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ABSTRACTS



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Mössbauer studies of ^{57}Fe doped LiMnPO_4 by external magnetic field

Hyunkyung Choi*, Chul Sung Kim

Department of Physics, Kookmin University, Korea

Olivine structure LiMPO_4 has received much attention because the covalently bonded PO_4 groups offer structure stability, excellent thermal, and environmentally friendly. These materials are known for their exceptionally large magnetoelectric (ME) effect. From these complex magnetic structures, LiMnPO_4 show the various anomaly effects. Therefore, we have substituted a small amount of ^{57}Fe ions for Mn sites and investigated the hyperfine electromagnetic interaction of Fe ions in crystal symmetry. The crystal and magnetic properties of ^{57}Fe doped LiMnPO_4 have been investigated by XRD, VSM, and Mössbauer spectroscopy. The pure $\text{Li}^{57}\text{Fe}_{0.01}\text{Mn}_{0.99}\text{PO}_4$ sample was prepared using the solid-state reaction method. The crystal structure is found to be an orthorhombic (space group: $Pmn2_1$). The determined lattice constants a_0 , b_0 , and c_0 are 6.1009 Å, 10.4435 Å, and 4.7427 Å, respectively. The magnetic susceptibility measured by VSM show that Néel temperature is 34 K. Mössbauer spectra of $\text{Li}^{57}\text{Fe}_{0.01}\text{Mn}_{0.99}\text{PO}_4$ have been taken at various temperatures ranging from 4.2 to 295 K. The charge state of the iron ions is ferrous in character by isomer shift. Magnetic hyperfine (H_{hf}) and electric quadrupole splitting (ΔE_Q) at 4.2 K have been studied, yielding the following results; $H_{\text{hf}} = 320$ kOe, $\Delta E_Q = 2.81$ mm/s. We find an abrupt change in ΔE_Q near 8 K due to the spin ordering. Also, Mössbauer spectra under various external fields at 4.2 K were performed parallel to the direction of the gamma-ray emission. From the analysis of Mössbauer spectra, we confirmed that an increase in the canting angle between the applied and H_{hf} due to spin ordering by the strong external field.

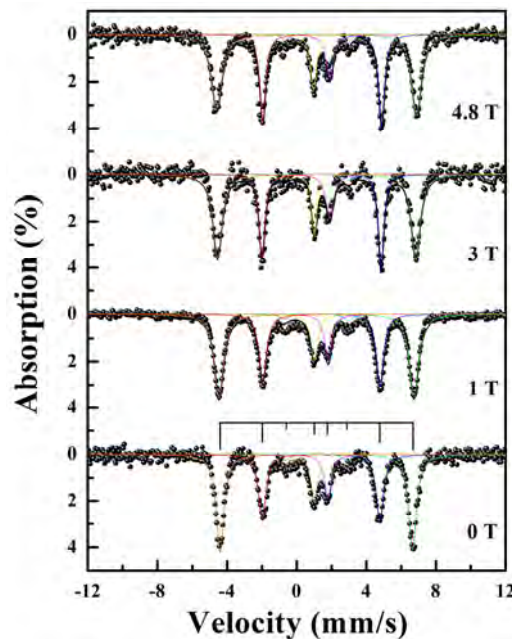


Fig. 1. Mössbauer spectra of $\text{Li}^{57}\text{Fe}_{0.01}\text{Mn}_{0.99}\text{PO}_4$ at 4.2 K under applied fields up to 4.8 T.