Pseudo spin valve structures with NiO/Co as a hard magnetic layer.

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Pseudo spin valve structures (PSV), i.e., layered structures consisting of soft and hard ferromagnetic layers (F_S and F_H, respectively) separated by a nonferromagnetic spacer (S) show a characteristic magnetoresistive dependence (Fig. 1). For some applications, a key problem is the choice of appropriate ferromagnetic materials for F_S and F_H layers and their thicknesses to ensure a high difference in the switching fields (coercive fields). We show that this can be achieved using a NiO/Co structure as a hard magnetic layer.

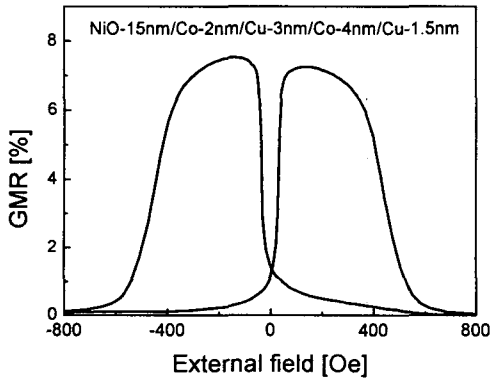

Fig.1. Typical GMR characteristic of PSV structure with NiO/Co as hard magnetic layer

A number of NiO/Co/Cu/Co PSV structures with various thickness of constituent layers were deposited by rf sputtering and examined from the point of view of the optimal GMR characteristics. The most important features of our PSV structures with suitable selected thicknesses of particular layers are:

- a relatively high value of GMR amplitude (up to 9 % at RT) due to a possible electron specular reflection at the NiO/Co interfaces,
- a high coercivity (500 Oe) of hard magnetic layer resulted from a specific interaction of a 15 nm thick antiferromagnetic NiO with a 2 nm thick Co layer,
- nearly symmetrical R(H) characteristics due to negligible unidirectional anisotropy field of NiO/Co bilayer with NiO thickness ≤ 15 nm.

In conclusion, good symmetrical GMR characteristics have been shown in NiO/Co/Cu/Co PSV structures by tailoring their switching fields (coercivities) and keeping the unidirectional anisotropy very weak.

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