Computational modelling of electronic transport in semiconductor nanomaterials

R. Djelti, S. Bentata, Z. Aziz, A. Besbes

Sciences and technology department, BP 56 A/B 27000 Mostaganem Algérie
Laboratoire de valorisation des matériaux
E-mail: Djeltired@yahoo.fr

The effects of the applied bias voltage on the miniband structure of GaAs-Al_{x}Ga_{1-x}As multiple quantum well with correlated structural disorder are studied by a computational model using exact Airy function formalism and the transfer-matrix technique. For low voltages extended states exist, the conduction is ohmic and the electron tunnelling through. Above a critical value of $V_a$ the tunnel probability decreases considerably, the miniband structure is destroyed, the states become localized on different wells [1]. Commuting resonance energy disappears in the miniband structure, because to have this resonance peak means that the structure is periodic and symmetric. In the presence of an external voltage, the structure remains periodic but the slope induced by $V_a$ destroyed the symmetry by changing the potential shape, which can be explained by the Stark effect causing a change in the electronic states under the electric field action [2].

From the results obtained for the dimer and trimer structure, we can generalize that the introduction of correlated structural disorder in (Quadruplets, Quintuplets, Sextuplet...) provides more wavelengths located in far-infrared.

Keywords: Superlattices, bias voltage, computational model, wavelengths, infrared.