AN 358
Improved Detection Limits in SIMS Measurements of SiC

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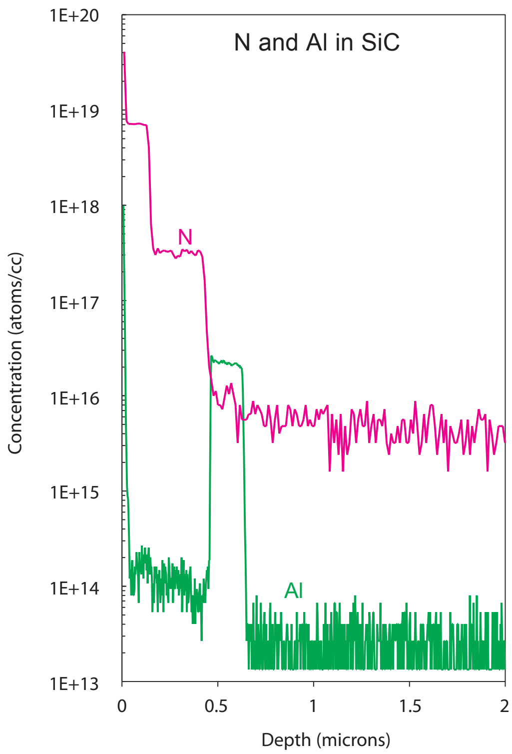
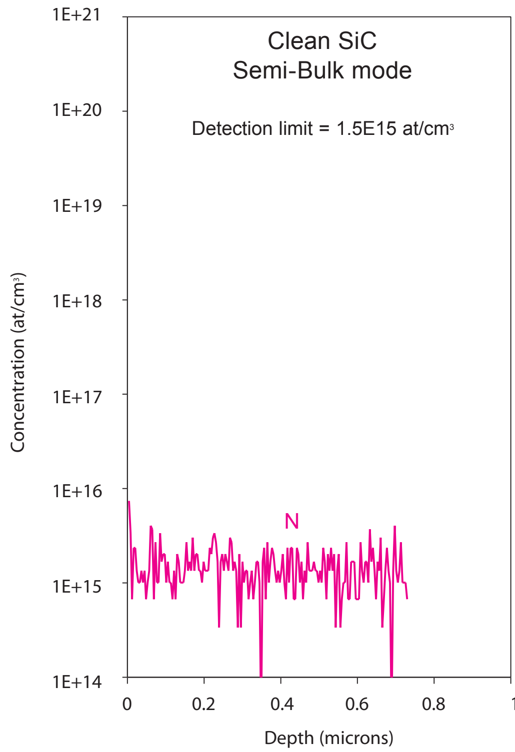
Discussion

SiC is a very important material for high-power, high-temperature, and high-radiation devices. The requirements for improving yields demand lower levels of impurities. In terms of SIMS this means the ability to measure very low doping or contamination levels in SiC. SiC material vendors and device manufacturers would benefit from the solution to this problem.

Doping levels in SiC are becoming very low. This requires lower allowable impurity concentrations. The analytical need is to provide accurate measurements to be able to distinguish differences in doping levels and presence or absence of impurities or unintentional dopants. Due to its unique capabilities of high detection sensitivity for a variety of elements, Secondary Ion Mass Spectrometry (SIMS) is an essential tool for characterization of dopants and impurities in SiC material.

We have adapted two SIMS tools for specialized analysis of three major dopant species in SiC: B, Al, and N. These two tools are also dedicated to these measurements. This provides us the capability to measure dopant or contamination levels 5-20 times lower than before. The depth profile (Figure 1) shows Al contamination in N doped layers; N contamination in the Al doped epi-layer; and detection levels of 2e13 at/cm^3 for Al and 5e15 at/cm^3 for N. B detection levels are about 1e13 at/cm^3. Figure 2 illustrates a semi-bulk mode analysis with a N detection level of ≤2e15 at/cm^3. SIMS is thus a vital tool for determining the doping concentration and resolving whether impurities are present.





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