

Influence of an External Magnetic Field on the Acoustomagnetolectric Field in a Rectangular Quantum Wire with an Infinite Potential by Using a Quantum Kinetic Equation

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Abstract : The acoustomagnetolectric (AME) field in a rectangular quantum wire with an infinite potential (RQWIP) is calculated in the presence of an external magnetic field (EMF) by using the quantum kinetic equation for the distribution function of electrons system interacting with external phonons and electrons scattering with internal acoustic phonon in a RQWIP. We obtained an analytic expression for the AME field in the RQWIP in the presence of the EMF. The dependence of AME field on the frequency of external acoustic wave, the temperature T of system, the cyclotron frequency of the EMF and the intensity of the EMF is obtained. Theoretical results for the AME field are numerically evaluated, plotted and discussed for a specific RQWIP GaAs/GaAsAl. This result has shown that the dependence of the AME field on intensity of the EMF is nonlinearly and it is many distinct maxima in the quantized magnetic region. We also compared received fields with those for normal bulk semiconductors, quantum well and quantum wire to show the difference. The influence of an EMF on AME field in a RQWIP is newly developed.

Keywords : rectangular quantum wire, acoustomagnetolectric field, electron-phonon interaction, kinetic equation method

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