Effect of Revolution and Rotating Substrate for ALD SiO2 Film at Low Temperature Using SDP System

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We report in this article low-temperature SiO2 thin film ALD system for next-generation semiconductor devices which can have circle map controllability and provides a very uniform and conformal thin film.

In this study, we present a newly developed SDP^{TM} (Space-Divided Plasma) ALD system with a wide range of map controllability by both revolution and rotating the substrate, and dividing the area of Source/ Purge/ Reactant (Plasma)/Purge.

We have investigated the characteristics of SiO2 thin film composition by O2 plasma for reactant and BDEAS for Si source at low process temperature ranging from 50℃ to 100℃. We have realized thickness map controllability and CD map adjustment at a real device, while showing high productivity. We have used an ellipsometer, TEM, AFM, XPS to evaluate thin film characteristics. The result shows the uniformity less than 0.3%, step coverage more than 95% at aspect ratio of 60:1. This SiO2 film is better on wet etch rate & breakdown voltage compared to HTO (High-Temperature Oxide).