Magnetic properties of CoFe/FeZr/CoFe multilayers

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Since the discovery of giant magnetoresistance (GMR) in Fe/Cr systems [1], magnetic multilayers have drawn much interest. In this paper, magnetic multilayers with amorphous paramagnetic spacers were investigated. The multilayers structure was SiO_2/Ta(5 nm)/NiFe(6 nm)/IrMn(8 nm)/CoFe(4 nm)/FeZr(0.3-2.7 nm)/CoFe(2 nm)/NiFe(6 nm)/Ta(5 nm). The multilayers were grown by using dc magnetron sputtering method. The base pressure was less than 5*10^{-8} Torr and the working pressure was 2*10^{-3} Torr. The magnetic field was applied 400 Oe for unidirectional magnetic anisotropy to the multilayers. The AFM images show that roughness of the FeZr layer is around 0.1 nm much less than that of Cu or Ru. The M-H curves in Fig. 1 were measured with VSM at room temperature. For the FeZr layer thinner than 2.0 nm, the pinned and free layers rotated simultaneously, which means that two CoFe layers were coupled ferromagnetically. When the FeZr layer is thicker than 1.6 nm, separate magnetization reversal was observed for two CoFe layers. For all FeZr thickness, no GMR effect was found, but negative AMR of 0.25% was observed. The reasons for the absence of GMR will be presented in detail.

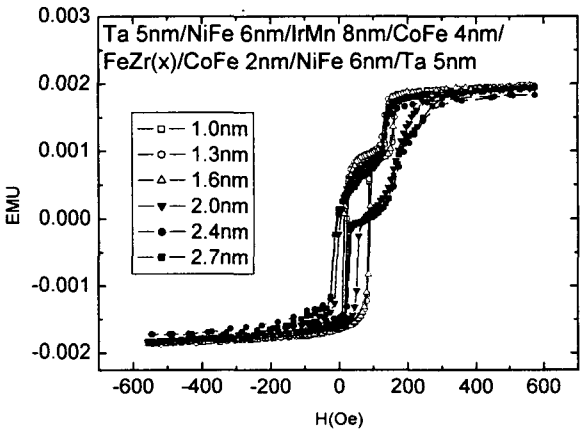

Fig. 1 M-H curves of dependent on FeZr thickness.

References

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