

Effect of a magnetic field on the critical temperature of a ferromagnet - Superconductor transition in layered heterostructures

Avdeev M., Proshin Y., Khusainov M., Tsarevskii S.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

Effect of an external magnetic field H on the superconductivity of bilayer (FS) and trilayer (FSF) heterostructures consisting of layers of ferromagnetic (F) and superconducting (S) metals has been studied. The case has been considered where the scattering in both metals is sufficiently strong (the so-called "dirty limit"), which makes it possible to use the Usadel equations to describe the proximity effect. For the Gor'kov function, a boundary problem is formulated that is free of restrictions on the magnitudes of the transparency of the FS (SF) interface and takes into account both the wave and diffusional types of motion of quasi-particles. Special attention is given to the case of a trilayer system, for which a detailed analysis of two states with parallel (P) and antiparallel (AP) directions of the magnetizations in the F layers has been performed. Based on the results obtained, the possibility of a technical application of the FSF system is considered. © Pleiades Publishing, Ltd., 2011.

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Keywords

Critical field, Critical temperature, Layered structures, Magnetic field, Magnetism, Proximity effect, Superconductivity