

عنوان مقاله:

The effect of hydrostatic pressure on the radiative recombination rate of InGaN/GaN multiple quantum well solar cells

محل انتشار:

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خلاصه مقاله:

In this paper, a numerical model is used to analyze photovoltaic parameters according to the electronic properties of InGaN/GaN multiple-quantum-well solar cells (MQWSC) under hydrostatic pressure. Finite difference techniques have been used to acquire energy eigenvalues and corresponding eigenfunctions of InGaN/GaN MQWSC, where all eigenstates are calculated via a 6×6 k.p method under applied hydrostatic pressure. All symmetry-allowed transitions up to the fifth subband of the quantum wells (multi-subband model) with barrier optical absorption are considered. The linewidth due to the carrier-carrier and carrier-longitudinal optical (LO) phonon scattering are also considered. A change in pressure up to ۱۰ GPa increases the intraband scattering time up to ۳۸ fs for heavy holes and ۴۰ fs for light holes. The raise in the height of the Lorentz function reduces the excitonic binding energy and decreases the radiative recombination rate up to ۰.۹۵×۱۰^{۲۵} cm^{-۳}S^{-۱}. The multi-subband model has a positive effect on the radiative recombination rate.

کلمات کلیدی:

recombination rate, Solar cell, optical absorption, multi-quantum well

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