ASYMMETRIC FIELD DEPENDENCE OF GMR EFFECT IN Py/Cu MULTILAYERS

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9.7 cm

The magnetic field (H) dependences of the GMR effect of ($Ni_{83}Fe_{17}$=Py)/Cu multilayers have been investigated at room temperature (R. T.) as well as at 4.2 K. An unusual asymmetric field dependence of the GMR effect was observed at R.T. and was absent at 4.2 K. It has been found that the asymmetric GMR(H) behaviour occurs only when the external magnetic field is changed from positive to negative field values and disappears when the magnetic field is changed in opposite direction. The asymmetric GMR(H) effect was found for all our multilayers independently of Cu thickness, however the effect was more pronounced for samples with small GMR amplitude. The appearance of such GMR(H) behaviour can be attributed to the existence of superparamagnetic interfacial entities. Thermal excitation of superparamagnetic states can be suppressed when an external magnetic field is applied and the contribution to a spin-mixing term (two current model) in resistance R(T) arising from superparamagnetic spins can partially fall off, leading to the occurence of an additional contribution to the GMR effect. The presence of the superparamagnetic areas in our Py/Cu multilayers has been confirmed by zero field cooling (ZFC) and field cooling (FC) magnetisation measurements. Well defined blocking temperatures were noted. The temperature dependencies of resistance performed for 4.2 K$\leq$T$\leq$ R.T. revealed the existence of a well pronounced Kondo-like minimum reflecting the presence of the intermixed interface areas.

13.4 cm

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