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EQ10

Synthesis and Characterization of FeCo Nanowires Embedded in AAO Nano-Template

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Nowadays the nano-scaled control of microstructures has become a critical issue for the enhancement of material properties and the achievement of desired properties. For example, ferromagnetic materials with a nano-grain structure shows excellent soft magnetic properties with a reasonable high frequency characteristics. However, it is still desirable to form a well-aligned regular ferromagnetic nano-array seperated by insulator for improving the high frequecy properties. In this study, a nano-template method, which is considered as one of the most effective and simplest methods has been therefore, used to achieve the nano-array structure.

In order to obtain a uniform porous structure surrounded by insulator, anodic aluminum oxide (AAO) was chosen as a nano-template. As a core magnetic material, FeCo alloy was chosen in this experiment because it possessed the highest saturation magnetization with a reasonable high anisotropy field. For improving high frequency characteristics, pores should possess high aspect ratio. In this experiment, the template was fabricated with a 3-step anodization at DC 60V condition because 3-step anodization method was simply process for nanowires by AC electrodeposition. But, AC electrodeposition method was needed optimum thickness of a bottom barrier layer (2~20 nm) [1]. Thus, 3rd anodization after 2nd anodization step conducted to obtain optimum thickness of bottom barrier layer. As a result, this template was shown to have a hexagonal porous structure with parallelly aligned uniform pores with a diameter of 80~100 nm [2]. And, FeCo nanowires was fabricated by electrodeposition method at AC 12V condition. A microstructural analysis of fabricated samples has been investigated by SEM, TEM, XRD and magnetic properties and high frequency characteristics analyzed by VSM and a permeameter. The high frequency properties of this structure showed linearly at ~6 GHz.

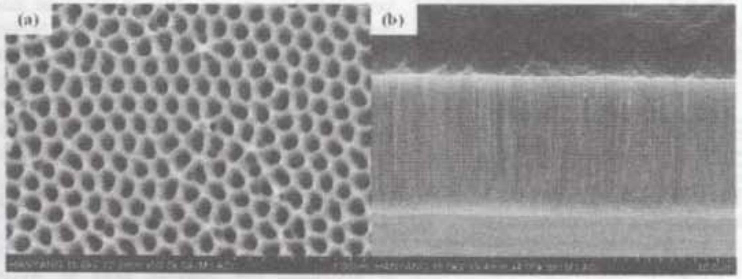

Fig. 1. SEM image of fabricated AAO nano-template (a) plane view, (b) cross-section view.

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EQ11

Oxidation Effect in Cobalt Nanoparticles Magnetic Fluids

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Suspensions of magnetic nanopaticle are the most promising solutions which have simultaneously liquid behavior and superparamagnetic properties [1]. The size of iron oxide nanoparticles depends on the iron diffusivities and the growth of the crystal size domains in the polycrystalline oxide shells [2]. In this study, we are focused on the effect of oxidation of iron nanoparticles for magnetic fluids and variation of microstructure. The magnetic fluid with cobalt nanoparticles prepared by modified HTTD (High Temperature Thermal Decomposition) method. Then the solution is oxidized by the process using mixed gas in ratio of Ar 80 % to O_2 20 % at 250 and 300°C, respectively. We have investigated the crystal structure, magnetic property, and microstructure of cobalt magnetic fluids by using x-ray diffraction (XRD), vibrating sample magnetometer (VSM), and transmission electron microscopy (TEM). The crystal structure of magnetic fluid is refined by cobalt and cobalt oxide with space group is *P*63mc, *Fm*-3m respectively. The magnetic properties of cobalt magnetic fluid which oxidized by different oxidation process are show crucial difference as shown in Fig. 1. The saturation magnetization (M_s) is decreased with increasing oxidation temperature.

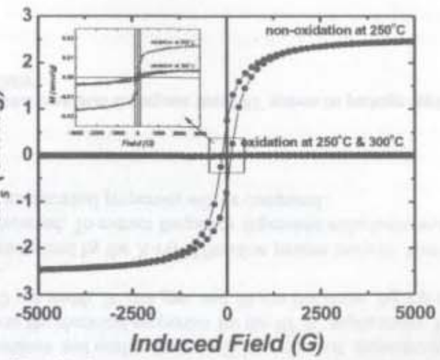

Fig. 1. Hysterisis loops of magetofluid by oxidation at room temperature.

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