CR14

Grain Size Reduction and Magnetic Property of Fe-Pd-Rh Alloys

Chien-Feng Lin*

Department of Mechanical Engineering, National Kaohsiung First University of Science and Technolog, Taiwan, ROC

*Corresponding author: Chien-Feng Lin e-mail: lin.lin3312@msa.hinet.net

The research reports that the Fe-30Pd-2Rh (at%) ferromagnetic shape memory (FSM) alloys were forged a (40~45%) reduction in thickness then through thermal annealing at 950-1100°C for various times that recrystallization generating the grain size reduction can be observed by scanning electron microscopy (SEM). Investigation with vibrating sample magnetometer (VSM) reveals that the strain-forged sample with complete recrystallization can contribute a high saturated magnetization as well as a high magnetic anisotropy. The high magnetic anisotropy will provide improved magnetostriction in the alloys for use in magneto-mechanical applications [1-3].

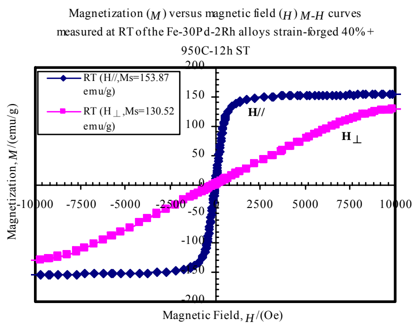

Fig. 1. Magnetization (*M*) versus magnetic field (*H*) *M-H* curves measured at RT of the Fe-30Pd-2Rh alloys strain-forged a 40% reduction in thickness and annealing at 950 °C for 12 h then quenching in ice brine. H⊥ denotes the magnetic field was applied perpendicular to the sample's cross section.

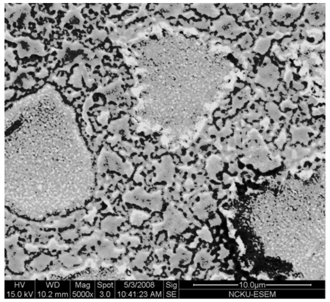

Fig. 2. SEM image taken from the alloys with strain-forged a 40% reduction in thickness then annealing recrystallization at 950 °C for 12 h and quenching in ice brine.

REFERENCES

[1] J. Cui, T. W. Shield, R. D. James, Acta Materialia, 52, 35 (2004).
[2] B. D. Cullity, "Introduction to Magnetic Materials", ed. by M. Cohen, Addison-Wesley, Reading, Massachusetts, USA chap. 1-2, and chap. 7-8, (1972).
[3] Y. C. Lin, H. T. Lee, S. U. Jen, and Y. T. Chen, Journal of Applied Physics 101, 09N514 (2007).

CR15

Mössbauer Studied of Superparamagnetic $Ni_{0.5}Zn_{0.5}Fe_2O_4$ Nanoparticles

Seung Wha Lee[1] and Chul Sung Kim[2]*

[1]Department of applied Mathematics, KonKuk University, Chungju 380-701, Korea
[2]Department of Physics, Kookmin University, Seoul 136-702, Korea

*Corresponding author: Chul Sung Kim, e-mail: cskim@phys.kookmin.ac.kr

In recent years a lot of work has been done on nanocrystalline materials because of their unusual properties compared to that of the properties of bulk materials [1, 2]. In particular, superparamagnetic (SPM) nanoparticles have been used in biomedicine and biotechnology as contrast agents in magnetic resonance imaging (MRI) and as drug carriers for magnetically guided drug delivery [3]. Superpara-magnetism has been extensively studied in the nanoparticles of pure metals such as Fe, Co, and Ni [3]. However, these metal nanoparticles are chemically unstable. Thus, their applications are very limited. On the other hand, abundant and diverse magnetic metal oxides offer great opportunities for developing superparamagnetic nanoparticles with desirable properties. In this study, a sol-gel procedure was used for the preparation of $Ni_{0.5}Zn_{0.5}Fe_2O_4$ nanoparticle powder and their magnetic and structural properties as a function of annealing temperature were characterized by using X-ray diffactometry (XRD), Mössbauer spectroscopy, and vibrating sample magnetometry (VSM) as well as scanning electron microscope (SEM). $Ni_{0.5}Zn_{0.5}Fe_2O_4$ powder that was annealed at 573 K has spinel structure and behaved superparamagnetically at room temperature. The estimated size of superparammagnetic $Ni_{0.5}Zn_{0.5}Fe_2O_4$ nanoparticle is around 7 nm. The hyperfine fields of the *A* and *B* patterns at 4.2 K were found to be 510 and 475 kOe, respectively. The blocking temperature (T_B) of superparammagnetic $Ni_{0.5}Zn_{0.5}Fe_2O_4$ nanoparticle is about 90 K. The magnetic anisotropy constant and relaxation time constant of $Ni_{0.5}Zn_{0.5}Fe_2O_4$ nanoparticle were calculated to be 1.6×10^6 ergs/cm^3.

REFERENCES

[1] S. H. Im, T. Herricks, Y. T. Lee, Y. Xia, Chem. Phys. Lett. **401**, 19 (2005).
[2] S. Y. An, I. B. Shim, and C. S. Kim, J. Appl. Phys. **97**, 10Q909 (2005).
[3] S. W. Lee, and C. S. Kim, J. of Magnetics **10**, 5 (2005).