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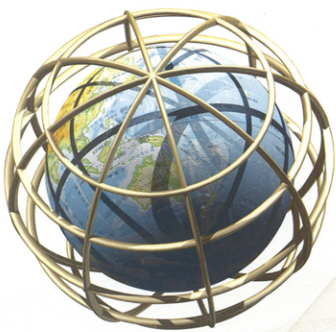

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PB05

Structural and Magnetic Characteristics of Bismuth Substituted Holmium Iron Garnet

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Bismuth-substituted heavy rare-earth iron garnet materials have attracted much attention in optical communication industries due to their small temperature coefficient of Faraday rotation, low optical absorption, and a low magnetic field for saturation [1]. Especially, $(TbBi)_3Fe_5O_{12}$, and $(HoBi)_3Fe_5O_{12}$ have received much attention for the communication systems devices in the wavelength range of 1.3 ~ 1.6 μm [2]. Here, we present the results of XRD, vibrating sample magnetometer (VSM), and the Mössbauer experiments on the bismuth substituted holmium iron garnet. The $Ho_2Bi_1Fe_5O_{12}$ powders were prepared by sol-gel method. The crystal structures were found to be a cubic structure with space group *Ia3d*. The determined lattice constant of sample is 12.462 Å. Fig. 1 shows the Temperature dependence of field cooled magnetization of $Tb_2Bi_1Fe_5O_{12}$ and $Ho_2Bi_1Fe_5O_{12}$. $Ho_2Bi_1Fe_5O_{12}$ exibited lower compensation temperature than $Tb_2Bi_1Fe_5O_{12}$. From the analysis of VSM hysteresis loop at room temperature, the saturation magnetization and coercivity of the sample are 15.545 emu/g and 33.33 Oe, respectively. The Néel temperature (TN) was determined to be 650 K by Mössbauer spectroscopy. Compare with our past results of $Tb_2Bi_1Fe_5O_{12}$ [3], $Ho_2Bi_1Fe_5O_{12}$ has larger saturation magnetization, higher T_N, and lower coercivity than $Tb_2Bi_1Fe_5O_{12}$. These phenomena can be explained by influence of the Bi ions on the super-exchange interaction between a-d sublattices[4].

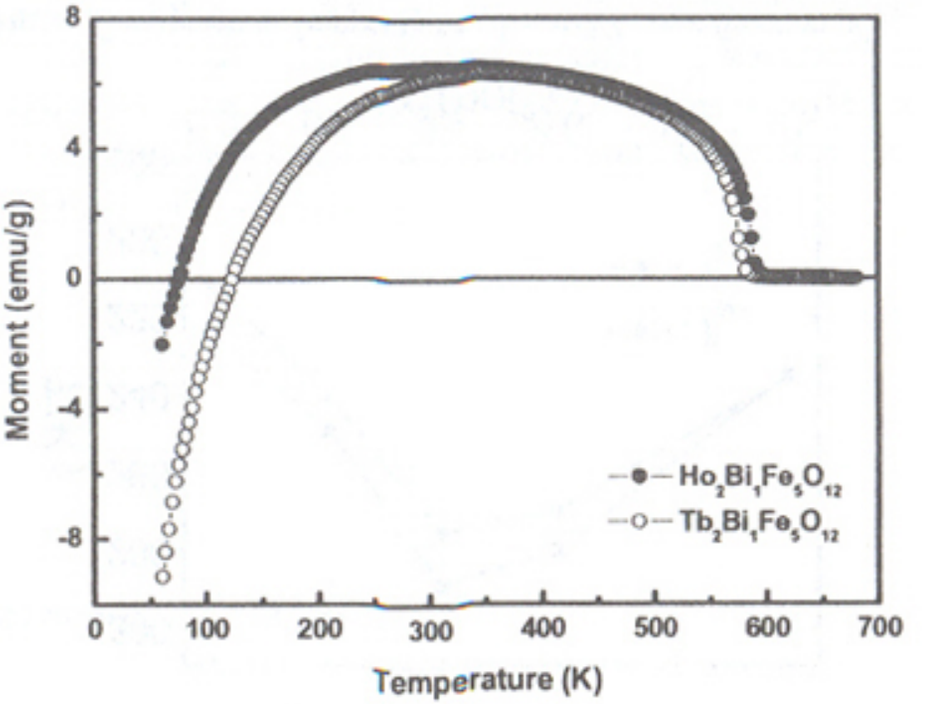

Fig. 1. Temperature dependence of field cooled magnetization of $Tb_2Bi_1Fe_5O_{12}$ and $Ho_2Bi_1Fe_5O_{12}$.

REFERENCES

[1] M. X. Xu, phys. stat. sol. (a), **170**, 175 (1998).
[2] G. Y. Zhang, X. W. Xu, and T. C. Chong, J. Appl. Phys., **95**(10), 5267 (2004).
[3] I. J. Park, K. U. Kang, and C. S. Kim, IEEE Trans. Mag., **42**(10), 2882 (2006).
[4] P. Hansen, K. Witter, and W. Tolkdorf, Phys. Rev. B. **27**, 4375 (1983).