

NOVELLUS DEVELOPS PRECISION ANTI-REFLECTIVE LAYERS THAT ENABLE CRITICAL DIMENSION CONTROL STRATEGIES FOR SUB-32nm LITHOGRAPHY

San Jose, California -- April 22, 2010 - Novellus Systems (NASDAQ: NVLS) announced today that it has developed precision anti-reflective layer (ARL) patterning films on its VECTOR PECVD platform with less than 2 angstroms wafer-to-wafer thickness variability. The new process technology utilizes VECTOR's multi-station sequential processing (MSSP®) architecture to deposit ARL films with ultra-uniform film thickness, refractive index (n), and extinction coefficient (k). The properties of these new films exceed the requirements of sub-32nm lithography and are significantly superior to similar films deposited using a side-by-side single station-like deposition architecture.

Control of critical dimension (CD) variation is essential for 32nm lithography and beyond. The 2009 International Technology Roadmap for Semiconductors (ITRS) recommends less than 1nm total CD variation to ensure the functionality of ultra-high performance circuits. Advanced lithography CD control tools such as high-end phase-shift masks with complex optical proximity correction have become extremely expensive to implement in order to achieve the tight CD control required for 32nm device manufacturing. An effective, less expensive lithography technique used to control variability is called dose compensation, where the exposure dose is adjusted using a software algorithm for a specific area on the wafer. To ensure proper performance, dose compensation strategies require predictable anti-reflective layer thickness and optical properties for each incoming wafer. Novellus engineers have developed a new ARL process technology on the VECTOR platform that provides the ultra-uniform wafer-to-wafer performance required to employ these dose compensation control strategies. The new process technology is coupled with the VECTOR's angular placement accuracy of less than 0.3 mm to ensure the predictable film properties required for sub-32nm lithography. Figure 1 shows ARL film thickness profiles for wafers processed on a VECTOR with MSSP and those deposited using a side-by-side single station-like deposition. The film thickness maps for the VECTOR ARL films show low within-wafer and wafer-to-wafer variability, with a predictable profile for each wafer. In contrast, the ARL films deposited on the single station-like architecture have large wafer-to-wafer variation, which can compromise a dose compensation control strategy.

Figure 1: ARL thickness profile maps for films deposited using MSSP (top), and side-by-side single station-like deposition (bottom). New VECTOR ARL process results in ultra-uniform film deposition.

Figure 2 further quantifies the low wafer-to-wafer variation obtainable using Novellus' new ARL process technology. The plot shows the normalized ARL thickness for a single measurement point on a wafer, measured over a 300 wafer run. Novellus' ARL process has a point-to-point thickness variation of 1.6 angstroms, or 0.34 percent of full range. The side-by-side single station-like deposition has a thickness variation of 7.3 angstroms (1.5 percent of full range), more than 4X that of the Novellus process. Factoring in the inherent bimodality of the side-by-side single station-like deposition, this variation may become too great to effectively employ dose compensation for CD control.

Figure 2: Normalized single point ARL thickness for selected wafers in a 300 wafer run lot. As shown in the charts, the MSSP deposition has 4x less wafer-to-wafer variability as compared to the side-by-side single station-like deposition.

"The new generation of precision ARL films developed for the VECTOR platform have ultra-uniform thickness and optical properties that are essential for CD control at advanced technology nodes," said Kevin Jennings, senior vice president of Novellus' PECVD business unit. "As dual and triple-layer PECVD ARL films are employed for reflectivity control, VECTOR's inherent process control will enable the efficient use of feed-back and feed-forward CD control solutions." For more information about film thickness profile control, please visit www.novellustechnews.com.

About Novellus' PECVD Technology:

Novellus' PECVD films deposited using VECTOR's multi-station sequential processing result in unparalleled wafer-to-wafer and point-to-point repeatability. This satisfies the variability needs of next generation technology for all films, in particular for optical films with tightly controlled lithography specifications. The industry-leading capability of VECTOR has resulted in the placement of over 1000 systems in 70 manufacturing facilities worldwide, processing over one million wafers a day.

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

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