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Investigation of Diffusion for the ion implanted Xenon in 6H-SiC

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Abstract content
 (Max 300 words)

Abstract

The diffusion behaviour of implanted xenon in 6H-SiC has been investigated using Rutherford backscattering spectroscopy (RBS) and channelling techniques. Xenon (Xe⁺) ions with energy of 360 KeV were implanted in SiC with a fluence of $1 \times 10^{16} \text{ cm}^{-2}$ at room temperature (23oC) and 600°C. 5h isochronal annealing was performed at temperatures ranging from 1000 to 1500°C in steps of 100oC. Channelling revealed that the sample (6H-SiC) at room temperature created an amorphous layer, 600°C it did not cause amorphisation, the crystal structure was preserved. Annealing the sample from 1000oC to 1500oC for caused some annealing of the radiation damage with defects still remaining. While at 600oC the damage pick disappears completely at 1500oC but the virgin spectrum is not achieved. This happened because of dechannelling due to extended defects like dislocations.

RBS on the annealed samples 600oC showed that no diffusion of the Xe occurred on the implanted samples when they were annealed with temperatures from 1000oC to 1400oC. A slight shift of the xenon peak position towards the surface after annealing at 1400°C was observed for 600oC implantation. After annealing with 1500oC, a shift toward the surface accompanied by diffusion was observed to be taking place for both 600oC implantation. In the room temperature implanted samples there was evidence of diffusion of the xenon which only started after annealing at 1200°C. The diffusion was accompanied by a loss of xenon from the SiC surface. The shift towards the surface is due to thermal etching of the SiC at 1400 and 1500°C and it might also be due to the migration of xenon corresponded to a gas migration model.

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Level for award
 (Hons, MSc,
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MSc

Main supervisor (name and email)
and his / her institution

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