Abstract for an Invited Paper
for the GEC07 Meeting of
The American Physical Society

A new generation of cryogenic processes for silicon deep etching

REMI DUSSART, GREMI - University of Orleans

Deep etching of silicon is intensively used in microtechnology for MEMS and power microelectronic components. At GREMI, we study and develop the cryoetching process, which is a good alternative in terms of rapidity and cleanliness compared to other processes (e.g. Bosch process). The reactor is an ICP where the wafer is cooled down to a very low temperature (about -100 $^{\circ}$C). SF6 and O2 are the basic gases involved in the process. O2 (10 %) is used to form an SiOxFy passivation layer, which grows on vertical sidewalls not submitted to ion bombardment. This oxidation occurs very efficiently at very low temperature of the substrate. The perfect control of this passivation layer formation is a key issue in the cryogenic process. Mass spectrometry measurements give the evolution of the oxidation threshold (necessary oxygen proportion to form the passivation layer) as a function of temperature, RF power and bias. The role of the etch by-products (SiF4) in the formation of the SiOxFy layer was investigated using ellipsometry and mass spectrometry. With this study, we were able to develop new processes based on steps of SiF4/O2 plasmas to enhance the passivation layer deposition and efficiency.