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Proximity effect in multilayer structures with alternating ferromagnetic and normal layers

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Abstract

© 2015, Pleiades Publishing, Inc. The character of the penetration of superconducting correlations into multilayer FF...F, FNFN...FN, and NFNF...NF structures being in contact with a superconductor with the singlet pairing potential has been studied theoretically. Analytical expressions for the effective superconductivity penetration depth in such structures have been obtained in the limit of small layer thicknesses. Numerical calculations taking into account self-consistently the suppression of the superconductivity in the superconductor owing to the proximity effect have been performed at arbitrary thicknesses. A simple analytical dependence approximating the spatial variation of the Green's function in a multilayer has been proposed. It has been shown that superconductivity is induced by the generation of two channels existing in parallel, one of which is characterized by the smooth (as in SN sandwiches) decay of the superconductivity, while damped oscillations (as in SF structures) take place in the second one.

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