The 8th International Symposium on Nanocomposites & Nanoporous Materials (ISNNM8)

February 22 - 24, 2007
Jeju HAEVICHI Resort

High Performance Nano Composites Program
Nano Center for Fine Chemicals Fusion Technology
Research Center for Nano Catalysis
Environment-friendly Materials Research Center
The Korean Powder Metallurgy Institute
Magnetic properties of Tb$_2$Bi$_4$Fe$_5$O$_{12}$ and Ho$_2$Bi$_4$Fe$_5$O$_{12}$ nanoparticle.

Il Jin Park, and Chul Sung Kim.

Department of Physics, Kookmin University, Seoul 136-702, Korea (cskim@phys.kookmin.ac.kr)

Polycrystalline Tb$_2$Bi$_4$Fe$_5$O$_{12}$ and Ho$_2$Bi$_4$Fe$_5$O$_{12}$ were prepared using the sol-gel method. Weighted amounts of Tb(NO$_3$)$_3$·5H$_2$O, Tb(NO$_3$)$_3$·5H$_2$O, Bi(NO$_3$)$_3$·5H$_2$O, and Fe(NO$_3$)$_3$·9H$_2$O were first dissolved in 2-methoxyethanol (2-MOE) and acetic acid. The solution was refluxed at 80 °C for 24 h to allow gel formation, and then dried at 120 °C for 24 h. The dried powder were ground and annealed at temperature 900 °C for 3h in air. The crystallographic and magnetic properties of powders were studied by using x-ray diffraction and vibrating sample magnetometer. Crystal structure of the samples is determined to be normal cubic structure Ia3d by Rietveld refinement. The particle sizes calculated using scherrer equation of Tb$_2$Bi$_4$Fe$_5$O$_{12}$ and Ho$_2$Bi$_4$Fe$_5$O$_{12}$ are 60 and 47 nm, respectively. The determined lattice constants of Tb$_2$Bi$_4$Fe$_5$O$_{12}$ and Ho$_2$Bi$_4$Fe$_5$O$_{12}$ are 12.499 and 12.459 Å, respectively. The saturation magnetization ($M_s$) and coercivity ($H_c$) can be controlled by bismuth contents in bismuth substituted terbium iron garnet [1]. In this study, we report on the magnetic properties of Tb$_2$Bi$_4$Fe$_5$O$_{12}$ and Ho$_2$Bi$_4$Fe$_5$O$_{12}$ nano powder. The $M_s$ of Tb$_2$Bi$_4$Fe$_5$O$_{12}$ and Ho$_2$Bi$_4$Fe$_5$O$_{12}$ is 10.234 and 14.404 emu/g, respectively. And the $H_c$ of Tb$_2$Bi$_4$Fe$_5$O$_{12}$ and Ho$_2$Bi$_4$Fe$_5$O$_{12}$ is 56.57 and 32.33 Oe, respectively. Ho$_2$Bi$_4$Fe$_5$O$_{12}$ shows the larger $M_s$ and smaller $H_c$ than Tb$_2$Bi$_4$Fe$_5$O$_{12}$.

References