

Physica Status Solidi C: Conferences 2006 vol.3 N5, pages 1257-1267

Study of the possibility of realization of a spin valve on the basis of superconductor/ferromagnet multilayers

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Abstract

The ways of realization of two different schemes of a spin valve for the superconducting current on the basis of the superconductor/ferromagnet proximity effect are studied. First, we have studied the superconducting proximity effect in the thin film system Fe/Cr/V/Cr/Fe where the Cr layers play the role of screening layers between the superconducting V-layer and the strongly pair breaking Fe-layers. Besides the new results concerning the magnetic phase transitions in the Cr layers we found the upper limit of the thickness of the screening Cr layers for operation a spin valve based on the Fe/V/Fe trilayer. Second, we studied the superconducting spin valve effect of a V-layer coupled to an antiferromagnetic [Fe/V]-superlattice. The parallel upper critical magnetic field exhibits an anomalous temperature dependence up to the ferromagnetic saturation field of the superlattice, indicating that the superconducting transition temperature T_c decreases when rotating the relative magnetization directions of the sublattice from antiparallel to parallel. © 2006 WILEY-VCH Verlag GmbH & Co. KGaA.

<http://dx.doi.org/10.1002/pssc.200563109>
