2X-Clean Process on 200 mm TEOS/FTEOS Producer for improved Throughput and less NF3 consumption

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Primary Area of Interest:

Cost reduction, throughput improvement

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PROBLEM DESCRIPTION

As part of a program to reduce emissions of global warming gases from semiconductor
production equipment NF3 was widely introduced in dielectric CVD chamber cleaning- The near-total dissociation of the gas achieves both superior chamber cleaning performance and improved environmental friendliness. When the industry moved to NF3 based cleans, this caused a NF3 shortage combined with high prices of NF3. The industry goal was now to reduce the NF3 consumption for cost reduction and reduced HF emission from the process.

OPPORTUNITY FOR IMPROVEMENT

The implementation of a 2X-Clean itself is nothing new to the industry. Caused by the temperature dependency of the TEOS/FTEOS process itself, the implementation of the standard 2X-Clean technique would lead to a higher Wafer-to-Wafer variation. With the development of a time corrected 2X-deposition it was possible to sustain the good Wafer-to-Wafer variation with getting the full benefit out of the 2X-Clean Process methology. In addition a significant throughput improvement of 15% for normal production thicknesses could be achieved. Only the implementation of the 2X-Clean reduced the NF3 consumption up to 25%, further optimization can reduce the NF3 usage up to 50% without jeopardizing the high throughput or good particle performance. Further cost reduction for the TEOS/FTEOS Producers are located in the area of APC.

CONCLUSION

The introduction of 2X-Cleans is a sufficient method to reduce NF3 consumption and increase wafer throughput while maintaining process and hardware stability.