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Title:Design of GaAs/Al<inf>x</inf>Ga<inf>1-x</inf>As asymmetric quantum wells for THz-wave by difference frequency generation

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Abstract:The energy levels, wave functions and the second-order nonlinear susceptibilities are calculated in GaAs/Al<inf>0. 2</inf>Ga<inf>0. 8</inf>As/Al<inf>0. 5</inf>Ga<inf>0. 5</inf>As/Al<inf>0. 5</inf>Ga<inf>0. 5</inf>As asymmetric quantum well (AQW) by using an asymmetric model based on the parabolic and non-parabolic band. The influence of non-parabolicity can not be neglected when analyzing the phenomena in narrow quantum wells and in higher lying subband edges in wider wells. The numerical results show that under double resonance (DR) conditions, the secondorder difference frequency generation (DFG) and optical rectification (OR) generation susceptibilities in the AQW reach 2. 5019 &mu;m/V and 13. 208 &mu;m/V, respectively, which are much larger than those of the bulk GaAs. Besides, we calculate the absorption coefficient of AQW and find out the two pump wavelengths correspond to the maximum absorption, so appropriate pump beams must be selected to generate terahertz (THz) radiation by DFG. &copy; 2012 Tianjin University of Technology and Springer-Verlag Berlin Heidelberg.

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Main heading:Semiconductor quantum wells

Controlled terms: Gallium - Optical frequency conversion - Terahertz waves

Uncontrolled terms:Absorption coefficients - Asymmetric models - Asymmetric quantum wells -Difference-frequency generation - Double resonance - GaAs - Narrow quantum wells - Non parabolicity - Numerical results - Optical rectifications - Pump beams - Second orders -Second-order nonlinear susceptibility - Subbands - Terahertz radiation - Two-pump

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