

Abstract Submitted
for the GEC07 Meeting of
The American Physical Society

Plasma Etching of Extremely High Aspect Ratio Features: Twisting Effects¹ MINGMEI WANG, ANKUR AGARWAL, YANG YANG, MARK J. KUSHNER, Iowa State University — Plasma etching of small features having very large aspect ratios allows only a marginal CD variation. Etching extremely high aspect ratios (~ 100) necessitates obtaining a uniform plasma density with high energy ions to mitigate the effect of energy losses due to sidewall impacts. Undesirable behavior such as tapering and twisting has been observed in etching of such features. Twisting is the sometimes sudden turning of a via or trench from the vertical to a side angle which occurs nearly randomly. For example, of three adjacent features, only one may display the behavior. One theory on the source of twisting is charging within and adjacent to the feature. In this talk, results from a computational investigation of plasma etching of extremely high aspect ratio features will be discussed. The 2-d Hybrid Plasma Equipment Model was linked with the Monte Carlo Feature Profile Model (MCFPM) to assess the effect of charging on the etching of high aspect ratio features. The MCFPM was modified to include the effects of charging by electrons and ions, including solution of Poisson's equation and conduction current through solid materials. Results will be discussed for an electron cyclotron resonance plasma reactor etching of SiO₂ in fluorocarbon plasmas.

¹Work supported by Micron Inc. and Semiconductor Research Corp.

Mark J. Kushner
Iowa State University

Date submitted: 15 Jun 2007

Electronic form version 1.4