Antiferromagnetism and magnetic properties in Thin Film of FeNi

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Thin Films of FeNi show evidence of an order antiferromagnetic when the demagnetizing factor versus Magnetic Field is attained. Coercivity of thin films of NixFe1-x with magnetic field perpendicular to the plane of the film was investigate and it is seen for the thin films of NixFe1-x show in decrease of the coercivity when the nickel fraction decreases. Some micromagnetic parameters of importance are used for characterizer the Thin Films of FeNi. Anisotropy constants versus the thickness for the thin films of FeNi were measured at room temperature. Reduced anisotropy versus inverse thickness for the thin films of FeNi was found

Keywords: Antiferromagnetic order; Reduced anisotropy.

1. Introduction

Conventionally the thin film is great application in the spin-valve read heads for the spintronic industrial. There for the study of the demagnetizing field in thin films is important because the sensitivity of MR heads also depend on the demagnetizing field as well as the anisotropy field [1]. In addition, the anisotropy constant of the magnetic materials is actual important because these are associated with the anisotropy field that also is a magnetic property important of the materials. By other hand also is important to remark that the reduced anisotropy can be affected due to different factors such as the thickness of the thin films.

2. Results and discussion

Conventionally the presence of antiferromagnetic order is determined about of the measure of the magnetization or susceptibility versus temperature. Also, the existence of antiferromagnetic order can be determined by the measure of ΔM plot versus Magnetic Field. However, also the antiferromagnetic order can be represented by the plot of the demagnetizing factor versus Magnetic Field that is independent of the temperature as is showed in the Fig. 3.1

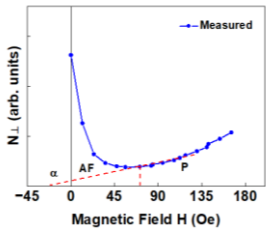

Figure 3.1: Demagnetizing factor versus Magnetic Field for the thin films of FeNi with magnetic field perpendicular to the plane of the film.

Reduced anisotropy can be modelled by the follow model $Hy=H_{a0}(t^{-1}-J)^{\beta}$ where H_y represent the reduced anisotropy, β represent the thickness of the cylinders in the thin films, while that t represent the thickness of the thin films as is showed in the Fig. 3.2.

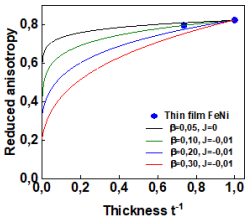

Figure 3.2: Reduced anisotropy versus inverse thickness for the thin films of FeNi.

Fig. 3.3 a) show the anisotropy constants versus the thickness for the thin films of FeNi measured at room temperature. Fig. 3.3 b) show the saturation magnetization versus inverse thickness for the thin films of FeNi. Then it is seen in the Fig. 3.3 a) that the values of Ku decrease whit the increase of the thickness that is related with change in the composition [8]. While that the Fig. 3.3 b) show the values of the magnetization for the thin films of FeNi, where is observed values of saturation magnetization representatives of these type of thin films.

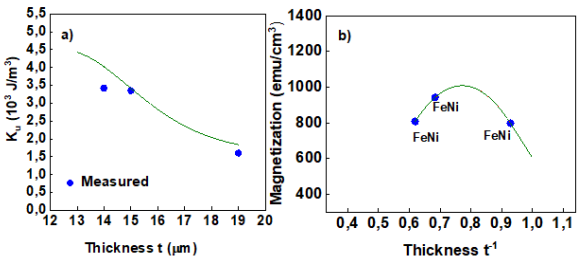

Figure 3.3: Constant of anisotropy and saturation magnetization for thin films of FeNi with magnetic field perpendicular to the plane of the film.

References

[1] L. Wang, S. G. Wang, Q. L. Ma1, H. F. Liu, and X. F. Han. Anomalous Behavior of Coercivity in Ferromagnet/Antiferromagnet Bilayers. Journal of Spintronics and Magnetic Nanomaterials Vol. 1, 47–51, 2012