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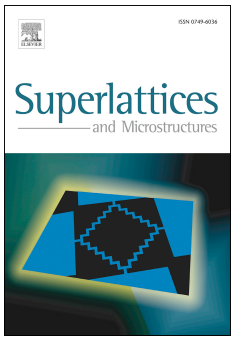

Numerical study of enhanced performance in ZnO-based ultraviolet light-emitting diodes with step graded-composition MgZnO multiple quantum barriers

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PII: S0749-6036(17)30569-4

DOI: 10.1016/j.spmi.2017.06.012

Reference: YSPMI 5061

To appear in: *Superlattices and Microstructures*

Received Date: 7 March 2017

Revised Date: 2 June 2017

Accepted Date: 2 June 2017

Please cite this article as: H. Long, J.H. Gu, H.N. Wang, C.Y. Yang, J. Hou, S.Z. Li, Y.Q. Yang, C.L. Wang, L.L. Zhao, Z.Y. Zhong, Numerical study of enhanced performance in ZnO-based ultraviolet light-emitting diodes with step graded-composition MgZnO multiple quantum barriers, *Superlattices and Microstructures* (2017), doi: 10.1016/j.spmi.2017.06.012.

Numerical study of enhanced performance in ZnO-based ultraviolet light-emitting diodes with step graded-composition MgZnO multiple quantum barriers

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Abstract

ZnO-based ultraviolet (UV) light-emitting diodes (LEDs) are attractive for potential applications. In the study, ZnO-based UV LEDs were numerically investigated to determine the effects of the different step graded Mg compositions in multiple quantum barriers (QBs) on their electrical and optical properties. With the increase of Mg composition for QBs from *n*-side to *p*-side, the maximum internal quantum efficiency of various LEDs increase from 32.6% to 91.9%. These improvements can be explained in terms of the modified energy band structures which improve hole injection from *p*-side to the active region and change the carrier-concentration distributions in multiple quantum wells, then lead to an improvement of radiative recombination rates. One can expect that by the elaborate design of device structure, the performance of ZnO-based LEDs can be further improved.

Keywords

Light-emitting diode (LED), ZnO, Ultraviolet (UV), Multiple quantum well (MQW), Internal quantum efficiency (IQE)

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