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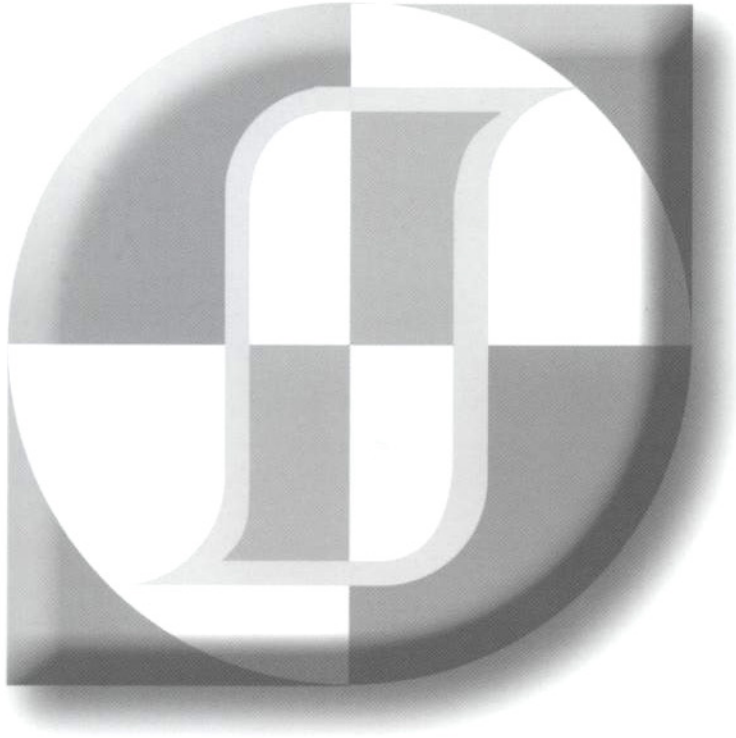

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DR04

Synthesis and Size Dependent Properties of Magnesium Ferrites

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$MgFe_2O_4$ materials have been studied by many researchers due to its technical applications [1, 2]. $MgFe_2O_4$ samples are prepared by solid state reaction, sol-gel, and high temperature thermal decomposition methods (HTTD) [2-4]. The samples (a) annealed at 1100 °C prepared by solid state reaction, (b) annealed at 800 °C prepared by sol-gel method under Ar atmosphere and (c) prepared by HTTD method have the inverse cubic spinel structure ($(Fe)_A[MgFe]_BO_4$) with space group of *Fd3m*. The saturation magnetization (M_s) and coercivity (H_c) 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 shifts 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 Fe^{3+} 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 (H_f) values of 432~451 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.

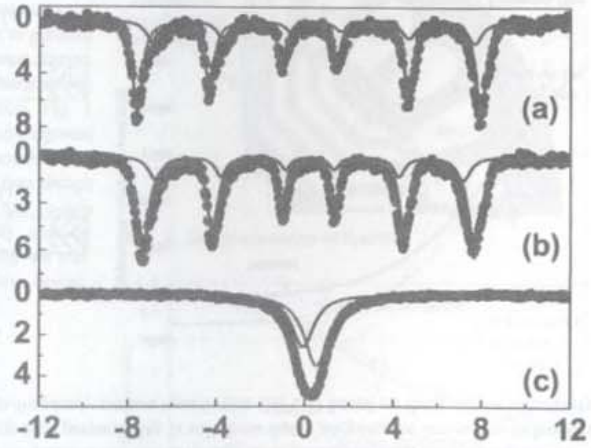

Fig. 1. Mossbauer spectra of samples by (a) solid state reaction, (b) sol-gel and (c) HTTD at room temperature.

REFERENCES
[1] Taeghwan Hyeon, Chem. Commun. 8, 927 (2003).
[2] S. C. Bhargava, Phys. Rev. B. 58, 3240 (1998).
[3] Seung-Iel Park *et al.*, J. of Magnetics 12, 137 (2007).
[4] Shouheng Sun *et al.*, J. Am. Chem. Soc. 126, 273 (2004).

DR05

Low Loss $Ba_3Co_2Fe_{24}O_{41}$ Ferrite through Added of Al_2O_3

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In order to realize the ferrite antenna application, low magnetic loss tangent ($\tan\delta_\mu = \mu''/\mu' < 0.02$, μ' : real permeability, μ'' : imaginary permeability) and moderately enhanced permeability ($\mu' > 2$) for operation in the antenna [1]. The magneto dielectric properties of $Ba_3Co_2Fe_{24}O_{41}$ (Co2Z) ferrite are introduced with a emphasis $\tan\delta_\mu$ and μ' as a function of Al_2O_3 addition. Co_2Z ferrite have been studied with X-ray diffraction, vibrating sample magnetometer, RF impedance/materials analyzer (10 MHz~1 GHz). Co_2Z ferrite was fabricated by co-precipitation method [2]. Percipitation powder was calcined 1000 °C for 6 h in air. The calcined powder was mixed with different amounts of Al_2O_3 with weighte percent (1~10 %) then sintered at 1250 °C for 6 h in air. As the Al_2O_3 addition is increased, μ' and $\tan\delta_\mu$ decreased, as shown in Fig. 1. With increasing Al_2O_3 added from 0 % to 10 %, the μ' decreased from 7.54 to 2.18 and the $\tan\delta\mu$ decreased from 0.04 to 0.02 at 200 MHz, respectively. With increasing Al_2O_3 added, the ε' decreased, the dielectric loss tangent ($\tan\delta_\varepsilon = \varepsilon''/\varepsilon'$, ε' : real permittivity, ε'' : imaginary permittivity) is not change fairly. Therefore, Co_2Z ferrite by added Al_2O_3 is a good candidate ferrite for antenna material.

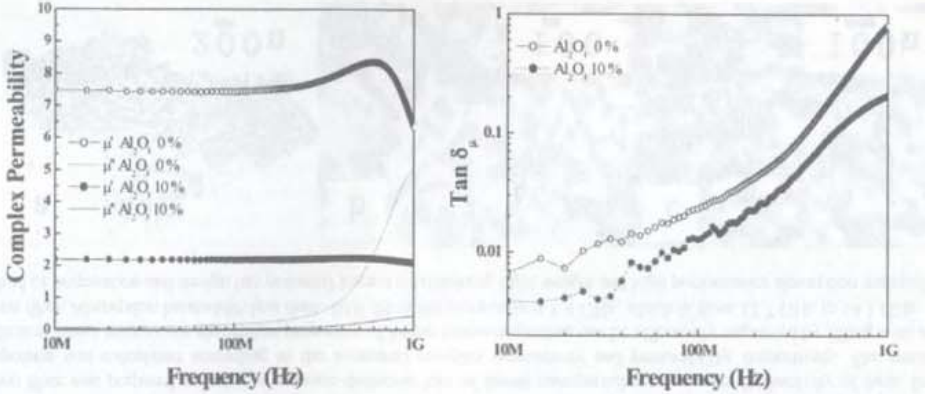

Fig. 1. Frequency dependence of Complex permeability and tan δ_μ for samples ratio at Al_2O_3.

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REFERENCES
[1] Kevin Buell, and Hossein Mosallaei *et al.*, IEEE Tras. Microw. Theory Tech., 52, 135 (2006).
[2] Hsing-I. Hsiag, and Ren-Qian Yao., Journal of Alloys and Compounds., 543, 366 (2008).