EFFECT OF MAGNETIC DOPANTS ON TRANSPORT PROPERTIES OF TRILAYER NANOSTRUCTURE

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Multilayer nanostructures are artificial systems which can be used in modern electronics as logic elements. Their properties depend on layer thicknesses and constituent materials; also the alignment of bands at interfaces plays fundamental role in the junctions.

One of the simplest multilayer nanostructures considered in the field of spintronics is the magnetic/non-magnetic/magnetic trilayer structure. The spin-dependent transport processes in the nanostructure give a contribution to various magnetotransport phenomena. Tuning and controlling these phenomena is necessary to make the nanostructure useful in applications.

We present results of calculations carried out to find the quantum coherent transport of spin-polarised electrons through the magnetic/non-magnetic/magnetic trilayer nanostructure when the non-magnetic layer is doped with several magnetic elements. The description of the transport of spin-polarised electrons in a structure with conducting non-magnetic layer must be based on the quantum theory of electronic transport because the classical theory of electron transport fails in this case.

Different spin configurations of magnetic elements are considered. We performed calculations of a spin-dependent transmission coefficient as a function of energy of incoming spin-polarised electrons for different spin configurations of magnetic dopants. We have found that positions of transmission maxima depend on the spin configurations. We have also calculated the differential conductance with respect to non-zero bias-voltage and temperature. Additionally, the influence of control gate on the transport characteristics of the nanostructure is discussed.