AMC2008

Asian Magnetics Conference 2008

December 10-13, 2008, Paradise Hotel, Busan, Korea

Hosted by

The Korean Magnetics Society

Sponsored by

Korea Research Foundation
Korea Science and Engineering Foundation
Korean Federation of Science and Technology Societies

The Korean Magnetics Society

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Magnetic Shielding Effectiveness Measurement of Magnetic Steel Sheets in ELF Range

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Magnetic field shield becomes more important due to the not only EMI/EMC problems but also bad influence to the human body[1,2]. Many countries now have regulation for magnetic field strength limit in ELF range. Magnetic Shielding Effectiveness (MSE) measuring method for constructions is in ASTM[3], but there is no measuring method for sheet specimen. In this work, we have designed new type of MSE measuring equipment for steel sheet specimens "biowave-steel" which is produced in POSCO. MSE measurement for steel sheet, we invoked two yokes. One is magnetizing yoke and the other is sensing yoke as shown in Fig. 1. And test specimen put into between two yokes. MSE was calculated from induced voltage of sensing yoke with sample V1 and without sample V2

$$MSE = \frac{V_2}{V_1} \qquad (1)$$

For higher reproducible measurement, gabs between magnetizing yoke and specimen, and magnetizing yoke and sensing yoke were fixed 3 mm and 8 mm respectively. Fig. 2 shows the constructed yoke system. MSE measurement for the biowave-steel frequency ranging from 10 Hz to 10 kHz for different specimen size is shown in Fig. 3. We can see that MSE depends on the specimen size. When frequency is low, specimen size of 8 mm × 8 mm enough, but higher frequency we need specimen size of 140 mm × 140 mm, because of enough large specimen size for eddy current loop generation.

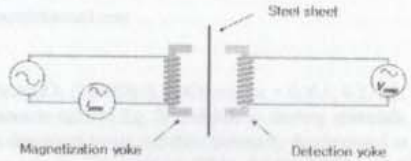

Fig. 1. Compose of magnetizing yoke and sensing yoke.

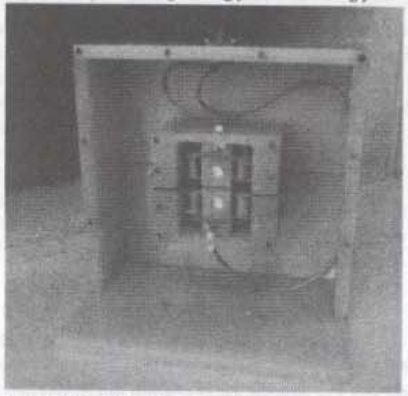

Fig. 2. The construckted yoke system.

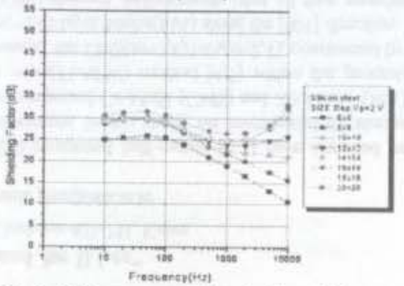

Fig. 3. MSE measurement for the bio stiel frequency ranging from 10 Hz to 10 kHz.

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Cation Distribution and Magnetic Properties of the Spinel $FeCr_{1.9}Al_{0.1}S_4$

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The cation distribution and magnetic properties of $FeCr_{1.9}Al_{0.1}S_4$ were investigated using X-ray diffractometer (XRD), vibrating sample magnetometer (VSM) and Mössbauer spectroscopy measurement. The crystal structure is determined to be a cubic spinel with space group *Fd-3m* and the lattice constant is found to be a_0 = 9.998 Å.

The temperature dependence of magnetization was measured at various external fields. Fig. 1. shows the zero field cooled (ZFC) and field cooled (FC) curves under 100 Oe external field. The magnetization followed a Curie-weiss law with a positive Curie temperature θ_{cw} = 160 K showing ferrimagnetic behaviors. We have observed the large irreversibility in ZFC and FC curves, at low external magnetic field. It dispeared gradually with increasing external field. It shows a cusp shape at 68 K which is explained by the magnetic domain motion. Moreover a week kink at 100 K is observed in which magneticzation decrease with increasing temperature and then it abruptly increase again. This abnormal feature is interepreted by magnetic fluctuation as substituting non magnetic ion Al^{3+} in the octahedral (B)site.

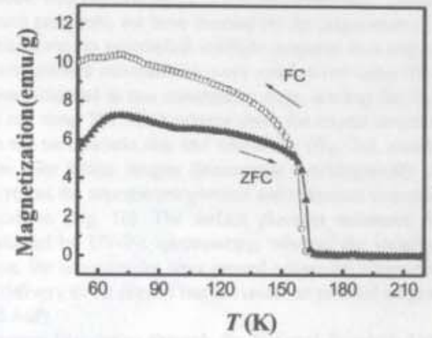

Fig. 1. The temperature dependence of zero-field-cooled and field-cooled magnatization for $FeCr_{1.9}Al_{0.1}S_4$ under the 100 Oe external field.