Abstract Submitted
for the GEC10 Meeting of
The American Physical Society

Study of the modifications induced by plasma VUV light on photoresist polymers for the development of plasma cure treatments MARC FOUCHIER, ERWINE PARGON, LAURENT AZARNOUCHE, OLIVIER LUERE, KEVIN MENGUELTI, GILLES CUNGE, CNRS/LTM, NADER SADEGHI, CNRS/LSP — As the critical dimension of gate transistors scales down to the nm range, LineWidth Roughness (LWR) becomes a serious issue. The key to decrease the final LWR is to minimize photoresist (PR) LWR before plasma transfer. It was observed that Vacuum Ultra Violet (VUV) light emitted by plasmas leads to significant PR chemical modifications that result in LWR decrease and etch resistance improvement. In order to optimize such treatment, a better understanding of plasma VUV light/PR interactions is needed. For this purpose, we have investigated the optical emission of various plasma chemistries (HBr, Cl2, N2) and the PR absorption before and after treatment in the VUV range (200-100nm). Among all plasmas investigated, HBr shows the strongest emission due to atomic Br lines at 157.5 and 163.3nm. The emission increases with source power, and decreases with pressure and gas flow. This strong emission is well correlated to the chemical modifications observed in the PR. The absorption spectra before treatment show a strong absorption between 100 and 170nm, while after HBr plasma treatment, the presence of a new absorption peak near 195nm conveys the formation of carbon double bonds which may explain the improved etch resistance.

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Date submitted: 10 Jun 2010 Electronic form version 1.4