

Thermal Conductivity and Optical Absorption of GaInAsSb/GaSb Laser Structure: Impact of Annealing Time

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Abstract : GaInAsSb grown on GaSb substrate is an interesting material employed as an active layer in vertical-cavity surface-emitting lasers (VCSELs) operating in mid-infrared emission. This material presents some advantages like high optical absorption coefficient and good thermal conductivity, which is very desirable for VCSEL application. In this paper, we have investigated the effects of thermal annealing on optical properties and thermal conductivity of GaInAsSb/GaSb. The studies are carried out by means of the photo thermal deflection spectroscopy technique (PDS). In fact, optical absorption spectrum and thermal conductivity have been determined by a comparison between the experimental and theoretical phases of the PDS signal. We have found that thermal conductivity increased significantly to 13 W/m.K for GaInAsSb annealed during 60 min. In addition, we have found that bandgap energy is blue-shifted around 30 meV. The amplitudes signal of PDS reveals multiple reflections as a function of annealing time, which reflect the high crystalline quality of the layer.

Keywords : thermal conductivity, bandgap energy of GaInAsSb, GaInAsSb active layer, optical absorption

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