

Spin and charge transport in metal-semiconductor heterostructures with double Schottky barriers

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One of the most important problems in modern electronics and spintronics is direct ferromagnet-semiconductor spin injection.

Basing on the analysis of previously obtained experimental results, we model the electrical properties of the interfaces. The interfaces can be considered as Fe/n⁺-GaAs/n-GaAs/n⁺-GaAs/Fe heterostructure, which works as double Schottky barrier.

We develop the methods of numerical simulation of nonequilibrium processes in metal-semiconductor nanostructures with multiple layers. We have proposed an algorithm for the simultaneous determination of carrier concentration and the potential from the Poisson equation over the entire length of the sample.

As result of our investigation we find current-voltage characteristics and spin polarized current profiles calculated for various concentrations and shapes of dopants.

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