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GMR/SV 소자의 외부자장 감응도 특성변화 연구

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The magnetic hysteresis loop and MR transfer curve of spin valves are shown in Fig. 1. In this case, both the free layer and the pinned layer have the same easy-axis and the hysteresis loop shown is along the easy axis. The hysteresis loop near the origin is associated with the magnetic switching of free layer, while the other loop is associated with the magnetic switching of the free layer, while the other loop is associated with the magnetic switching of the pinned layer. The free-layer hysteresis loop is slightly shifted to the right because of a weak ferromagnetic coupling from the pinned layer. The resistance of spin valve (SV) is maximum when bottom and top ferromagnet layers are antiparallel, and minimum when parallel. The corresponding MR transfer curve along the easy axis and the magneto-sensitivity (*M-S*), which is defined a slope value with an MR ratio divided by one applied magnetic field, are shown in Fig. 1(b).

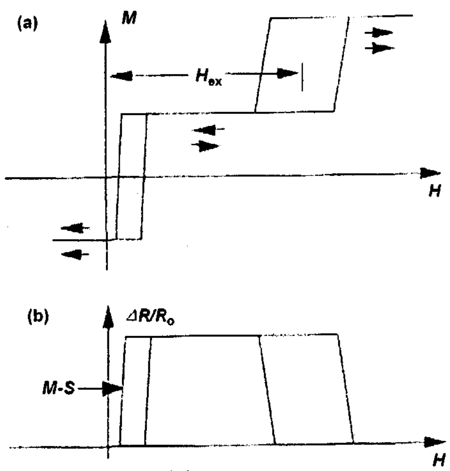

Figure 1. (a) The magnetic hysteresis loop, and (b) the MR transfer curves od spin valve along the easy axis. The arrows represent the magnetizations of free and pinned layers. Here *M-S* is magneto-sensitivity, which showed the slope with an MR ratio divided by one applied magnetic field.

To linearize a GMR/SV device, we can design one sensor are as follows; an its structure of Ta(50 Å)/NiFe(70 Å)/Cu(26 Å)/NiFe(50 Å)/FeMn(100 Å)/Ta(100 Å), top SV type MR ratio with 1.0 % at room temperature, as shown in Fig. 2. To get the optimum condition of magneto-sensitivity, we measured the annealing temperature dependence of exchange coupling fields (H_{ex}), sheet resistance (Ω), magnetoresistance ratio (MR(%)), and magneto sensitivity (%/Oe). The optimized relatively magnetic sensitive change of shadow mask patterned GMR/SV as a function of the applied neighbor field by flip-flop of free layer was about 1.6 %/Oe, as shown in Fig. 2, after vacuum annealing process at 220 ℃ for 1 hr. If it applying to pulse diagnostic apparatus, the change in radial artery pulses during a forward pulse without reflected pulse was analyzed one in magnetic fields by height gap for measuring procedures before secondary pulse. By these two simulation steps, we made an accurate estimate of the spatially arterial pulse. Therefore, the displacement of magnets corresponds to the enough output voltage signal having one bit range of 0 ~ 0.5 mV.

However, to apply for 2-dimensional magnetoresistance sensor array having the high magneto sensitivity, MR ratio, and output signal, we have to require a more prospective sub-micron patterned a really integrated GMR/SV device.

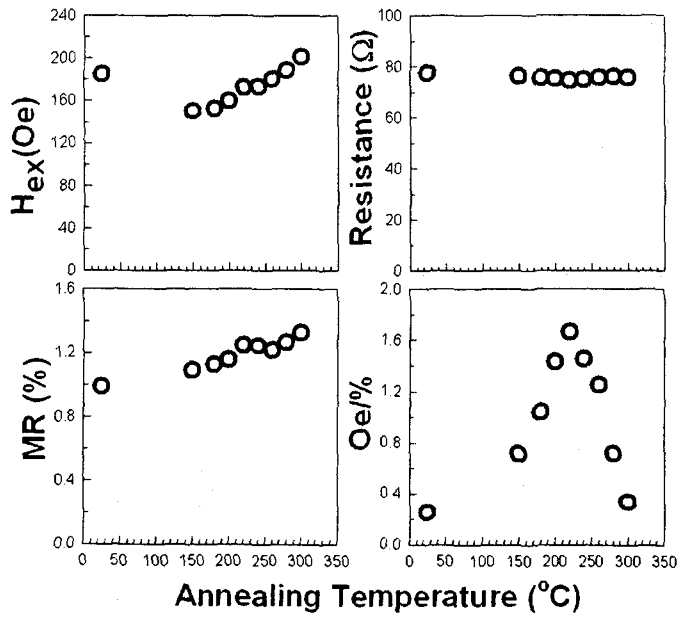

Figure 2. The annealing temperature dependence of exchange coupling fields (H_{ex}), sheet resistance (Ω), magnetoresistance (MR(%)), and magneto sensitivity (%/Oe) for the glass/Ta(50 Å)/NiFe (70 Å)/Cu(26 Å)/NiFe(50 Å)/FeMn(100 Å)/Ta(50 Å) multilayers.

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