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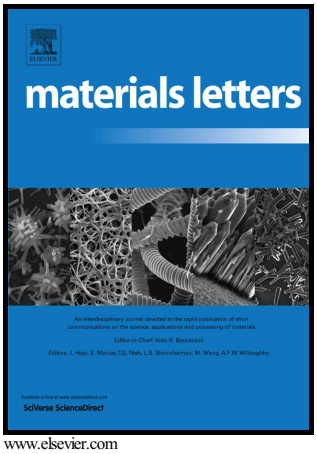


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# Effect of Mo addition on high-temperature soft magnetic properties for air annealed FeCo-based nanocrystalline alloys

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## Abstract

Temperature dependence of initial permeability ($\mu_i$-$T$ curves) for as-quenched and annealed $(Fe_{0.5}Co_{0.5})_{73.5}Si_{13.5}B_9Cu_1M_3$ (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 $\mu_i$ of Mo-alloy was lower than that of Nb-alloy when nanocrystallized in air, the more stable value of $\mu_i$ and improved high-temperature soft magnetic properties was observed. The reason for the evolution of $\mu_i$ 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 $Fe_{73.5}Si_{13.5}B_9Cu_1Nb_3$ 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