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ABSTRACTS

GR-12. Mössbauer studies of mixed valence LuFe_2O_4 . B. Bang¹, S. Kim¹, S. Cheong² and C. Kim¹. *1. Physics, Kookmin University, Seoul, South Korea. 2. Physics & Astronomy, Rutgers University, Piscataway, NJ, USA*

Single crystalline LuFe_2O_4 was grown using the floating zone method. The crystal structure shows two-dimensional layered type rhombohedral ($R\bar{3}m$) structure. The lattice constants are found to be $a_0 = 3.440(3)$ Å and $c_0 = 25.263(5)$ Å, as a hexagonal cell for convenience. The magnetic Curie temperature (T_C) was determined to be 240 K from the $M(T)$ curve and Mössbauer spectra. Just below T_C , the magnetic moment has large value and shows abrupt change in $M(T)$ curve. In order to figure out the spin configuration of Fe ions, the LuFe_2O_4 have been studied by Mössbauer spectroscopy. The Mössbauer spectra have been taken at various temperatures ranging from 4.2 K to room temperature. The spectrum at room temperature consisted of a single absorption line and a doublet split with the electric quadrupole splitting (ΔE_Q) which the value is 0.66 ± 0.01 mm/s. The isomer shift value of the single line is 0.20 ± 0.01 mm/s relative to the Fe metal that are consistent with the Fe^{2+} valence state, and the value of the doublet is 0.77 ± 0.01 mm/s indicating Fe^{3+} . The Mössbauer spectrum at 4.2 K were fitted four sets of Zeeman sextet, which two sets out of four are assumed Fe^{3+} phases and the others are Fe^{2+} . The average magnetic hyperfine fields at 4.2 K are 475 and 472 kOe for Fe^{3+} and Fe^{2+} phase, respectively. The absorption area ratio at 4.2 K between these two phases shows 1:1. Using Mössbauer technique, we present that the mixed valence of Fe ion for LuFe_2O_4 are ordered in a unit layer.