

## Nb Effect on Soft Magnetic Properties in $\text{Fe}_{81-x}\text{Nb}_7\text{B}_{12+x}$ ( $x=0,0.5$ ) Ribbons Fabricated by Single Melt-spun Method

Chungnam National University Dongsheng Sun, S.M. Hong, C.G. Kim, C.O. Kim  
Moscow State University, Russia E.E.Shalyguina

### 1. INTRODUCTION

The Fe-M-B (M=Zr, Hf and Nb) type alloys as a soft magnetic materials have been investigated by K. Suzuki et al.[1]. The addition of Nb in the FeB alloy lead to inhibit the growth of crystalline in heat treatment. And about the annealing effect on the magnetic properties of nanocrystalline  $\text{Fe}_{80.5}\text{Nb}_7\text{B}_{12.5}$  was researched by I. Skorvanek et al.[2]. The minimum value of coercivity is found after annealing of specimens in the temperature range 610–630 °C. The aim of this paper is to contribute to understanding effect of Nb on the magnetic properties with the different composition.

### 2. EXPERIMENTAL

The  $\text{Fe}_{81}\text{Nb}_7\text{B}_{12}$  and  $\text{Fe}_{80.5}\text{Nb}_7\text{B}_{12.5}$  casts were prepared by vacuum induction furnace. The constituent elements with 99.9 wt% purification were melted in a quartz crucible under argon atmosphere. Then the casts were crushed into small size to be suitable for the next step. The quartz crucible with a nozzle (diameter 0.5 mm) was used. The FeNbB ribbons were made by R.S.P(Rapid Solidification Process) system under the argon atmosphere with 60 m/sec wheel velocity, 2 atm argon pressure and then heat treated for 1 hour at 500 °C, 550 °C, and 600 °C, respectively. After that, the magnetic properties were measured by the VSM(Vibration Sample Magnetometer) magnetometry, MOKE(Magneto Optical Kerr Effect) magnetometer, and the MI(Magneto Impedance) properties were measured.

### 3. RESULT

The soft magnetic  $\text{Fe}_{81-x}\text{Nb}_7\text{B}_{12+x}$  ( $x=0,0.5$ ) amorphous ribbons were fabricated by single melt-spun method successfully. The width and thickness of ribbons were about 0.5 mm and 10  $\mu\text{m}$ . According to analysis of the hysteresis loop with the heat treated ribbons, it can be shown that the coercivity( $H_c$ ) of the  $\text{Fe}_{81}\text{Nb}_7\text{B}_{12}$  sample increased obviously when heat treated at 600 °C. The  $H_c$  can reach 16.8 Oe but the coercivity improvement of  $\text{Fe}_{80.5}\text{Nb}_7\text{B}_{12.5}$  ribbon is not remarkable.

### 4. REFERENCES

- [1] K. Suzuki, A. Makino, A. Inoue, T. Masumoto, J. Appl. Phys. 74 (1993) 3316
- [2] I. Skorvanek, J. Kovac, J. Marcin, P. Duhaj, R. Gerling, J. Magn. Mater. 203 (1999) 226–228