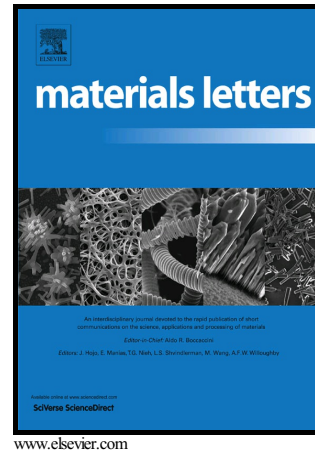


Author's Accepted Manuscript

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PII: S0167-577X(16)31453-7
DOI: <http://dx.doi.org/10.1016/j.matlet.2016.08.146>
Reference: MLBLUE21430

To appear in: *Materials Letters*

Received date: 18 July 2016
Revised date: 26 August 2016
Accepted date: 29 August 2016

Cite this article as: Li-juan Li, Zhi Wang and Ye Han, Effect of Mo addition on high-temperature soft magnetic properties for air annealed FeCo-based nanocrystalline alloys, *Materials Letters* <http://dx.doi.org/10.1016/j.matlet.2016.08.146>

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Effect of Mo addition on high-temperature soft magnetic properties for air annealed

FeCo-based nanocrystalline alloys

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Abstract

Temperature dependence of initial permeability (μ_i - T curves) for as-quenched and annealed $(\text{Fe}_{0.5}\text{Co}_{0.5})_{73.5}\text{Si}_{13.5}\text{B}_9\text{Cu}_1\text{M}_3$ (M=Nb, Mo) alloys were investigated. The Curie temperature of Mo-alloy is decreased by about 5 °C compared with Nb-alloy. Although room-temperature μ_i of Mo-alloy was lower than that of Nb-alloy when nanocrystallized in air, the more stable value of μ_i and improved high-temperature soft magnetic properties was observed. The reason for the evolution of μ_i at elevated temperature was also analyzed.

Keywords:

Nanocrystalline materials; Magnetic materials; Soft magnetic properties

1. Introduction

FeCo-based nanocrystalline alloys have been extensively investigated for improved high-temperature magnetic properties [1-2]. Meanwhile, some literatures have also studied the application of FeCo alloy nanoparticles in the fields of biomedicine [3], soft magnets [4], and catalysis [5]. To obtain dual-phase nanocrystalline structure, the amorphous ribbons of FeCo-based alloys are heat-treated and the heat treatment is performed in either vacuum or inert gas to avoid oxidation, which deteriorates soft magnetic properties [6-7]. Nevertheless, annealing in air is not only simple but low-cost. The effect of air-annealing on the stability of soft magnetic amorphous and nanocrystalline alloys has been studied by some researchers [8-10]. Silveyra et al. [10] found that replacing Nb by Mo in $\text{Fe}_{73.5}\text{Si}_{13.5}\text{B}_9\text{Cu}_1\text{Nb}_3$ can enhance oxidation resistance. The Curie temperature of Fe-based alloys is lower than that of FeCo-based alloys, therefore, if replacing Nb by Mo in Fe-Co-Si-B-Cu-Nb can also enhance oxidation resistance, it

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