PS 31

THE CRITICAL MAGNETIC FIELDS OF SUPERCONDUCTING NANOSTRUCTURES BASED ON NB AND CU-NI – ALLOY LAYERS

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Based on studies of resistive transitions in ferromagnet/superconductor/ferromagnet samples $Cu_{41}Ni_{59}/Nb/Cu_{41}Ni_{59}$ it were investigated the thermodynamic fluctuations of the superconducting order parameter, the width of the critical region and the change of the Ginzburg-Levanyuk criterion; execute the theoretical calculation of the critical magnetic fields for the three-layered nanostructures of the ferromagnet-superconductor-ferromagnet and compare them with experimental data in three-layered nanostructures $Cu_{41}Ni_{59}/Nb/Cu_{41}Ni_{59}$

In frame of this work the main scientific and technical problem was resolved: found a significant increase (by 9-10 orders) of the Ginzburg-Levanyuk criterion in three-layered F/S/F nanostructures in compare with value for pure bulk superconductors ($Gi_{3D} = 10^{-13} - 10^{-14}$), which significantly increased the broadening of the critical fluctuations and the width of the resistive transition of layered superconductor-ferromagnet structures to the experimentally observed values, $Gi = 10^{-3} - 10^{-4}$; performed theoretical calculations for the critical magnetic fields of layered nanostructures ferromagnet-superconductor-ferromagnet based on Usadel formalism, which provided an adequate description of the critical magnetic fields, which is in agreement with experimental data; increasing of thickness of ferromagnet layer in system $Cu_{41}Ni_{59}/Nb/Cu_{41}Ni_{59}$ substantially influenced on the temperature dependence of the critical magnetic fields in perpendicular and parallel orientation and increase the non-linearity and their anisotropy in compare with the critical magnetic fields of single niobium films.

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