Optimization of optical gain by thin layers in QW diode lasers

M. Oskoe, M. Amir Manouchehry

Water and Energy Research Center, Sharif University of Technology
Email: oskoie@sharif.edu.ir

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Abstract: Advanced diode laser consists of a two dimensional thin layer which is about 10 nanometers size. Optical gain of thin layers has a great deal of importance in light amplification. Thin layers cause a modification in conduction and valance bands of bulk materials. Subbands have been computed through effective mass equations. As a result of this method, particular effective masses are available. These specific equations are formed by numerical methods. Studied structure in this research includes a two dimensional thin layer of GaAs with a quantum well width from 7.5 to 8.5 nanometers, cladded by two layers of AlGaAs which has a larger band gap. Aluminum percentage has been chosen 15 to 45 percent. Results from this study demonstrates that quantum well width should be adjusted according to Aluminum percentage, and the final optimized result, based on the developed optical gain model, is a thin layer of 8.5 nanometers width cladded by a 25 percent of aluminum in AlGaAs materials.

Key Words: nanometer size, Quantum Well (QW) Diode Lasers, quasi-fermi levels, energy subbands, optical gain.