Stained Barriers Influence on InGaAsN Quantum Well Laser Diodes

Ashour, Hussam (School: Dar Althikr Private School)

Fiber optical cables connect the whole world to the internet and most of these cables use strained quantum well laser diodes (SQWLDs). Laser diodes lose around 25% of the power they are given in the form of heat due to some internal effects. Strained barriers (SBs) are materials with a large bandgap that go into the structure of the quantum well laser diodes (QWLDs) and they have proven to reduce the threshold current of the device. This research examines the effect of SBs on the QWLDs electrical properties and explains the internal effects that occur. Four devices were used in this experiment of two different cavity lengths. The devices' electrical properties were tested by controlling their temperature and measuring the I-V curve at a range of temperatures (240K-260K) and input current (0mA-12.5mA). After analyzing the results, the linear series resistance was found to increase by around 2.26 milliohms when SBs are added. This increase was due to the high relative resistivity of the SBs material, GaAsP. It was found that the ideality factor for the devices increased by an average of 9% over said temperatures. This increase was due to the increase of the occurrence of tunneling field emission in the conduction band. This project will provide a deeper understanding of the internal effects of SQWLDs, which may be useful in industries such as medial therapy, automotive and aerospace.

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