CC06

Magnetostatic Coupling Between two Nanowires of Different Width

Lee Hanseok, Kim Seungho, Chang Youngwook, Yoo Kyung-Hwa, and Lee Jaeyong*

Institute of Physics & Applied Physics, Yonsei university, Seoul 120-749, South Korea

*Corresponding author: , Lee Jaeyong, e-mail: jl10017@phya.yonsei.ac.kr

Six pairs of magnetic nanowires are fabricated by using electron beam lithography and lift-off. Each pair is composed of two 20 nm thick NiFe nanowires (width = 400 & 800 nm). The separation (d) between them varies from 2000 nm to 70 nm.
The magnetic hysteresis loops are measured by using magneto optical Kerr effect and the images of domains are taken by using magnetic force microscopy (MFM).
All wires show abrupt switching, which suggests the single domain-like behavior.[1,2] The MFM image confirms single domain state at remanent state. As d decreases, the magnetostatic interaction affects the switching field (Hsw) of the pair, which are summarized in figure 1.

When $d > 500$ nm, Hsw does not change. But when $d \leq 500$ nm, the two wires show different behavior. As the magnetic field increases in the opposite direction after saturation, the magnetization of the 800 nm wire switches first and then the magnetizations of the two interacting wires are antiparallel.
The switched wire produces field to the neighboring 400 nm wire. This field is in opposite direction to the applied field. This increases the switching field of the 400 nm wire. The decreased switching field of the 800 nm wire is explained on the arguments of interaction of the two parallel magnetizations. In the conference, we will present the magnetic domain images, in addition to the detailed data of the above. The magnetic domain images are taken at the parallel and antiparallel alignments of the magnetizations.

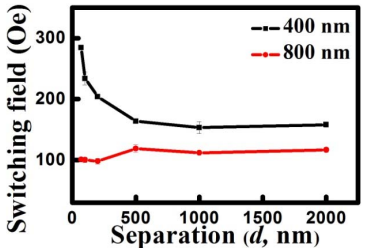

Fig. 1. Variation of the switching field (Hsw) vs. separation (d).

REFERENCES

[1] M. Brands *et al.*, Phys. Rev. B. 74, 174411(2006).
[2] K. Shigeto, T. Shinjo, T. Ono, Appl. Phys. Lett. 75, 18(1999).

CC07

Effect of Grain Size and Die-upset Temperature on Texture in Die-upset Nd-Fe-B Magnet

H. W. Kwon[1]*, J. I. Lee[1], Y.S. Kang[2], and G.S. Choi[3]

[1]Pukyong National University, Nam-Gu, Busan, South Korea 608-739
[2]SOGANG University, Seoul, Mapo-Gu, South Korea 121-742
[3]TONGMYONG University, Nam-Gu, Busan, South Korea 608-739

*Corresponding author: H.W. Kwon, e-mail: hwkwon@pknu.ac.kr

1. Introduction

One of the most common techniques being used to align the $Nd_2Fe_{14}B$ grains in the Nd-Fe-B material is a die-upset technique. The die-upset technique is usually applied to the melt-spun Nd-Fe-B material. The die-upsetting leads to a good texture of the nanocrystalline $Nd_2Fe_{14}B$. The formation of texture is known to take place via the stress-induced preferential grain growth. Considering the texture formation mechanism, the grain size before the die-upsetting is believed to play an important role. In the present study, the hot-pressed compacts with various grain sizes ranging from several tens of nm to several hundreds nm were prepared, and then they were subjected to a die-upsetting. The effect of grain size in the hot-pressed compact on the texture in die-upset magnet was investigated. The effect of dieupset temperature on the texture in die-upset magnet was also investigated.

2. Experimental work

Starting alloy of $Nd1_{3.5}Fe_{80}Ga_{0.5}B_6$ was prepared by an arc-melting using high purity elements. The prepared alloy was melt-spun, and the obtained ribbon was briefly milled and compacted. The hot-pressed compact was die-upset in an open die at various temperatures to achieve height reduction of around 75%. Texture in the die-upset magnets was evaluated by a magnetic means. Demagnetization curve was measured along the direction parallel and perpendicular to the pressing direction using a VSM at room temperature after pre-magnetizing with pulsing field of 50 kOe. Texture in the die upset sample was evaluated using the ratio of $M_{7(//)}/M_{7(\perp)}$, where, $M_{7(//)}$ and $M_{7(\perp)}$ are the magnetization at 7 kOe along the directions parallel and perpendicular to the pressing direction, respectively.

3. Results and discussion

In order to prepare the hot-pressed compacts with different grain size, the powder material was hot-pressed at different temperatures. The compacts hot-pressed at 750°C, 770°C and 820°C had grain size of around 50 nm, 100 nm and 200 nm, respectively. These compacts with different grain size were die-upset at 750°C and the texture in the die-upset samples was examined. It was found that the die-upset sample from the hot-pressed compact with fine grain size (50 nm) exhibited much higher texture with respect to the samples from the hot-pressed compacts with coarser grain size (100 nm and 200 nm). Meanwhile, the effect of die-upset temperature on the texture in the die-upset sample was investigated using the compact hot-pressed at 770°C. It was found that the sample die-upset at lower temperature of 700°C had lower texture, so did the sample die-upset at higher temperature of 900°C. The samples die-upset at modest temperature range from 750°C to 850°C showed much higher texture. The dependence of texture in the die-upset samples on the initial grain size and hot-deformation temperature is to be explained based upon the dissolution and precipitation mechanism.