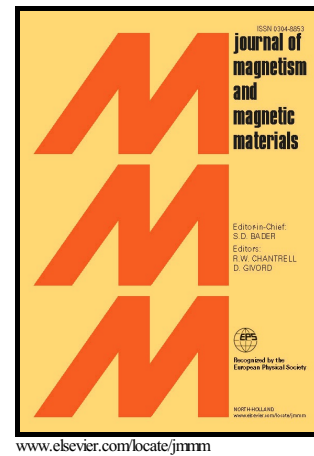


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Micromagnetic Study for Magnetic Properties of Exchange Coupled Nanocomposite Magnetic Systems with Nd₂Fe₁₄B Grains Embedded in α -Fe Matrix

Hyok-Su Ryo^{a,b*}, Lian-Xi Hu^{b*}, Yu-Lin Yang^c

^aFaculty of Physics, Kim Il Sung University, Pyongyang 999093, Democratic People's Republic of Korea

^bSchool of Material Science and Engineering, Harbin Institute of Technology, Harbin 150001, China

^cSchool of Chemistry and Chemical Engineering, Harbin Institute of Technology, Harbin 150001, China

histar8297@yahoo.com (Hyok-Su Ryo)

hulx@hit.edu.cn (Lian-Xi Hu)

*Corresponding authors.

Abstract: Developing high efficiency rare earth alloy magnets at low cost is an economically hopeful way to expand their application area. In this study, magnetic properties of nanocomposite isotropic exchange coupled systems with the structure of Nd₂Fe₁₄B crystalline grains embedded in α -Fe matrices have been simulated by micromagnetic finite element method (FEM). The results have been analyzed by means of the effect of volume fraction of nanosized exchange coupling area between the magnetically hard Nd₂Fe₁₄B and soft α -Fe phase on magnetic properties of the exchange coupled Nd₂Fe₁₄B/ α -Fe magnetic systems. The results show that the magnetic systems with the structure of Nd₂Fe₁₄B grains embedded in α -Fe matrices can have comparatively advanced magnetic properties with small amount of Nd₂Fe₁₄B components, because of efficient inter-phase exchange coupling between magnetically hard Nd₂Fe₁₄B grains and soft α -Fe matrix.

Keywords: Permanent magnet, Nanocomposite magnet, Exchange coupling, Micromagnetic simulation, Microstructure, Nd₂Fe₁₄B/ α -Fe magnets

1. Introduction

Discovery of exchange coupled nanocomposite magnets [1, 2] opened an outlook to develop high efficiency permanent magnets which have good magnetic properties (e.g. high remanence and maximum energy product) with low cost by replacing iron to comparatively expensive Nd₂Fe₁₄B composition. Many researchers have theoretically [3] and experimentally [4-8] studied the magnetic properties and behaviors of exchange coupled nanocomposite magnets including Nd₂Fe₁₄B/ α -Fe

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