

عنوان مقاله:

Performance Enhancement of Deep Violet InGaN Double Quantum Wells Laser Diodes with Quaternary Superlattice Barriers Structure

محل انتشار:

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خلاصه مقاله:

The performance characteristics of InGaN Double-Quantum-Well (DQW) Laser Diodes (LDs) with different barrier structures were studied numerically by Integrated System Engineering Technical Computer-Aided Design (ISE TCAD) software. Three different kinds of structures of barriers including quaternary AlInGaN and AlInGaN/AlGaN superlattice barriers were used and compared with conventional GaN in InGaN-based laser diodes. Replacing the traditional GaN barriers with quaternary AlInGaN increased holes and electrons flowing in the active region and thus, the radiative recombination enhanced the output power. However, it did not reduce the threshold current due to hole and electron overflowing. To investigate the ways of greatly reducing the threshold current, the structure consisting of AlInGaN/AlGaN superlattice barriers was proposed. The simulation showed that electrical and optical characteristics such as output power, Differential Quantum Efficiency (DQE), and slop efficiency were significantly enhanced for LDs containing superlattice barriers compared to the basic structure. This is while the threshold current was considerably reduced. The enhancement was mainly attributed to the improvement of hole injection and also the blocking hole and electron overflowing caused by the reduction of polarization charges at the interface between the barriers, the well, (and the Electron Blocking Layer (EBL).

کلمات کلیدی:

InGaN quantum well laser, superlattice barriers, Electrical and Optical Properties, numerical simulation

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