Surface contribution to GMR in Fe/Cr/Fe trilayers

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We analyse the transport properties of very thin trilayers using the layered potentials calculated by means of the ab initio method of the desity functional theory (DFT) in the planar geometry for nFe/3Cr/nFe (n is the number of monoatomic layers of Fe, $1 \leq n \leq 8$) [1]. We take into account the values of the relaxation time and the effective mass of an electron given by their relations to the considered potential. We apply the semi-classical approach based on Boltzmann formalism which can determine the contribution from interface, bulk and surface. In the standard Boltzmann approach the specularity factor P, which is a measure of the surface roughness, is also responsible for the scattering of electrons on the surface. However, the parameter P has two different values of the potentials for different spin orientations. Therefore, the scattering of the electrons at the outer surfaces is a spin dependent character. Our calculations show that the influence of the surface on GMR is small in the case of the considered here system determined by the used parameters. In this context our results confirm the experimental observations [2] and by this fact they reflect an important role of the interface behaviour for GMR.

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