CSTIC 2025 POSTER

Optimizing Photoresist Coating Processes with Computational Fluid Dynamics and Taguchi Design of Experiments

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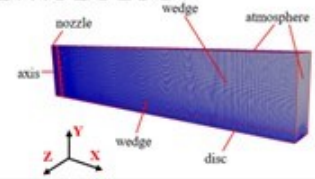
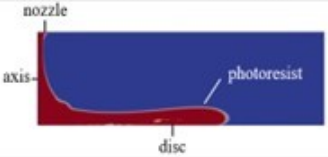
INTRODUCTION

- The uniformity of photoresist film thickness is crucial in microelectronics manufacturing.
- Traditional models predict only the average photoresist thickness, limiting effectiveness.
- An OpenFOAM-based model was developed to simulate photoresist distribution on the rotating wafer and the Taguchi method was used to optimize the process.

METHODOLOGY



Two-dimensional simulations are considered by employing a fan-shaped with minimal angle mesh.

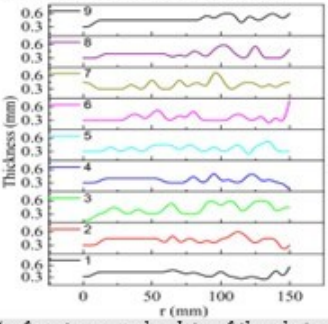


The photoresist is ejected from the nozzle and strikes the disc rotating around the axis vertically.

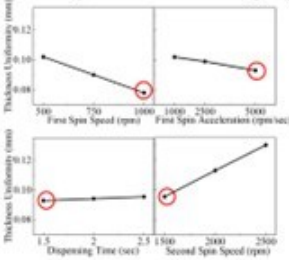
Expt. No	Experiment Parameters			
	First Spin Speed (rpm)	*Acceleration (rpm/sec)*	*Dispensing Time (sec)*	*Second Spin Speed (rpm)*
1	750	5000	1.5	2000
2	500	1000	1.5	1500
3	750	1000	2	2500
4	750	2500	2.5	1500
5	1000	1000	2.5	2000
6	500	5000	2.5	2500
7	500	2500	2	2000
8	1000	2500	1.5	2500
9	1000	5000	2	1500

A set of optimization experiments were designed based on Taguchi's DOE.

RESULTS & DISCUSSION



Surface topography data of the photoresist film extracted from the simulation program.



The optimized results obtained from the statistical analysis of the film thickness data.

SUMMARY

- The relationship between process parameters and the uniformity of photoresist film thickness was investigated using computational fluid dynamics.
- Employed the Taguchi experimental design techniques to optimize the coating process.
- The findings can provide valuable guidance for the optimization of photoresist coating process formulas.