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Infrared Properties of $\text{La}_{0.8}\text{Ba}_{0.2}\text{MnO}_3$ and $\text{La}_{0.7}\text{MnO}_3$ Thin FilmsM. H. Chang^{*1}, H. L. Liu¹, H. Chou², W. J. Chang³, and J. Y. Lin⁴¹Department of Physics, National Taiwan Normal University, Taipei 116, Taiwan²Department of Physics, National Sun Yat-sen University, Kaohsiung 804, Taiwan³Department of Electrophysics, National Chiao Tung University, Hsinchu, 30050, Taiwan⁴Institute of Physics, National Chiao Tung University, Hsinchu, 30050, Taiwan

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Two $\text{La}_{0.8}\text{Ba}_{0.2}\text{MnO}_3$ thin films (thickness around 300 Å and 1500 Å) and three $\text{La}_{0.7}\text{MnO}_3$ thin films (thickness around 3500 Å) were grown on SrTiO_3 (001) substrate using the off-axis magnetron sputtering technique or pulsed-laser deposition. The optical reflectance spectra of the samples were measured over a broad energy range from the far-infrared through the ultraviolet and at the temperatures between 20 and 330 K. To extract the optical constants of the films, the Drude-Lorentz model was used to fit all of the layers of this thin-film structure. From the parameters obtained, these studies reveal (i) the 1500 Å-thick $\text{La}_{0.8}\text{Ba}_{0.2}\text{MnO}_3$ thin film exhibits the strongest Drude response at 20 K and (ii) the pronounced resonance in the mid-infrared in all thin films can be well understood in the framework of small polaron model.

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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, $(\text{TbBi})_3\text{Fe}_5\text{O}_{12}$ and $(\text{HoBi})_3\text{Fe}_5\text{O}_{12}$ 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 $\text{Ho}_2\text{Bi}_1\text{Fe}_5\text{O}_{12}$ powders were prepared by sol-gel method. The crystal structures were found to be a cubic structure with space group $I\bar{4}3d$. The determined lattice constant of sample is 12.462 Å. Fig. 1 shows the temperature dependence of field cooled magnetization of $\text{Tb}_2\text{Bi}_1\text{Fe}_5\text{O}_{12}$ and $\text{Ho}_2\text{Bi}_1\text{Fe}_5\text{O}_{12}$. $\text{Ho}_2\text{Bi}_1\text{Fe}_5\text{O}_{12}$ exhibited lower compensation temperature than $\text{Tb}_2\text{Bi}_1\text{Fe}_5\text{O}_{12}$. 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 $\text{Tb}_2\text{Bi}_1\text{Fe}_5\text{O}_{12}$ [3], $\text{Ho}_2\text{Bi}_1\text{Fe}_5\text{O}_{12}$ has larger saturation magnetization, higher T_N , and lower coercivity than $\text{Tb}_2\text{Bi}_1\text{Fe}_5\text{O}_{12}$. These phenomena can be explained by influence of the Bi ions on the super-exchange interaction between a-d sublattices[4].

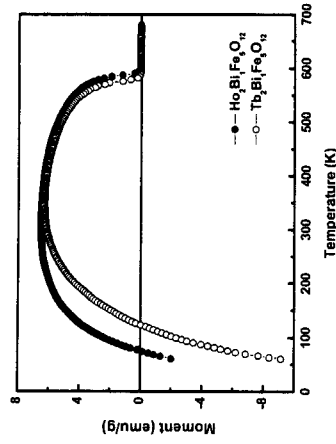


Fig. 1. Temperature dependence of field cooled magnetization of $\text{Tb}_2\text{Bi}_1\text{Fe}_5\text{O}_{12}$ and $\text{Ho}_2\text{Bi}_1\text{Fe}_5\text{O}_{12}$.

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