TD09

Magnetotransport ofPy/Pt/Py spin valve device

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ABSTRACT

Spin injection into nonmagnetic metal has been extensively studied for various nonmagnetic metals such as Al, Cu, Au etc with different interface features, which gives useful information on spin injection and spin dependent transport. [1,2] Successful spin injection has been achieved in such devices because there is no serious resistance mismatch between ferromagnetic and nonmagnetic metals. Effective spin injection into nonmagnetic channel gives rise to spin accumulation at antiparallel magnetic state of two ferromagnetic electrodes.

Lateral spin valve structure has been used for investigating spin transport in metallic films consists of two ferromagnetic electrodes, the spin injector and spin detector, and a spin transmitting channel. Important information such as the spin relaxation length and the injected spin polarization can be obtained with lateral spin valve. [2,3]

Our device used in the experiment was a lateral spin valve consisting of a Pt film as the spin transmitting channel and $Ni_{80}Fe_{20}$ films as electrodes for spin injection and detection. 60nm thick Pt film was patterned to define Pt channel by electron-beam lithography followed by lift-off process on an oxidized Si substrate. 80nm thick Py($Ni_{80}Fe_{20}$) electrode with a differentaspect ratio being separated by a distance of 200nm ~ 600nm are fabricated on a pre-patterned Pt channel. Junction area on Pt transport channels was carefully cleaned by O_2 plasma prior to Py deposition in order to have good Ohmic contact. The resistivity of Pt channel of our device is 1.3mΩ cm at 15K.

We have investigated the spin valve effect in NiFe/Pt/NiFe devices. A clear spin valve effect on the magnetoresistance was deteced by using a conventional four-terminal geometry.

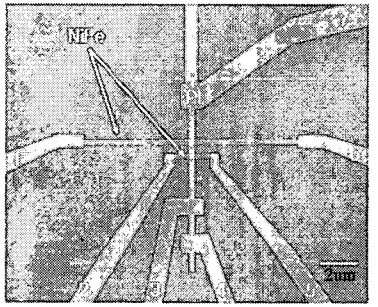

Fig. 1. SEM image of a NiFe/Pt/NiFe lateral spin valve.

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TD10

Magnetic anisotropy of epitaxial Cu/Ni/Cu structure growth by magnetron sputtering

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The magnetic anisotropy of epitaxial Cu/Ni/Cu/Si(001) films with Ni thickness in range 2-10 nm was investigated. All the samples were prepared by dc-magnetron sputtering with base pressure of 2×10^{-7} Torr and the Ar working pressure was 0.4 mTorr. The epitaxial orientation relationships and microstructural characteristics of the films were studied by X ray diffraction. The hysteresis loop were measured at room temperature using vibrating sample magnetometer (VSM) and Alternating gradient magnetometry (AGM) with magnetic field applied perpendicular and parallel to film. The obtained results show that with 4 nm Ni thickness we can obtain perpendicular magnetic anisotropy (PMA). The XRD pattern shows the (001) texture for the Si and Cu layer.

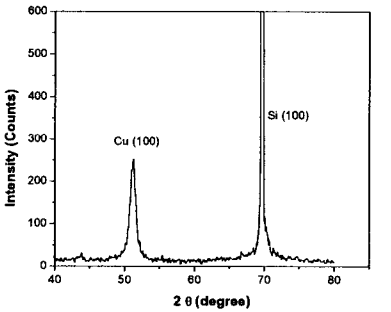

Fig. 1. XRD pattern of Cu/Ni/Cu/Si(001)

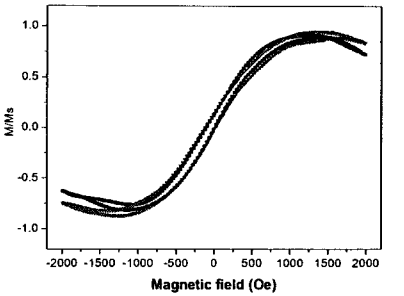

Fig. 2. VSM hysteresis loop of Cu/Ni(4nm)/Cu/Si(001)

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