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The solitary re-entrant superconductivity in the clean four-layered superconductor/ferromagnet system

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Abstract

The superconducting critical temperature Tc for asymmetric four-layered system ferromagnet/superconductor/ferromagnet/superconductor (F' /S/F/S') in the clean limit using the boundary value problem for Eilenberger function is investigated. An electron-electron coupling constant in ferromagnetic metals and pair amplitude changes along the F/S interfaces are taken into account. It is shown that 0- and π - phase superconducting states of pure thin F'/S/F/S' fourlayers are controlled by the magnitude and sign of electron correlations in the F and F' layers, as well as by the competition between homogeneous Bardeen-Cooper-Schneffer (BCS) pairing and inhomogeneous Larkin-Ovchinnikov-Fulde-Ferrell (LOFF) pairing. A solitary re-entrant superconductivity for the 00π state is predicted. The results of numeric calculations allow to explain the absence of the suppression of three dimensional superconductivity in short period Gd/La superlattices.

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