BT10

A Universal Law for Remanence Enhancement of Single-phased Permanent Nanomagnets

Q. X. Zhang, G. P. Zhao*, and C. W. Xian

College of Physics and electronic engineering, Sichuan Normal University, Chengdu, 610066, China

*Corresponding author: G. P. Zhao, zhaogp@uestc.edu.cn

A universal law for remanence enhancement has been derived micromagnetically for single-phased permanent nanomagnets, which is, $M_r=a+b/L$ where $a=M_s/2$ and $b=cWM_s$, M_r, M_s, W, L are the remanence, saturation magnetization, domain wall width and average grain size respectively and c is a dimensionless constant. This analytical formula is consistent with available experimental data, which reveals that our calculated remanence is larger than the predictions of the Stoner-Wohlfarth model for all particle sizes, and that remanence enhancement is proportional to the ratio of domain wall width and average grain size.

By fitting the experimental data of M_r as a function of $1/L$, the important parameters of the material, such as the saturation magnetization M_s and the wall width W could be obtained with good reliability.

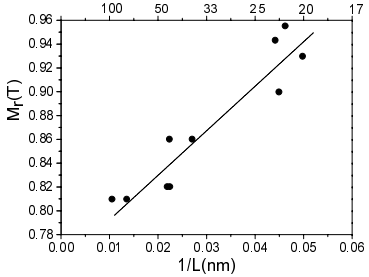

Fig. 1. Fitting of experimental data from Ref [1] (solid symbol).

Fig. 1 shows the fitting of experimental data [1] of $Nd_2Fe_{14}B$, which demonstrates that a good linearity does exist as the grain size changes from 20nm to 100nm.

This work is supported by National Natural Science Fund under contract number 10747007.

REFERENCES

[1] A. Manaf, R. A. Buckley, H. A. Davies, and M. Leonowicz, J. Magn. Magn. Mater. 101 360 (1991).

BT11