عنوان مقاله:

Effect of Heat-Treatment on the GMI Effect and Domain Structure of Amorphous and Nanocrystalline Soft Magnetic Fe72Si12.5B9Nb3Cu1Al1.5Ge1 Alloy

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خلاصه مقاله:

Amorphous and nanocrystalline alloys have attracted considerable attention due to their often unique magnetic, electronic, mechanical, chemical, optical and other properties [1]. Among different nanocrystalline alloys, Fe–Cu–Nb–Si–B alloys (i.e. Finemet) have attracted much interest because of their excellent soft magnetic properties. This alloy is derived from the conventional Fe–Si–B system with minor additions of copper (Cu) and niobium (Nb)[2]. In this case, Cu acts as a nucleating agent and enhances the nucleation of the bcc grains whereas Nb inhibits the grain growth of the FeSi phase that crystallizes from the amorphous matrix during annealing [2,3]. It has been found that the crystallization of Fe–Si–B amorphous alloys containing Nb and Cu causes the formation of nanoscale BCC structure and the BCC alloys exhibit good soft magnetic properties of 1.2/1.4T for saturation magnetic fluxdensity (Bs) and high effective permeability (μe)[4]. One of the very important features observed in this nanocrystalline compound is the so-called magnetoimpedance (MI) effect making them as an excellent candidate for technological applications such as magnetic devices or sensors based on MI effect. This phenomenon is a strong dependence of the electrical impedance Z (f, H), of a ferromagnetic conductor on an external static magnetic field H, when a high-frequency alternating current flows through it[5]. The percentage change of the magnetoimpedance (i.e., the GMI ratio) with applied magnetic field has been expressed as : (1)Where Z(H) is the impedance of the sample at zero DC magnetic field, Hmax is the maximum applied DC magnetic field[5,6]. Various works have reported the effects of heat-treatment conditions [7] and different substitutions [8,9] on the magnetic properties of FINEMET alloys. In the work presented here, we report the effect of annealing time on the GMI effect and domain structure of the as-spun and heat-treated Fe72Si12.5B9Nb3Cu1Al1.5Ge1 ribbons

کلمات کلیدی: