

Reentrant superconductivity in superconductor-ferromagnetic-alloy bilayers

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Abstract

Oscillating behavior of superconductivity in ultrathin bilayers of niobium and ferromagnetic alloy Cu₄₁Ni₅₉ has been observed. This phenomenon was most pronounced at a Nb layer thickness of about 7.3 nm: the superconducting transition temperature T_c first sharply decreased with an increase in the ferromagnetic alloy thickness to complete suppression of superconductivity at the ferromagnetic alloy thickness $d_{\text{CuNi}} = 4$ nm. With a further increase in the thickness d_{CuNi} , the superconductivity was restored at $d_{\text{CuNi}} \geq 13$ nm. This strongly nonmonotonic and reentrant behavior of superconductivity in Nb/Cu₄₁ Ni₅₉ bilayers is attributed to implementation of a state in the ferromagnetic alloy that is similar to the quasi-one-dimensional Fulde-Ferrell-Larkin-Ovchinnikov state. © Allerton Press, Inc. 2008.

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