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Lattice Position of Displaced Atoms in Boron Implanted Silicon

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In the present paper the lattice position of displaced Si atoms in B^+ implanted silicon as well as the subgap absorption are studied. Implantations were simultaneously performed into <100>, <110> and <111> oriented Si substrates (7° off the main axis) at room temperature. In order to obtain an almost homogeneously damaged layer about 0.8 μm thick, an energy-dose-program was used (300 keV B^+: ion dose N_1, 150 keV B^+: ion dose $0.5N_1$, and 50 keV B^+: ion dose 0.46 N_1; dose variation $1\text{x}10^{14}$ cm$^{-2} \leq N_1 \leq 1\text{x}10^{16}$ cm^{-2}). Rutherford backscattering (RBS) - channeling measurements at 300 K and 100 K were carried out. By evaluating the RBS spectra in the framework of the discontinuous model of the dechanneling the concentration of displaced Si atoms as well as their displacement distances perpendicular to the <100>, <110> and <111> axes were calculated.

By means of the Photothermal Deflection Spectroscopy (PDS) the subgap absorption behaviour was investigated which gives additional information about the defect concentration, especially of the concentration of divacancies. By comparing the results of the temperature dependent RBS and the PDS measurements an attempt is made to get an idea about the microscopic defect structure in weakly damaged B^+ implanted Si.