PROGRESS REPORT FOR AINGRA06073

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<th>PROJECT TITLE</th>
<th>SIMS analysis on epitaxy SiC layer on Si</th>
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**SCIENTIFIC OBJECTIVES**

The epitaxial growth of high quality 3C SiC on Si requires a seed of the material to be realised before further growth can proceed. Obviously if the starting material is silicon, some means of converting or modifying the silicon surface to SiC for seed purposes is required. SIMS can be a sensitive and informative technique for the characterization of SiC on Si. A great deal of information about C, Si distribution, impurities, structural defects may be obtained from SIMS measurement.

**PROGRESS REPORT and RESEARCH OUTCOMES**

In essence, SIMS experiments have focused on the interface properties of structural carbonization and epitaxy SiC on Si. A series of steps that follow carbonization and epitaxy layers have been studied in relation to their effects on the quality of SiC and its interface with Si. The first of these experiments investigated the profile of the carbonization layer, measuring the diffusion of carbon which has to be compared with our Transparent Electron Microscopy (TEM) image results. SIMS experiments also investigated the Si and SiO2 interface which involved different elements in the interface area such as carbon, silicon, nitrogen or other impurities.

To date, we have successfully developed and tested a sequential carbonization approach for SiC seed layers. The next segment of this work is to investigate the role of the seed layers in creating thick SiC films. We plan to complete this research in the next round experiments.

Our project has been significantly benefited by the AINSE funding support. From the results generated by the investigation of the interface between SiC and Si, the flow rates and partial pressures of epitaxy gases have been adjusted to get a decent SiC seed layer. The SIMS investigation on the interface between SiO2 and SiC indicates the industry standard interface for CMOS transistor, which further strengthens our position as one of the leading groups in SiC society of the world.

**DATA**

Figure 1 and Figure 2 indicates the carbon diffusions from SiC to Si with different carbonization conditions. The different slopes of carbon and silicon show the concentration with the depth.
Figure 1 and Figure 2 shows the concentrations of N, O, Si and C. It clearly indicates that the quality of interface is depended on the process for gate oxide growth.

Figure 3 and Figure 4 shows the concentrations of N, O, Si and C. It clearly indicates that the quality of interface is depended on the process for gate oxide growth.
Figure 3 SIMS results for the sample E152 (NH3 treated) with different annealing temperatures

Figure 4 SIMS results for the sample E146 (No treated) with different annealing temperatures
PUBLICATIONS / REPORTS arising as a result of your work.

1. Deep void formation mechanism in Si(100) during its carbonization, in press, Thin Solid Films
   Support by AINSE funding AINGRA0507

2. Pre-linear growth model for the thermal oxidation of silicon carbide, submitted to Applied Physics letters
   Supported by AINSE funding AINGRA06073

PhD STUDENTS

Li Wang, a PhD student, is involved with the project SIMS analysis on epitaxy SiC layer on Si, her thesis is going
on still.