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Fabrication of CPP-GMR Spin Valve Using EB Assisted CVD Hard Masks

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We have already reported before that using EB-assisted CVD carbonic hard masks is possible to fabricate MTJs with the size of 30nmϕ [1]. Our developed nano-fabrication technique is damage free against the MTJs because barrier layer employs only the physical etching by Ar ion and is independent of any chemical reactive process. In this study, we applied the same one to CPP-GMR spin valve fabrication. Optimizing EB probe current well, several size of carbon pillars were deposited on GMR film such as sub./ Ni-Fe-Cr(50) / Cu-O(200) / Mn-Ir(100) / $Co_{70}Fe_{30}$(40) / Ru(9) / $Co_{70}Fe_{30}$(40) / Cu(50) / $Co_{70}Fe_{30}$(40) / Ni-Fe-Cr(100), in Å unit. CPP-GMR area after Ar ion etching was varied from 34 x 34nm^2 to 200 x 200nm^2. Then SiO_2 was deposited as insulating film and remained carbon pillar was etched away by O_2 ashing in order to contact with the top Cu electrode. CPP-MR was measured using DC 4 probe under constant bias voltage of 5mV. Size dependence of the CPP-GMR spin valve resistance and CPP-MR ratio also will be discussed in the conference.

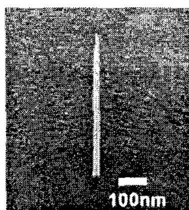

Fig. 1 SEM image of carbon pillar deposited on a GMR film using EB assisted CVD

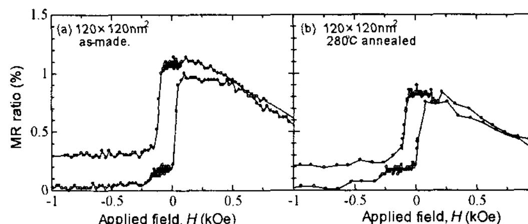

Fig. 2 *MR* curves of CPP-GMR spin valves fabricated with using EB assisted CVD hard mask milling method.

1. S. Isogami, M. Tsunoda and M. Takahashi, IEEE Trans. Magn., in press (2005)