TEOS-SiO_2 Plasma Deposition for Electronic Components Fabrication with Samco's PD-270STLC

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■ Introduction

Samco began supplying cathode coupled PECVD system PD-270STLC as part of its LSCVD® (Liquid Source CVD) line-up, which consists of systems that are capable of dense, high-rate plasma deposition of TEOS-SiO_2 films.

These systems are subsequently used for applications such as optical waveguides, MEMS and TSV. Due to its uniformity and stability, the PD-270STLC is well-suited for electronic component fabrication.

■ SiO_2 Film Uniformity for Electronic Components

Figure 1 illustrates the exterior of the PD-270STLC, a vacuum cassette system for electronic component fabrication. The specifications include two TEOS supply lines in the rear to ensure steady, continuous use. One carrier accommodates up to a single φ8" wafer or multiple smaller wafers, and one cassette allows for consecutive, automatic processing of up to 10 trays.

Figure 1 PD-220NL Exterior

Electronic component fabrication requires precise, uniform SiO_2 thin films for maximum yield rate. A film thickness uniformity of no more than ±1% is typically required in such cases. This type of optimized precision and uniformity is possible with Samco's unique cathode coupled PECVD systems.

■ Deposition Results with Samco's PD-270STLC

This section introduces 1μm TEOS-SiO_2 deposition results achieved by the PD-270STLC. Figure 2 illustrates a layout of three φ4" wafers on a tray. Distribution results of the Y-axis direction are found in Figure 3.

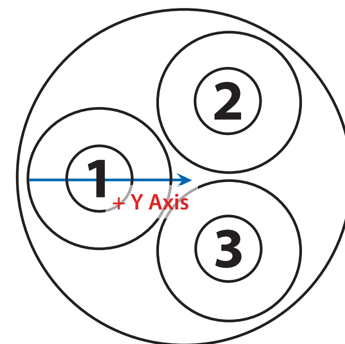

Figure 2 FTIR evaluation of each SiN_x film

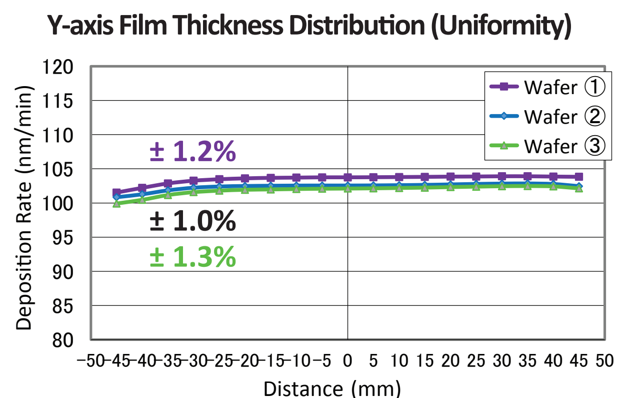

Figure 3 Film thickness distribution comparison

Due to the concentric deposition, uniformity was determined based on the Y-axis. As seen in Figure 3, SiO_2 film deposition distribution on Si substrates has a favorable uniformity of no more than ±1.3% on the Y-axis direction. Figures 4 and 5 illustrate the deposition results for 10 consecutive batches and the uniformity for film stress/wet etching rate (W.E.R.), respectively.

As seen in Figure 4, deposition uniformity between batches for φ4" wafers is no more than ±1.4%, and there were no significant changes in film distribution over the course of ten consecutive batches.

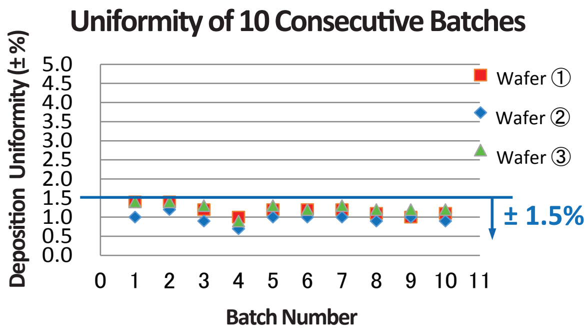

Figure 4 Wafer batch uniformity

Figure 5 shows mostly stable film stress and W.E.R, which indicates that the PD-270STLC is also capable of depositing films with stable properties.

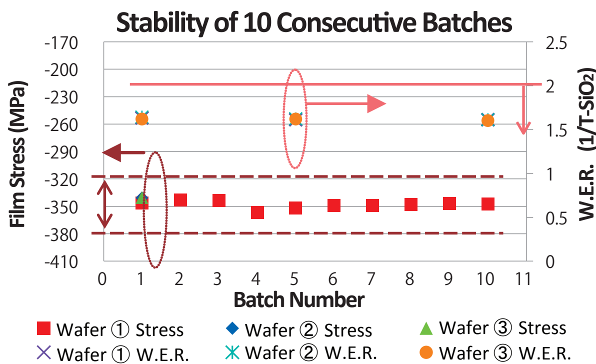

Figure 5 Film stress, W.E.R. uniformity

Under these conditions, a uniformity of ±1% can be achieved when deposition is performed on a batch of three φ4" device substrates (a different type than the aforementioned wafers). The same degree of uniformity is possible even with 10 consecutive batches.

Conclusion

TEOS-SiO_2 deposition via the PD-270STLC demonstrates favorable deposition uniformity and repeatability across three φ4" substrates, which can be utilized for the fabrication of electronic components and other applications. For more information about TEOS-SiO_2 deposition, please contact a Samco representative. We would be happy to discuss your specific process needs.

*LSCVD (Liquid Source CVD) is a registered trademark of Samco Inc.

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