

Thermal Annealing Effects on Minority Carrier Lifetime in GaInAsSb/GaSb by Means of Photothermal Deflection Technique

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Abstract : Photothermal deflection technique PTD have been employed to study the impact of thermal annealing on minority carrier in GaInAsSb grown on GaSb substrate, which used as an active layer for Vertical Cavity Surface Emitting laser (VCSEL). Photothermal deflection technique is nondestructive and accurate technique for electronics parameters determination. The measure of non-radiative recombination, electronic diffusivity, surface and interface recombination are effectuated by fitting the theoretical PTD signal to the experimental ones. As a results, we have found that Non-radiative lifetime τ_{nr} increases from 3.8 μs ($\pm 3, 9\%$) for not annealed GaInAsSb to the 7.1 μs ($\pm 5, 7\%$). In fact, electronic diffusivity D increased from 60.1 ($\pm 3.9\%$) to 89.6 cm^2/s ($\pm 2.7\%$) for the as grown to that annealed for 60 min respectively. We have remarked that surface recombination velocity (SRV) decreases from 7963 m/s ($\pm 6.3\%$) to 1450 m/s ($\pm 3.6\%$).

Keywords : nonradiative lifetime, mobility of minority carrier, diffusion length, Surface and interface recombination velocity. GaInAsSb active layer

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