55th Annual Conference on
Magnetism and Magnetic Materials
November 14-18, 2010 • Atlanta, GA

August 17, 2010

Kontan Tarigan
Room # 40-350, Applied Physics Laboratory
Natural Science College
Chungbuk National University
410 Seongbong-ro, Heungdeok-gu
Cheongju Chungbuk 361-763
SOUTH KOREA

Dear Kontan,

This is your formal invitation to attend and participate in the **2010 Magnetism and Magnetic Materials Conference ("MMM 2010").** The MMM 2010 Conference will be held at the Hyatt Regency Atlanta Hotel in Atlanta, GA, USA. **The official dates of the Conference are November 14-18 (Sunday through Thursday), 2010.** The technical program will be of the highest quality. You should benefit greatly from both the technical program and from participation in the many informal discussions that take place among the participants on matters of mutual technical interest.

Funds to support participants in the MMM 2010 Conference are not available. Therefore, **this invitation does not include any financial support for your travel, registration fees or local expenses once you arrive in the United States.** Should you need financial assistance, you will need to obtain the necessary funding elsewhere. **We cannot waive the registration fees for any participants, including speakers**.

The MMM 2010 Conference has no influence over the visa application process. **You have been chosen to present a paper CU-04** entitled, "Local Structure and Magnetic Properties of Fe50Mn50 Metastable Alloys." **You must present your work in person for it to be published in the Proceedings**.

In order for an attendee to register as a "student" that person must bring with him/her an official school identification card that has the individual's picture on it. This student I.D. card must be shown upon arrival at the Registration Desks onsite in order to obtain the student registration fee.

The Advance Registration Form, the Hotel Reservation Form, and list of all fees are available now on the Conference web site at: http://www.magnetism.org.

We look forward to having you with us at the 2010 Magnetism and Magnetic Materials Conference.

Sincerely,

55th Annual Conference on
Magnetism and Magnetic Materials
November 14-18, 2010 • Atlanta, GA

Diane S. Melton
2010 MMM

Conference Manager

Jointly sponsored by the Physics Conferences Inc (AIP) and Magnetics Society of the Institute of Electrical and Electronics Engineers in cooperation with The American Physical Society.

CU-04

The 55th Magnetism and Magnetic Materials Conference,
Atlanta, Georgia, USA, 14–18 November 2010

The Physics Based Human Resources Development Program for the Next Generation Devices

Local Structure and Magnetic Properties of $Fe_{50}Mn_{50}$ Metastable Alloys

K. Tarigan*, D.Yang, T. Phan, *S. Oh and* S.Yu

BK21 Physics Program and Department of Physics, Chungbuk National University, Cheongju 361-763, South Korea

Introduction

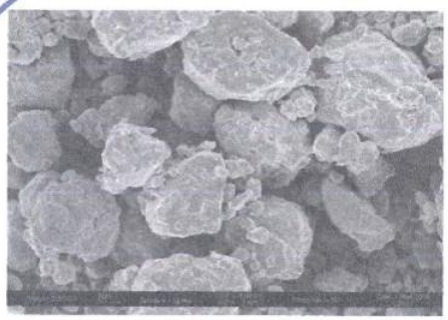
So far anti-ferromagnetic FeMn alloys have been extensively studied for many magnetic applications. Various phenomena such as spin transition and shape-memory effect in FeMn alloys have been reported by Refs. [1,2]. FeMn thin films are widely used in a spin-valve structure in combination with magnetoresistive materials for applications of magnetic sensors and magnetic data storage.[3] For anti-ferromagnetic (AFM) domain, it has been revealed that the bias field increases with decreasing AFM domain size d as $1/d$. The exchange bias is attributed to the formation of domain walls in AFM.[4,5] Magnetic properties of an assembly of small grains depend strongly on the counter play of local magnetic anisotropy energy and ferromagnetic exchange energy.[6]

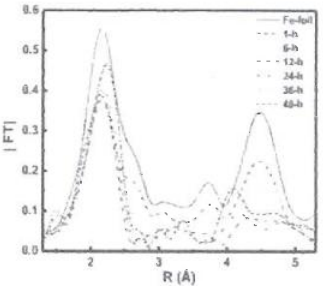
Mechanical alloying (MA) has been used to prepare metastable phases such as supersaturated solid solution, amorphous phases and nanopowders, starting from a mixture of elemental components or inter-metallic compounds.[1,7] As a mater of fact, this is an effective way to fabricate nanocrystalline alloys.[8] For FeMn alloys, their physical properties are related to structural variations. Some regularity in atomic arrangement in solids can be classified by the short-range order (SRO) and long-range order (LRO). Among these, LRO is frequently examined by X-ray diffraction studies while SRO could be examined by extended X-ray absorption fine structure (EXAFS). EXAFS give useful information related to the local structure around specific atoms.[1] In this work, we present preparation and characterization of the structure and magnetic behavior of $Fe_{50}Mn_{50}$ alloys as changing the milling time.

