Materials Science Forum Vols. 373-376 (2001) pp. 753-756

Cation Distribution and Magnetic Interaction in $Y_3Fe_{5-x}Cr_xO_{12}$ by Mössbauer Spectroscopy

Chul Sung Kim[1], Young Rang Uhm[1], Jae-Gwang Lee[2], Kwang-Ho Jeong[3]
[1]Department of Physics, Kookmin University, Seoul 136-702, Korea
[2]Department of Applied Physics, Konkuk University, Chungbuk 380-701, Korea
[3]Department of Physics, Yonsei University, Seoul 120-749, Korea

Keywords: $Y_3Fe_{5-x}Cr_xO_{12}$, Garnet, Distribution,

Abstract

The iron containing garnet has been examined by ^{57}Fe Mössbauer spectroscopy and vibrating sample magnetometer. The results show that the chromium in compounds of the $Y_3Fe_{5-x}Cr_xO_{12}$ (x = 0.0, 0.25, 0.5, and 1.0) occupied at octahedral site. The substitution of Fe^{3+} by Cr^{3+} on the octahedral site results in much lowering of magnetic ordering temperature. The Mössbauer spectra can be analyses 3set or 4set of six Lorentzian with increasing an amount of Cr^{3+}. It results from the distribution($_4C_n$) of Fe^{3+} and Cr^{3+} at octahedral site. The ratios of areas, a, d_1, d_2, d_3, in $Y_3Fe_{4.5}Cr_{0.5}O_{12}$ are 0.33, 0.22, 0.28, 0.14. The saturation magnetization and the coercivity decrease as increasing Cr^{3+}.