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Critical temperature oscillations and reentrant superconductivity due to the FFLO like state in F/S/F trilayers

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Abstract

Ferromagnet/Superconductor/Ferromagnet (F/S/F) trilayers, in which the establishing of a Fulde-Ferrell Larkin-Ovchinnikov (FFLO) like state leads to interference effects of the superconducting pairing wave function, form the core of the superconducting spin valve. The realization of strong critical temperature oscillations in such trilayers, as a function of the ferromagnetic layer thicknesses or, even more efficient, reentrant superconductivity, are the key condition to obtain a large spin valve effect, i.e. a large shift in the critical temperature. Both phenomena have been realized experimentally in the Cu 41Ni 59/Nb/Cu 41Ni 59 trilayers investigated in the present work. Ferromagnet/Superconductor/Ferromagnet (F/S/F) trilayers, in which the establishing of a Fulde-Ferrell Larkin-Ovchinnikov (FFLO) like state leads to interference effects of the superconducting pairing wave function, form the core of the superconducting spin valve. The realization of strong critical temperature oscillations in such trilayers, as a function of the ferromagnetic layer thicknesses, are the key condition to obtain a large shift in the critical temperature.

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Keywords

FFLO, Fulde-Ferrell Larkin-Ovchinnikov superconductivity, inhomogenous superconductors, Proximity effect (superconductivity), superconducting thin films