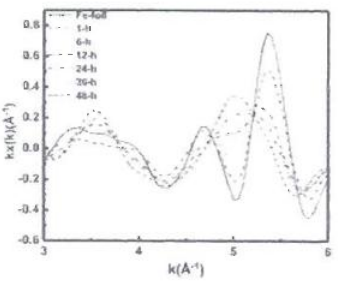
Experiment

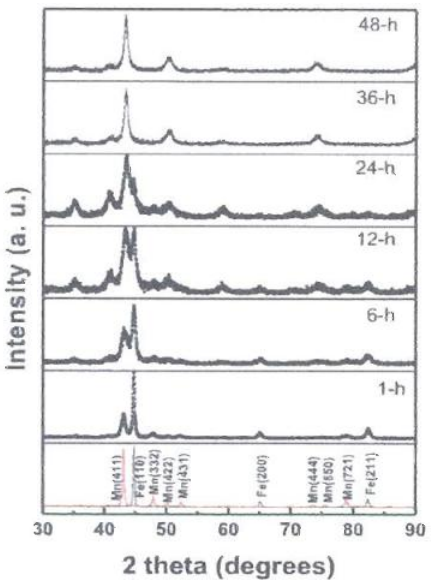
$Fe_{50}Mn_{50}$ metastable alloys were prepared by mechanical alloying using a SPEX 8000 mixer with stainless steel balls and vial. The starting material was a mixture of pure Fe and Mn powders (used commercial Fe and Mn powders as the precursors). The weight ratio of balls-to-powder mixture was 5:1. $Fe_{50}Mn_{50}$ alloys were mixed and ground for different times 1, 2, 4, 6, 12, 24, 36 and 48 hrs. This process was performed in Ar ambient to prevent oxidation during the alloying process. After the preparation, magnetic measurements were carried out on SQUID. XRD data were obtained by an X-ray diffractometer using the Cu-K_α radiation. Based on these data, crystallite size of the samples was estimated in terms of the Scherrer formula. EXAFS data were collected from the 3C1 EXAFS beam line of the Pohang Light Source (PLS). The PLS was operated with an energy of 2.5 GeV, and a maximum current of 200 mA. EXAFS spectra were obtained at Fe K-edge (7112 eV) in the transmission mode at room temperature. The sample chamber was filled with pure nitrogen gas. The EXAFS data were analyzed by FEFF. Finally, the nanoparticle size and their shape were checked by scanning electron microscope (SEM).

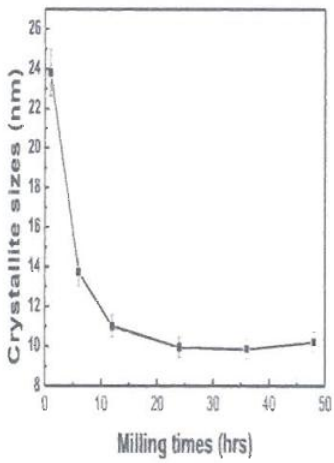
Results and discussions

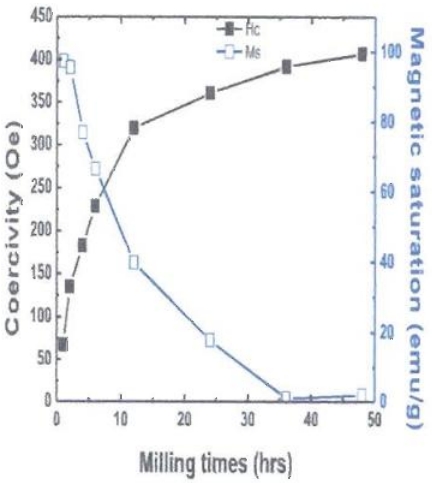












Conclusions

The formation of $Fe_{50}Mn_{50}$ metastable alloys is explicitly shown in the EXAFS spectra by the variation of amplitude and phase between 12 hrs and 24 hrs milling times. The significant change of the structural phase revealed that new atom neighbors between the central Fe and Mn atoms increased during the MA process. The Fe and Mn atoms are diffused each other to form the FeMn alloy phase.

* kontan_tarigan@yahoo.com