The diagram of $p-n$ junction formed on the n-GaAs surface by 1.5 keV Ar^+ ion beam

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The core-level and valence band electronic structure of the n-GaAs (100) has been studied by synchrotron-based high-resolution photoelectron spectroscopy after irradiation by an Ar^+ ion beam with energy $E_i = 1500$ eV and fluence $Q = 1 \cdot 10^{15}$ ions/cm^2. Conversion of the conductivity type of the surface layer and formation of a $p-n$ structure have been observed. The p-surface layer thickness ($d \sim 5.0$ nm) and band structure were experimentally determined from the Ga3d photoelectron spectrum by separation and analysis of the low intense n-type bulk contribution from deeper layers. A band diagram of the $p-n$ junction formed on the n-GaAs-surface by Ar^+ ion bombardment was reconstructed. The $p-n$ junction proved to be unexpectedly narrow compared to the extended tail of the implanted ion depth distribution.

Keywords: GaAs, $p-n$ junction, band structure, ion irradiation, Ar^+ ion beam.

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