Introduction to the Dual-Chamber ALD System “AD-8002LPC”

Introduction

With the miniaturization and increasing functionality of semiconductor devices, the importance of Atomic Layer Deposition (ALD)—which enables nanoscale film thickness control and excellent coverage—is growing[1]. Among the types of films deposited by ALD, insulating oxide films such as AlO_2 and SiO_2 were among the first to be adopted in mass production processes and play a crucial role in manufacturing applications. Meanwhile, demand is also growing for a diverse range of film types, including nitride films, films containing heavy metals, and conductive films. As shown in Table 1, Samco is actively pursuing development in these areas as well[2,3]. This report introduces the dual-chamber ALD system “AD-8002LPC.”

System Specifications

The AD-8002LPC is equipped with two reaction chambers, based on Samco’s well-established ALD system, the “AD-800LP.” Figure 1 shows the exterior of the system. This system is equipped with a vacuum cassette chamber and supports both direct wafer handling and tray transfer.

For production applications, processing the same film type simultaneously in both reaction chambers reduces the takt time per cassette, as shown in Table 2. For research applications, depositing different film types in each reaction chamber helps minimize contamination. Additionally, the system enables the deposition of multilayer films with different deposition temperatures, a feat difficult to achieve with a single reaction chamber. In addition, by selecting appropriate precursors, the system supports deposition of a wide variety of oxide and nitride films.

Performance and Deposition Data

Figure 2 shows the deposition results obtained using the AD-8002LPC. Using 8-inch Si wafers, TiOx was deposited by thermal ALD in each reaction chamber for three consecutive batches. TDMAT (tetrakis(dimethylamino)titanium) was used as the precursor, and H_2O was used as the oxidant. In both reaction chambers, the uniformity and GPC (Growth Per Cycle; deposition amount per cycle) during the three consecutive batches were confirmed to be highly stable.

Table 1. ALD deposition materials

Oxide film				Nitride film			
	Thermal		Plasma				
	H_2O	O_3	O_2		N_2	NH_3	N_2/H_2
AlO_x	◎	◎	◎	AlN	◎	◎	◎
TiO_x	◎	☆	◎	TiN	—	◎	◎
SiO_2	X	◎	◎	SiN_x	◎	X	X
HfO	◎	☆	◎	HfN	—	☆	☆
ZrO	◎	☆	◎	ZrN	—	—	—
SnO	◎	◎	☆	SnN	—	☆	☆
ZnO	◎	☆	☆	ZnN	—	—	—
TaO_x	◎	☆	◎	TaN	—	☆	◎
GaO_x	☆	—	☆	GaN	—	☆	☆

◎ Proven track record
☆ Available upon request
X Unsuitable for our systems
— Little demand, rare in literature

Figure 1. ALD system AD-8002LPC

Table 2. Comparison of processing time per wafer and takt time

	AD-800LP	AD-8002LPC
Process time per wafer [min]	132	128
Takt time for 25 wafers [min]	3,330	1,670

For TiO_x deposition of 20 nm (GPC: 0.6 Å/cycle)
Processing time may vary significantly depending on film type and application

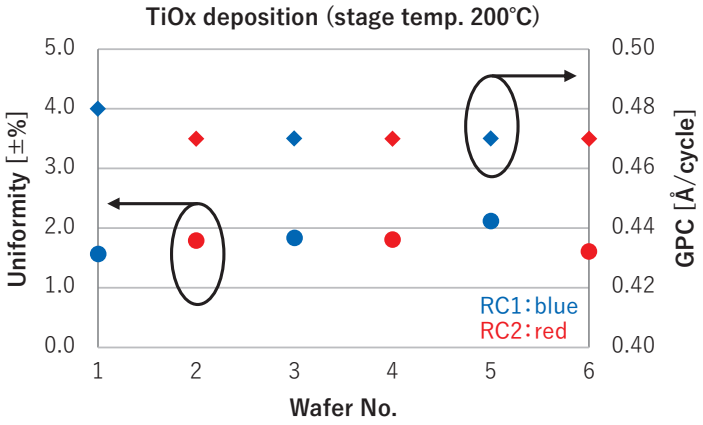

Figure 2. Results of three consecutive deposition batches in each reaction chamber of AD-8002LPC

Conclusion

In this report, we introduced the specifications of the dual-chamber ALD system “AD-8002LPC” and the basic performance of thermal ALD deposition. This system supports not only thermal ALD but also plasma ALD, and the plasma source can be selected from two types: parallel-plate and remote plasma.

Designed for a wide range of applications from research to production, the system also supports through-the-wall processing, a feature frequently required in production environments.

Going forward, we plan to expand the dual-reactor configuration to include “ALD+α” processes such as “ALD+CVD,” “ALD+ALE,” and “ALD+Aqua.”* We will continue to develop both the equipment and processes to meet customer needs.

*Aqua Plasma®: Samco’s proprietary water vapor-based plasma surface treatment process.

■ References

1. T.-Y. Lee et al., “Advances in core technologies for semiconductor manufacturing: applications and challenges of atomic layer etching, neutral beam etching and atomic layer deposition,” *Nanoscale Advances*, Vol. 7, (2025), pp. 2796–2817.
2. G. K. Deyu et al., “Recent advances in atomic layer deposition of superconducting thin films: a review,” *Materials Horizons*, Vol. 12, (2025), pp. 5594–5626.
3. Samco Inc., “Plasma enhanced and thermal ALD system AD-800LP,” *Samco Now*, Vol. 118 (July 2022).