Large magnetoresistance effect in cylindrical semiconductor nanowires with constriction

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Magnetotransport properties of the three-dimensional semiconductor nanowires with a single constriction have been studied within the Landauer-Büttkier formalism in combination with the adiabatic approximation in the presence of the magnetic field aligned along the growth axis of the nanosystems. Performed calculations prove the occurrence of the large magnetoresistance effect in the examined nanosystems at low temperatures and at relatively high magnetic fields up to 12 T.

This effect is explained in terms of the Stark resonant states found in the quantum well in front of the constriction [1]. The magnetoresistance calculated as a function of the applied voltage exhibits rapid changes due to the influence of the transmission via the Stark resonances, and the modification of the current-voltage characteristics slope resulting from the applied magnetic field.

References:

[1] M. Wołoszyn, J. Adamowski, P. Wójcik, and B. J. Spisak, J. Appl. Phys. 114, 164301 (2013)

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