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Optical spectra of the near surface layers of GaAs implanted with Xe⁺, In⁺ and Kr⁺, ellispometric and nuctear investigation

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The (100) surface of SI GaAs single crystals have been doubly irradiated with Xe+ ,In+ and Kr+ ions. The ion energies were in region from 100 keV to 300 keV, and the total fluence were 3x1013 cm-2 and 3x1016 cm-2. The parameters of the ion implantation, for all ions, were chosen to provide formation of a parallel flat layer containing the constant value of atomic concentration of doped atoms in the implanted layers. The optical spectra: refraction and extinction spectra of for the all samples were determined from the spectroscopic ellipsometry (SE) measurements. The investigations were performed in the range of the wavelength from 250 nm to 900 nm at four angles of incidence of the light beam (65o, 70o, 75o and 80o). The three phase model was used for description of the investigated samples (an ambient, a parallelepiped homogeneous layer of native oxide and homogeneous substrate). The parametric model of dielectric function was used for the determination of optical spectra of irradiated samples with fluence 3x1013 cm-2 and EMA approximation was applied in the study of samples implanted with fluences 3x1016 cm-2. The thicknesses of the all implanted layers have been investigated using the nuclear methods of Rutherford backscattering spectrometry (RBS). In this study, it was assumed that the thickness of implanted layers depends only on a kind and the energy of the incident ions. It observed that the intensity of the dielectric functions near the critical points CP in the obtained spectrum is changing after radiation damage. The obtained results confirm that the measurements using the nuclear methods as well as SE technique give a consistent description of the implanted GaAs samples.

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