Abstract Submitted
for the GEC12 Meeting of
The American Physical Society

Multi-scale approach for simulation of deep silicon etching under ICP SF6/Ar plasma mixture[1] AMAND PATEAU, AHMED RHALLABI, MARIE CLAUDE FERNANDEZ, Institut des Materiaux Jean Rouxel - University of Nantes, FABRICE ROQUETA, MOHAMED BOUFNICHEL, ST Microelectronics Tours, PLASMAS ET COUCHES MINCES TEAM, ST MICROELECTRONICS TOURS TEAM — Deep etching of silicon represents a new challenge in the silicon semi-conductor manufacturing. Indeed, deep silicon etching is used to form through-silicon vias and connect stacked dies or wafers in 3D integration. In this context, computer simulation of plasma etching can contribute to the optimization of the etching process. In this study, we have developed a silicon etching simulator under ICP SF6/Ar plasma discharge. Such model is composed of three modules permitting to predict the 2D etched silicon morphology versus the operating conditions: plasma kinetic model, sheath model and etching model. The plasma kinetic model is based on the 0D global approach which allows the calculation of the average densities and fluxes of neutral and ion species as well as the electron density and temperature versus the ICP machine parameters. Such output parameters are introduced as input parameters in the sheath model and silicon etching model. Cellular Monte-Carlo method is used to describe the plasma surface interactions in a probabilistic way for silicon etching trough the mask. The aim of this work is to validate the set of simulation and show the influence of some input parameters (Rf power, pressure, gas flow rate and bias voltage) on the etching processes.

[1]This work is supported by ST Microelectronics Tours - France.

Ahmed Rhallabi
Institut des Materiaux Jean Rouxel - University of Nantes

Date submitted: 13 Jun 2012 Electronic form version 1.4