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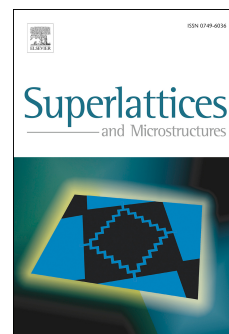
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Interband optical absorption in wurtzite $\text{Mg}_x\text{Zn}_{1-x}\text{O}/\text{ZnO}/\text{Mg}_y\text{Zn}_{1-y}\text{O}$ asymmetric quantum wells

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Abstract

Based on Fermi golden rule, the optical absorption induced by interband transition of electrons and holes in wurtzite $\text{Mg}_x\text{Zn}_{1-x}\text{O}/\text{ZnO}/\text{Mg}_y\text{Zn}_{1-y}\text{O}$ asymmetric quantum wells at room temperature has been discussed. The built-in electric field (BEF) and Poisson potential are considered to calculate the eigenstates and eigenenergies of electrons and holes. The interband optical absorption coefficients (IOACs) influenced by ternary mixed crystal and size effects as functions of incident photon wavelengths are presented. The results indicate that increasing Mg component in left barrier can enhance the BEF to enforce electrons (holes) close to the left (right) interface, so as to reduce the overlapping of their wave functions. Thus the IOAC peak decreases rapidly and presents a blue shift with the increment of Mg component x . Furthermore, the size effect on IOACs is also discussed. The absorption peak is more sensitive to the change of the well width than the left barrier size. The absorption peak reduces sharply and shows a red shift with the increase of the well width. Our results could provide guidance on experiments and device fabrication.

Key words: Asymmetric, ZnO/MgZnO quantum well, Electronic interband optical absorption

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