Optically-induced nonequilibrium spin currents in semiconductor nanostructures

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9.7 cm

One of the most important problems in modern electronics and spintronics is related to the optical manipulation of charge and spin currents in magnetic and nonmagnetic semiconductor nanostructures. Besides of the physical importance, the results of research in this direction can have various applications in spintronic devices for electronics and telecommunication.

We develop the basics of computer modelling of nonequilibrium processes in semiconductor nanostructures with multiple magnetic layers and nanoribbons, taking into account different mechanisms of spin-density and spin-current generation. The essential role in such mechanisms is related to the spin-orbit interaction.

We present the results of computer simulation for a three-layer model with magnetic p-n junction and optically excited spin density in the nonmagnetic layer. In this structure we calculated the profiles of nonequilibrium charge and spin densities as well as charge and spin currents as a function of external voltage. Our simulations include self-consistent calculation of the magnetization profile affected by the current-induced spin torque in nonequilibrium conditions.

13.4 cm

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