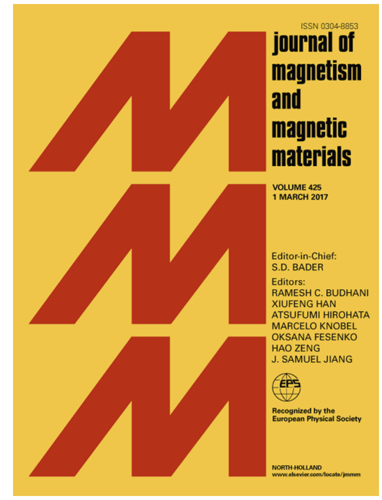
Accepted Manuscript



Effects of La substitution on the crystal structure and magnetization of MM-Fe-B alloy (MM=La, Ce, Pr, Nd)

Weiqiang Liu, Zhipeng Zhang, Ming Yue, Zhi Li, Dongtao Zhang, Hongguo Zhang

PII: S0304-8853(18)30815-1
DOI: https://doi.org/10.1016/j.jmmm.2018.05.043
Reference: MAGMA 63955

To appear in: *Journal of Magnetism and Magnetic Materials*

Received Date: 20 March 2018
Revised Date: 15 May 2018
Accepted Date: 16 May 2018

Please cite this article as: W. Liu, Z. Zhang, M. Yue, Z. Li, D. Zhang, H. Zhang, Effects of La substitution on the crystal structure and magnetization of MM-Fe-B alloy (MM=La, Ce, Pr, Nd), *Journal of Magnetism and Magnetic Materials* (2018), doi: https://doi.org/10.1016/j.jmmm.2018.05.043

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Effects of La substitution on the crystal structure and magnetization of MM-Fe-B alloy (MM=La, Ce, Pr, Nd)

Weiqiang Liu, Zhipeng Zhang, Ming Yue*, Zhi Li, Dongtao Zhang, Hongguo Zhang

College of Materials Science and Engineering, Beijing University of Technology, Beijing, 100124, China

Abstract Permanent magnet materials based on the $MM_2Fe_{14}B$ (MM = Misch-metal) are widely noted. However, as a room temperature paramagnetic phase, the existence of $CeFe_2$ phase in $MM_2Fe_{14}B$ alloy is unavoidable. In order to eliminate the $CeFe_2$ phase, the La substitution on MM in $MM_2Fe_{14}B$ alloys was described. Alloys with nominal composition of $(La_xMM_{1-x})_{33}Fe_{66}B$ (x = 0, 0.025, 0.05, 0.075, 0.1, 0.15) were prepared, and the crystal structure and magnetization of the $(La_xMM_{1-x})_{33}Fe_{66}B$ alloys were investigated. XRD results reveal that the lattice parameter a, c, unit-cell volume V, and c/a ratio of $(La_xMM_{1-x})_{33}Fe_{66}B$ alloys increase linearly with the La increase, indicating that La atoms enter into the main phase. Key to this study is the finding that $CeFe_2$ phase disappears with the La content above 0.075. It is therefore concluded that La substitution could inhibit formation of $CeFe_2$ phase. This is consistent with the observation from SEM-EDS. Another interesting finding is that La substitution would cause the change of Nd, Pr, La and Ce ratio in main phase, which means the ratios of four rare earth elements change with the La substitution. With the increase of x, the (Pr+Nd)/(La+Ce) ratio in main phase of $(La_xMM_{1-x})_{33}Fe_{66}B$ alloys decreases first, showing the lowest point at x=0.075, and then increases. As a result, the saturation magnetization (M_s) of $(La_xMM_{1-x})_{33}Fe_{66}B$ alloys has the same tendency, which decreases from 11.78 kG (x = 0) to 11.35 kG (x = 0.075) first, and then increases to 11.96 kG (x = 0.15). And the Curie temperature (T_c) displays the same trend compared to the M_s. These facts show that the MM has a great potential to prepare the low cost sintered permanent magnets.

Keywords: MM-Fe-B; Highly abundant rare earth; $CeFe_2$; Microstructure; Magnetization

*Corresponding author

E-mail address: yueming@bjut.edu.cn

1 Introduction

Since the discovery of Nd-Fe-B in 1983 by Sagawa [1], permanent magnets develop rapidly and become the heart of modern technology, such as wind power generators and electric cars [2-8]. Along with the continually expanding market of Nd-Fe-B permanent magnets, there is a booming need for Nd/Pr that takes over 90% in the

Download English Version:

https://daneshyari.com/en/article/8152613

Download Persian Version:

https://daneshyari.com/article/8152613

Daneshyari.com