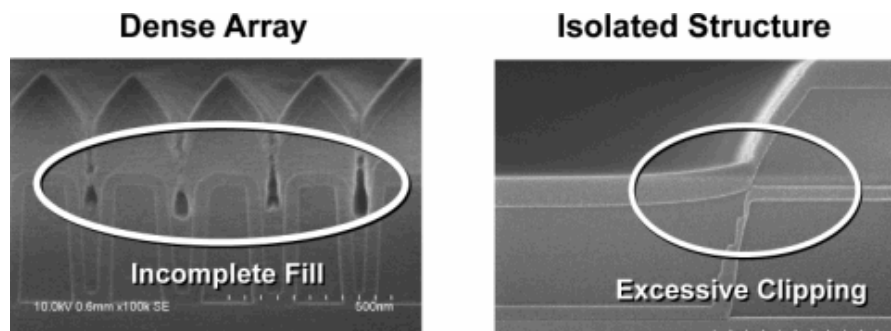
NOVELLUS

## NOVELLUS' SPEED® MAX HDP-CVD DIELECTRIC GAPFILL SYSTEM EXTENDS STI APPLICATION TO 32nm

### *Advanced SPM-F™ Technology Eliminates Ex-situ Wet Etch Processing; Increases Fab Productivity*

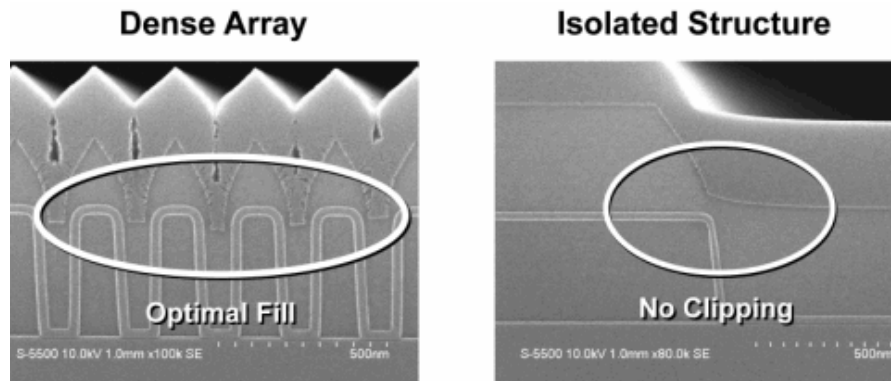
San Jose, Calif. - October 5, 2009 -- Novellus Systems (NASDAQ: NVLS) today announced that it has developed a manufacturing process to extend the company's SPEED Max shallow trench isolation (STI) application to the 32nm technology node. The new process technology takes advantage of the dynamic profile control (DPC™) of the SPEED Max high density plasma chemical vapor deposition (HDP-CVD) platform. By tailoring the deposition, etch, and sputter-to-deposition (S/D) ratio, Novellus engineers have developed a single-pass, sequential profile modulation technique using fluorine (SPM-F) to fill 32nm features. The process meets the stringent integration requirements of STI logic applications and the productivity required for high volume manufacturing.

As semiconductor manufacturers move to 32nm and beyond, the need to extend technology on existing platforms with minimal hardware modifications is critical, not only to meet development schedules, but also to manage manufacturing costs. Since new material changes add significant integration uncertainty, and many alternative films and deposition techniques have qualities that are undesirable, HDP is still the preferred gapfill dielectric technology for advanced geometries. However, to achieve complete gapfill at 32nm and beyond, conventional HDP deposition processes that utilize alternating deposition and etch cycles to fill a feature must be carefully controlled. Too many deposition/etch cycles, or inadequate control of process uniformity, will result in excessive clipping or voids within the trenches (as shown in figure 1), leading to yield loss. Insufficient gapfill can be overcome by adding an ex-situ wet etch process, but at the cost of added defects, integration complexity, and lower productivity. To achieve complete gapfill without the use of an ex-situ wet etch step, parameters like S/D ratio, process chemistry, and etch uniformity must be optimized across the wafer.



**Figure 1: 32 nm baseline process with incomplete fill and excessive clipping.**

Novellus has developed a unique SPM-F gapfill process using the SPEED Max platform that eliminates the need for an ex-situ wet etchback step. Using SPEED Max's isolated plasma source and DPC technology, complete fill of 32nm structures was achieved (see figure 2) by reducing the oxide top-hat build-up, and eliminating clipping in both dense arrays and isolated features. By eliminating the need for an external wet etchback step, the new SPEED Max SPM-F process also meets the productivity and defect requirements of 32nm high-volume manufacturing.



**Figure 2: SPEED Max SPM-F process optimized for 32 nm.**

"The gapfill and defectivity results we achieved on 32nm structures allowed us to back-qualify the SPEED Max process to a previous technology node and eliminate ex-situ wet etch processing, said Dr. Kaihan Ashtiani, vice president and general manager of the Gapfill business unit. "This eliminates a second wafer pass through the HDP tool, resulting in an increased fab productivity."

For more information regarding SPEED Max's STI application at 32nm, go to [www.novellustechnews.com](http://www.novellustechnews.com).

**About Novellus' HDP-CVD Technology:**

Novellus' SPEED Max system extends the HDP-CVD application into the 45 and 32 nm technology nodes. The system's isothermal chamber design, combined with an enlarged remote plasma source, allows more wafers to be processed between plasma cleans, and delivers superior throughput per system. In addition, the SPEED Max multi-port injection, together with isolated source technology, customizes the deposition and in-situ etching profile for optimal film thickness and gapfill uniformity across the wafer.

**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)

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