

Analysis of local structure and perpendicular magnetic anisotropy of GdCo and GdFe thin films

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Rare Earth - Transition Metal (RE-TM) amorphous alloys have been studied for Magneto-Optical (MO) recording media. One of the important points for the MO medium is to obtain the large perpendicular magnetic anisotropy. The origin of the perpendicular magnetic anisotropy of RE-TM alloys has been debated with great interest [1][2]. Still now, the problem of the magnetic anisotropy of RE-TM amorphous alloys is being discussed and several models are proposed [3][4]. But the relationship between the structure and magnetic properties are still unclear because the structural analysis of RE-TM alloys is difficult due to the structural complexity of the amorphous state. The Extended X-ray Absorption Fine Structure (EXAFS) spectroscopy is a useful probe providing the informations of short range atomic structures. In the EXAFS spectroscopy, highly polarized synchrotron radiation gives an opportunity for the angular-resolved analysis of a disordered structure. Recent EXAFS study indicated that the magnetic anisotropy in amorphous RE-TM alloys is correlated with the local structural anisotropy [5][6].

In this article, the preliminary results of the EXAFS measurements for GdCo and GdFe thin films are presented.

GdCo and GdFe thin films were prepared by the rf magnetron sputtering. The total thickness of samples were about 100 nm and the surfaces of samples were covered by Au or Pt layer (5 nm) in order to prevent the oxidation. The EXAFS measurements were carried out at Gd K-edge (50.2 eV) utilizing total electron yield method at room temperature.

Figure 1 shows the typical absorption I/I_0 of a GdFe thin film at Gd K absorption edge. The signal to noise ratio (S/N) is very low due to the poor signal current. The EXAFS oscillation can not be seen in the absorption spectrum. This is due to the low S/N ratio and the disorder structure of GdFe thin film, which is in amorphous state. In this experiments, we use the original detector which

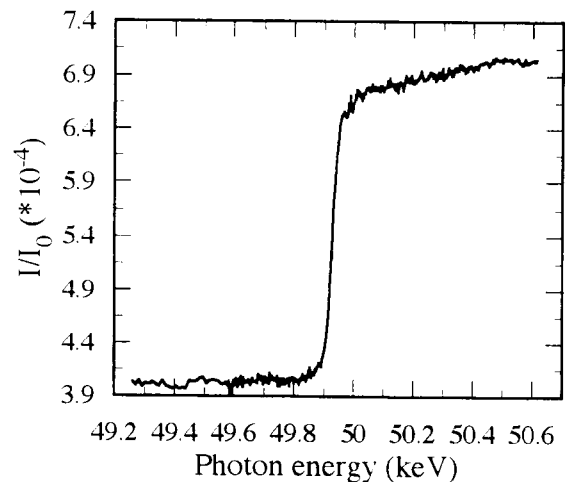


Fig. 1 The absorption spectrum of amorphous GdFe thin film at Gd K absorption edge.

has a electrode. There is no other equipment in this detector. It is thought that the sample current becomes smaller in this energy region. We should improve our detector in order to obtain clear signals.

References

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