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Synthesis and Size Dependent Properties of Magnesium Ferrites

Sung Wook Hyun, Hyung Jeon Kim, Chu Sik Park, Kyung-Soo Kang, and Chul Sung Kim

1Department of Physics, Kookmin University, Seoul 135-702, Korea
2Nanomedical National Core Research Center, Yonsei University, Seoul 120-749, Korea
3Hydrogen Energy R&D Center, Korea Institute of Energy Research, Daejeon 305-343, Korea

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

MgFe2O4 materials have been studied by many researchers due to its technical applications [1, 2]. MgFe2O4 samples are prepared by solid state reaction, sol-gel, and high temperature chemical decomposition methods (HTTD) [3-4]. The samples (a) annealed at 1100 °C by solid state reaction, (b) annealed at 800 °C by sol-gel method under Ar atmosphere and (c) prepared by HTTD method have the inverse cubic spinel structure (Fe3+)MgFe2O4 with space group of Fd3m. The saturation magnetization (Ms) and coercivity (Hc) at room temperature are found to be 53.3, 44.2 and 53.9 emu/g and 94.1, 81.6 and 22.3 Oe, respectively. Mössbauer spectra of all samples have been obtained at room temperature and the sample prepared by HTTD method was measured at various temperatures ranging from 4.2 to 300 K. The isomer shift at room temperature for the A and B sites of all samples are found to be 0.22-0.44 and 0.17-0.19 mm/s relative to the Fe metal, respectively, which are consistent with the Fe3+ valence state. Mössbauer spectrum of the sample prepared by HTTD method shows superparamagnetic behavior at room temperature and Mössbauer spectra of the other samples show ferrimagnetic state of 6-line shapes having the hyperfine field (Hhf) values of 412-451 kOe for the A sites and 466-483 kOe for the B sites. The linewidth and the hyperfine field of Mössbauer spectra is broadened and reduced, respectively, which is reduced the particle sizes.

REFERENCES

Low Loss Ba3Co2Fe2O11 Ferrite through Added of Al2O3

Jun Sig Kurni*, Won-Ki Ahn, Sang-Hoon Park, Jeong-Keun Ji, Ki-Ho Kim, Chul Sung Kim, and Won-Mo Seong

1E.M.W. Antenna Co., Ltd., 459-24 Kama-dong, Kumchon-gu, Seoul, South Korea
2Department of Physics, Kookmin University, 861-1, Champung-dong, Sungbuk-gu, Seoul, South Korea

*Corresponding author: Jun Sig Kurni, e-mail: jskurni@emwantenna.com

In order to realize the ferrite antenna application, low magnetic loss tangent (tan δ, μ'/μ < 0.02, μ'': real permeability, μ'': imaginary permeability) and moderately enhanced permeability (μ' > 2) for operation in the antenna [1]. The magnetodielectric properties of Ba3Co2Fe2O11 (Co2Z) ferrite are introduced with a emphasis tan δ, and μ' as a function of Al2O3 addition. Co2Z ferrite have been studied with X-ray diffraction, vibrating sample magnetometer, RF impedance/materials analyzer (10 MHz-1 GHz). Co2Z ferrite was fabricated by co-precipitation method [2]. Precipitation powder was calcined 1000 °C for 6 h in air. The calcined powder was mixed with different amounts of Al2O3 with weight percent (1-10%) then sintered at 1250 °C for 6 h in air. As the Al2O3 addition is increased, μ' and tan δ decreased, as shown in Fig. 1. With increasing Al2O3 added from 0% to 10%, the μ' decreased from 8.15 to 1.28 and the tan δ decreased from 0.04 to 0.06 at 200 MHz, respectively. With increasing Al2O3 added, the ε' decreased, the dielectric loss tangent (tan δ, ε''/ε', ε'': real permittivity, ε'': imaginary permittivity) is not change fairly. Therefore, Co2Z ferrite by added Al2O3 is a good candidate ferrite for antenna material.

Fig. 1. Mössbauer spectra of samples by (a) solid state reaction, (b) sol-gel and (c) HTTD at room temperature.

Fig. 1. Frequency dependence of Complex permeability and tan δ, for samples ratio at Al2O3.

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