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# Proximity effects in asymmetric layered ferromagnet/superconductor nanostructures

Fazleev N., Proshin Y., Khusainov M.
*Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia*

## Abstract

The asymmetric four-layered F′ / S′ / F″ / S″ nanostructure consisting of rather dirty superconducting (S) and ferromagnetic (F) metals is studied within the theory of the proximity effect taking detailed account of the boundary conditions. The new π phase superconducting states are obtained for the F′ / S′ / F″ / S″ structure in addition to the known "superlattice" states. The dependence of critical temperatures versus the F layer thicknesses is explored for a wide range of parameters. Decoupled superconductivity is predicted for this nanostructure and an optimal set of parameters is determined for which the difference between the critical temperatures for different states becomes significant. The complicated phase diagram of the asymmetric four-layered F′ / S′ / F″ / S″ nanostructure is constructed, explored, and compared with the ones for F/S bilayers, symmetric F/S/F and S/F/S trilayers, and F/S superlattices. © 2009 American Institute of Physics.

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