

# Soft magnetic properties and giant magneto-impedance effect of $\text{Fe}_{73.5-x}\text{Cr}_x\text{Si}_{13.5}\text{B}_9\text{Nb}_3\text{Au}_1$ (x=1, 2, 3, 4, 5) alloys

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**Abstract:** In this paper, the effect of microstructural and surface morphological developments on the soft magnetic properties and giant magneto-impedance (GMI) effect of  $\text{Fe}_{73.5-x}\text{Cr}_x\text{Si}_{13.5}\text{B}_9\text{Nb}_3\text{Au}_1$  (x=1, 2, 3, 4, 5) alloys was investigated. It was found that the Cr addition causes slight decrease in the mean grain size of  $\gamma$ -Fe(Si) grains. AFM results indicated a large variation of surface morphology of density and size of protrusions along the ribbon plane due to structural changes caused by thermal treatments with increasing Cr content. Ultrasoft magnetic properties such as the increase of magnetic permeability and the decrease of coercivity were observed in the samples annealed at 540 °C for 30 min. Accordingly, the GMI effect was also observed in the annealed samples. © 2006 Elsevier B.V. All rights reserved.

**Author Keywords:** AFM; Magnetic properties; Microstructure; Nanocrystalline alloys; Surface topography

**Index Keywords:** Atomic force microscopy; Coercive force; Heat treatment; Magnetic permeability; Magnetic properties; Microstructure; Nanostructured materials; Surface topography; Effect of microstructural and surface; Giant magneto-impedance (GMI); Nanocrystalline alloys; Iron alloys

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