

Nano Layer Deposition; Unique Thin Film Deposition Technology Surpasses Atomic Layer Deposition in Flexibility

July 22 2004

Tegal Corporation today announced that it has been granted United States Patents, No. 6,689,220 and 6,756,318, which enable nano layer deposition (NLD) of conformal thin films for barrier, copper seed and high-K dielectric applications in advanced microprocessor and memory device production.

The systems and methods described in the '220 and the '318 enable nano layer deposition with ultra-conformality comparable to that of atomic layer deposition (ALD) and the manufacturing throughput of more conventional chemical vapor deposition (CVD) systems. NLD allows semiconductor manufacturers to choose from a wide field of deposition precursors (a key limitation of ALD) for the application of any thin film in use today on the surface of a wafer with atomic layer precision. NLD technology can also be used to construct complex, compound film structures with a level of control and conformality that was previously unavailable or impractical.

The '220 patent covers a system and process incorporating a pulsed plasma and deposition technique applicable to a variety of films such as Titanium Nitride, Copper and several low-K (dielectric constant) insulating films. The pulsing technique can also be used to deposit a low-K material and to "seal" it in-situ in order to preserve the film's low-K properties. This has been a major limitation to the successful implementation of low-K dielectric materials into current generations of

semiconductors.

The '318 patent combines system design, source design and NLD technology to enable a manufacturing solution for next generation semiconductor devices. The '318 discloses a new helical ribbon electrode as a plasma source for use in an NLD system. The '318 patent builds on the technology disclosed in the '220 patent and provides a multi-chamber platform for performing a wide variety of processing steps such as pre-clean, etch, NLD, densification, etc. As a result, complex films can be deposited with complete conformality and layer thicknesses can be controlled to one monolayer or to several hundred of Angstroms.

The market for highly conformal deposition tools, such as ALD and NLD, is one of the fastest-growing segments of the semiconductor device manufacturing space. According to VLSI Research Inc., the current market for highly conformal deposition tools is over US\$100 million and will grow at an annual rate of over 66% to reach US\$1.35 billion in 2008.

"We are pleased to add these two key patents to Tegal's extensive base of intellectual property and know-how," said Michael Parodi, Tegal chairman, president & CEO. "This is one of the most exciting areas that Tegal has ever participated in, and we look forward to demonstrating the superiority of our NLD systems in the market."

Safe Harbor Statement

Except for historical information, matters discussed in this news release contain forward-looking statements within the meaning of Section 27A of the Securities Act and Section 21E of the Exchange Act. Forward-looking statements, which are based on assumptions and describe our future plans, strategies and expectations, are generally identifiable by the use of the words "anticipate," "believe," "estimate," "expect," "intend,"

"project" or similar expressions. These forward-looking statements are subject to risks, uncertainties and assumptions about the company including, but not limited to industry conditions, economic conditions, acceptance of new technologies and market acceptance of the company's products and services. All forward-looking statements attributable to the company or persons acting on its behalf are expressly qualified in their entirety by the cautionary statements in this paragraph. For a further discussion of these risks and uncertainties, please refer to the company's periodic filings with the Securities and Exchange Commission.

Source: [Tegal Corporation](#)

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