X-Ray Synchrotron Studies of AlGaAs Based Laser Structures

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Modern semiconductor lasers include a complicated layered structures with quantum wells and insulated buried layers introduced by selective implantation with He or H ions. The strain and defects induced by implantation may disturb the action of the laser. In present studies the most important methods of characterization were white beam Bragg case section topography and recording of rocking curves with a small $50 \times 50\ \mu m^2$ probe beam.

The investigations were performed in a special multilayers containing two relatively thick layers of AlGaAs separated by a thin layer with smaller Al concentration, covered by 0.3 μm GaAs cup. The structures were studied before and after implantation with 150 keV He ions at room temperature and 180º C. It was possible to reproduce the character of experimental rocking curves in numerically simulated using the Takagi-Taupin theory. In the computations we included the change of chemical composition and a strain profile being a sum of strain connected with epitaxial layers and the point defect distribution obtained with TRIM95. The necessary modification of the point defects distribution was flattening of the top part.

The section topographs revealed stripes due to successive epitaxial layers and the strain modulation fringes due to the buried layer. In case of selective implantation the topographs revealed some contrasts due to strains at the edges of the implanted areas.

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