



## Investigation of physical and chemical interactions during etching of silicon in dual frequency capacitively coupled HBr/NF<sub>3</sub> gas discharges

By Marco Reinicke

Books On Demand Nov 2009, 2009. Taschenbuch. Book Condition: Neu. 213x151x20 mm. Neuware - High aspect ratio silicon etching used for DRAM manufacturing still remains as one of the biggest challenges in semiconductor fabrication, requiring well understood and characterized process fundamentals. In this study, physical and chemical interactions during etching silicon in capacitively coupled plasma discharges were investigated in detail for different HBr/NF<sub>3</sub> mixed chemistries for single frequency as well as dual frequency operation and medium discharge pressures inside an industrial MERIE CCP reactor typically used for DRAM fabrication. Utilization of the dual frequency concept for separate control of ion energy and ion flux, as well as the impact on discharge properties and finally on etching at relevant substrate surfaces were studied systematically. The complex nature of multi frequency rf sheaths was both analyzed experimentally by applying mass resolved ion energy analysis, and from simulation of ion energy distributions by using a Hybrid Plasma Sheath Model. Discharge composition and etch processes were investigated by employing standard mass spectrometry, Appearance Potential Mass Spectrometry, Quantum Cascade Laser Absorption Spectroscopy, rf probe measurements, gravimetry and ellipsometry. An etch model is developed to explain limitations of silicon etching in HBr/NF<sub>3</sub> discharges to achieve highly anisotropic etching. 284...

### Reviews

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