Sustainable Semiconductor Manufacturing

Increasing efficiency and reducing F_2 consumption of a LPCVD system for the deposition of polycrystalline Si layers

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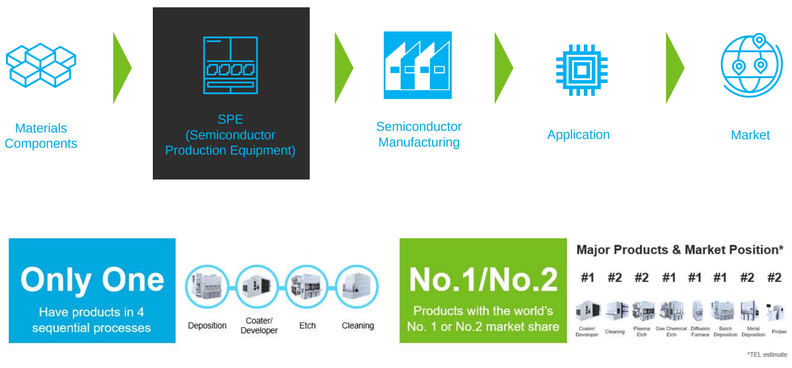
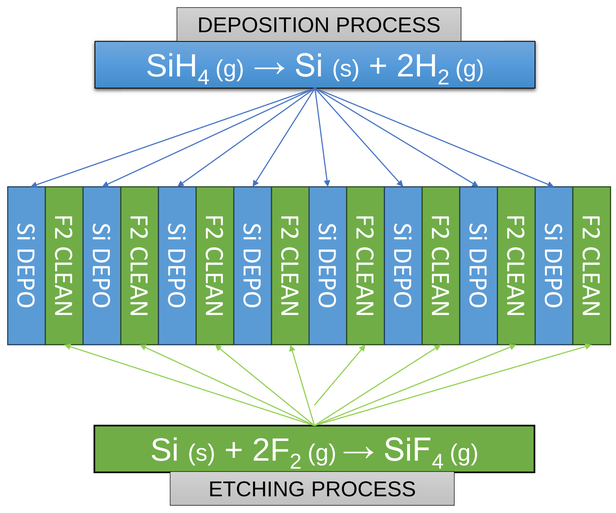
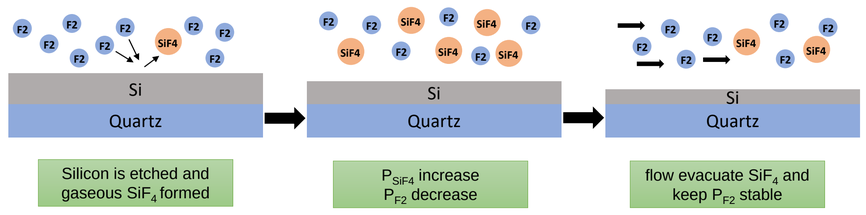
1 Tokyo Electron



2 Process Development



Thermal thin film deposition of Polysilicon layers by Low Pressure Chemical Vapour Deposition (LPCVD) on silicon substrates followed by in-situ dry clean of reactor parts using Fluorine gas (F_2).



This work investigates F_2 savings to lower the environmental impact and total cost of ownership (TCO).

3 Analytical Approach

Cleaning sequences for different layer thicknesses (undoped and boron doped polysilicon) were analysed using residual gas analyser (RGA) for endpoint detection. F and SiF_3 concentration were measured in the vacuum line.

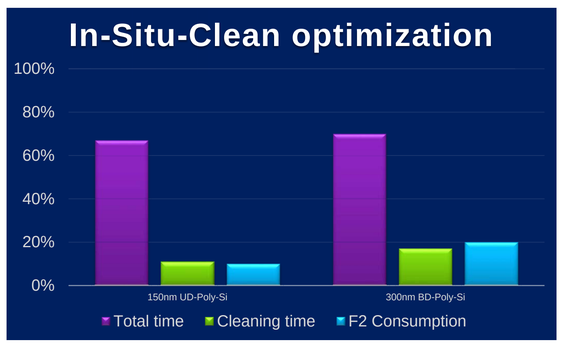
Decreased reading of SiF_3 in combination with increased F signal indicates cleaning endpoint due to saturation of cleaning reaction within the reactor chamber.

Different cleaning sequences were optimized by injector sequencing, minimizing gas flows and cleaning times. Finaly the results were verified visually.

4 Results

~90%
less F_2 needed

Savings	Silicon Deposition
Total time	33%
Cleaning time	89%
F2 Consumption	90%



5 Summary

- Higher Productivity
- Cost Reduction
- Safety Improvement
- Improved Parts Lifetime
- Lower Environmental Impact

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