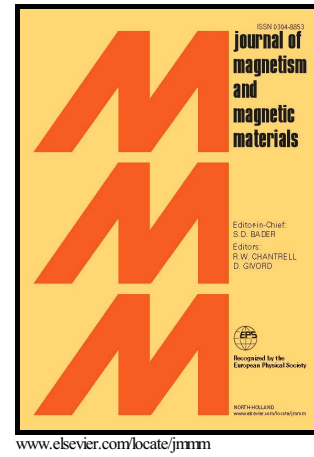


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Tuning the microstructure and magnetic properties of bulk nanocomposite magnets with large strain deformation

Hailing Li, Wei Li, Defeng Guo, Xiangyi Zhang*

*State Key Laboratory of Metastable Materials Science and Technology, Yanshan University,
066004 Qinhuangdao, People's Republic China*

E-mail addresses: lhl_nano@163.com (Hailing Li),

xyzh66@ysu.edu.cn (Xiangyi Zhang)

*Corresponding authors. Tel./Fax: +86-335-8057018;

Abstract

In this study, we investigated the effect of strain on the microstructure and magnetic properties of bulk α -Fe/Nd₂Fe₁₄B nanocomposite magnets produced by a combination of severe plastic deformation at room temperature and subsequent thermal annealing. Experiment results indicate that severe plastic deformation can induce the formation of α -Fe and Nd₂Fe₁₄B nanocrystals in the amorphous matrix and then suppress the formation of metastable intermediate phases during thermal annealing. The volume fraction of α -Fe phase in the magnets increases as the strain increases, and the grain size of α -Fe and Nd₂Fe₁₄B phases significantly decreases. As a result, the bulk magnets made at $\varepsilon = 6.2$ show enhanced magnetic properties, $(BH)_{\max} = 17.8$ MGOe and $H_c = 7.2$ kOe, compared with that of directly annealed partially amorphous (Nd-Pr)-Fe-Co-Nb-B, $(BH)_{\max} = 12.2$ MGOe and $H_c = 6.2$ kOe.

Keywords: strain; severe plastic deformation; microstructure; magnetic properties; nanocomposite magnets

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