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XPS Study of the Interface IrMn/CoFe and Si(100)/CoFe on Magnetic Tunneling Transistors

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Magnetic tunneling transistors (MTTs), structured as sub./CoFe/AlOx/FeCo/IrMn/Cu/Ta with differing base thickness of 3-9 nm, were fabricated on silicon wafers with a thermally oxidized layer via rf magnetron sputtering under the ultra-clean sputtering process conditions. The CoFe/IrMn and Si(100)/CoFe interfaces were thought to be the main reason for the enhancement in tunneling magnetoresistance (TMR) and magneto-current (MC) ratio [1-3]. In order to study these characteristics, micro-structure and composition of the interface of CoFe/IrMn and Si/CoFe layers were investigated comprehensivelyin both chemical and physical properties of the elements existing in the interface. X-ray photoelectrons spectroscopy (XPS) profile analysis has shown that the creation of supplemental components existing in the interface such as Mn_2O_3, Fe_2O_3, CoO, *etc* is the most importance parameter influencing TMR and MC ratio. Moreover, magneto-Coulomb effect of MTT structures was discussed in this work.

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The Relationship between Magnetic and Structural Properties of the Mechanically Alloyed $Fe_{60}Cr_{40}$

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Fe-Cr alloy has been interested in various applications of the structural materials of reactor and the magnetic devices [1, 2]. To investigate the properties of Fe-Cr system, we prepared $Fe_{60}Cr_{40}$ alloys with the mechanical alloying techniques in process periods of 1, 2, 4, 6, 12 and 24 hours, respectively. The magnetic properties were related to the structural variation including the short range order and the long range order. The structures were analyzed by the x-ray diffraction (XRD) and the extended x-ray absorption fine structure (EXAFS). XRD peaks indicating the long range order decreased significantly as the milling time increased. EXAFS analysis provides the local structural information about atoms interested. Figure 1 shows the variation of EXAFS spectra measured at Fe Kedge (7112 eV) with the increasing milling times. Figure 2 shows the magnetization with the vibrating sample magnetometry (VSM) at the room temperature. The magnetization decreased rapidly in 0-6 milling times but linearly above 6 hours of milling time as the milling time increased. The magnetic properties will be discussed in connection with the local structural variations

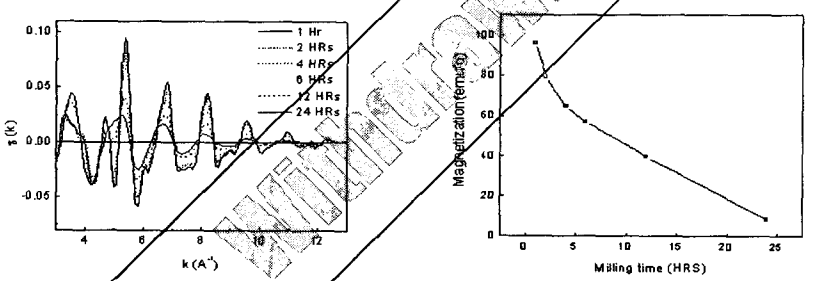

Fig. 1. EXAFS spectra of Fe60Cr40 alloys v.s. the milling times.

Fig. 2. Magnetization v.s. the milling times.

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