

Electrical Characteristics of Double-barrier Resonant Tunneling Structures with Different Electrode Doping Concentrations

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Abstract

The electrical characteristics of AlGaAs/GaAs double-barrier resonant tunneling structures with various electrode doping concentrations have been studied. It was found that the peak current and the valley current are not sensitive to the change in the doping level of the electrodes. The peak-current voltage and the valley-current voltage, however, increase when the electrode doping level is lowered. These behaviors are explained using the band-bending effect in the electrodes. For devices with lightly doped or undoped electrodes, the quantum size effect in the accumulation layer due to the strong band bending causes additional kinks in the current-voltage characteristics. They are attributed to the resonant tunneling of electrons from the quantized levels in the accumulation layer. The quantum effect also accounts for the improved negative differential resistance behavior.