A systematic study of giant magnetoimpedance of Cr-substituted $Fe_{73.5-x}Cr_xSi_{13.5}B_9Nb_3Au_1$ (x = 1, 2, 3, 4, 5) alloys

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Abstract: The magnetoimpedance of $Fe_{76.5-x}Cr_xSi_{13.5}B_9Nb_3Au_1$ (x = 1, 2, 3, 4, 5) alloys has been measured to investigate the influence of crystallization process on the soft magnetic properties and magnetic anisotropy after thermal treatment. Annealing performed at 540 and 550 °C for 30 min in a vacuum indicated that ultrasoft magnetic properties of nanocomposite materials are obtained. The magnetoimpedance ratio (MIR) and incremental permeability ratio (PR) measurements show that the maximum values of MIR and PR increase drastically in the heat-treated samples. It means that the samples are softened by nanocrystallization. The PR curves become narrower and sharper due to the decrease of anisotropy. The MIR behavior related with the softness of magnetic properties of heat-treated samples and the incremental PR strongly changes with external magnetic field.

Author Keywords: Amorphous; Magnetoimpedance; Nanocrystalline; Permeability

Index Keywords: Heat treatment; Iron; Magnetic anisotropy; Magnetic fields; Magnetic permeability; Nanostructured materials; Soft magnetic materials; Incremental permeability ratio (PR); Magnetoimpedance ratio (MIR); PR curves; Ultrasoft magnetic properties; Amorphous alloys

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