Strain Profiles in the Insulated Buried Layers Obtained by He Implantation in AlGaAs

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The insulated buried layers formed by 150 keV He ions to $Al_xGa_{1-x}As$ with various concentration of Al were studied with synchrotron diffraction methods. Some samples were studied with HRTEM. The implantations were performed at RT, 80 and 120º C. The doses varied from 2×10^{16} to 6×10^{16} cm^{-2}. The measurements included taking local rocking curves using small 50×50 μm^2 probe beam. The rocking curves exhibited characteristic interference maxima and enabled the analysis of the strain profiles by fitting the theoretical rocking curves obtained by numerical integration of the Takagi-Taupin equations. The white beam synchrotron back reflection topography revealed a sequence of strain modulation fringes similar to the main interference maxima in the rocking curves. The evaluated profiles exhibited the deformed region close to the surface indicating that the deformation is mainly caused by the point defects produced by incident ions and the recoils. The other feature increasing with the temperature of implantation was the flattening of top part of the strain maximum corresponding to the insulating buried layer. This flattening was more distinct for lower concentration of Al. The HRTEM patterns revealed characteristic small gaseous inclusions appeared in the most deformed region in the samples implanted with the highest applied doses.

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