

## Mössbauer Study of Nanocrystalline Cobalt Ferrite

E.J. Choi<sup>1</sup>, Y. Ahn<sup>1</sup>, K.C. Song<sup>2</sup> and H.N. Oak<sup>3</sup>

<sup>1</sup> Department of Nanomaterial Science, Konyang University, Nonsan, Chungnam, 320-711, Korea

<sup>2</sup> Department of Chemical Engineering, Konyang University, Nonsan, Chungnam, 320-711, Korea

<sup>3</sup> Institute of Physics and Applied Physics, Yonsei University, Seoul 120-711, Korea

\*Corresponding author: e-mail: ejchoi@konyang.ac.kr, Phone: +82 41 730 5216, Fax: +82 41 736 4078

Research on nanoparticles has been very active because of their various unusual properties which are not observed in the corresponding bulk crystals. One of the most pronounced feature is superparamagnetic relaxation [1]. The purpose of the present work is to report superparamagnetic phenomena observed for nanocrystalline cobalt ferrite prepared by a microemulsion method [2], using SQUID magnetometry and Mössbauer spectroscopy.

X-ray diffraction patterns of nanocrystalline cobalt ferrite were obtained with Cu-K $\alpha$  radiation. The particle size and size distribution were examined by a Philips STEM-12 transmission electron microscopy. Magnetization measurements were performed in a SQUID magnetometer between 5 and 300 K, in field up to 50 kOe. A Mössbauer spectroscopy of the electromechanical type was used in the constant-acceleration mode.

All peaks of X-ray diffraction patterns can be attributed to a cubic spinel structure with the lattice constant  $a_0 = 8.39$  Å. The particle size distribution was analyzed by least-square fitting to a lognormal distribution [3]. Superparamagnetic behaviour of the particles is confirmed by the coincidence of plots of the magnetization versus field divided by temperature. As the temperature increases toward the Curie temperature, Mössbauer line broadening and a pronounced central doublet appear, suggesting superparamagnetic relaxation [4].

### References

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