Proximity Effect on the Magnetoresistance of Superconductor/Ferromagnet Structures

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The magnetoresistance of dc magnetron sputtered Nb/Permalloy (Py) bilayers and trilayers have been measured with current flow in the layer plane. We discuss effects which are experimentally found in superconductor (*S*)/ferromagnet (*F*) hybrids when the magnetization of the *F*-layers is inhomogeneous, or when the magnetization directions in different *F*-layers are not parallel. Above the superconducting transition temperature of Nb, the magnetoresistance is the standard behavior for anisotropic magnetoresistance (AMR) and due to domain effects, for magnetic fields applied parallel or perpendicular to the long axis of bars with the easy axis of magnetization. However, in both bilayers and trilayers, we find a strong increase of the resistance in the middle of superconducting transition at slightly higher coercive field H_c of the Py layer. We ascribe the possible origins of this unusual resistance increase in terms of ferromagnet-superconductor interface scattering or spin-polarized quasiparticles scattering.

Keywords : proximity effect, Nb, permalloy, magnetoresistance