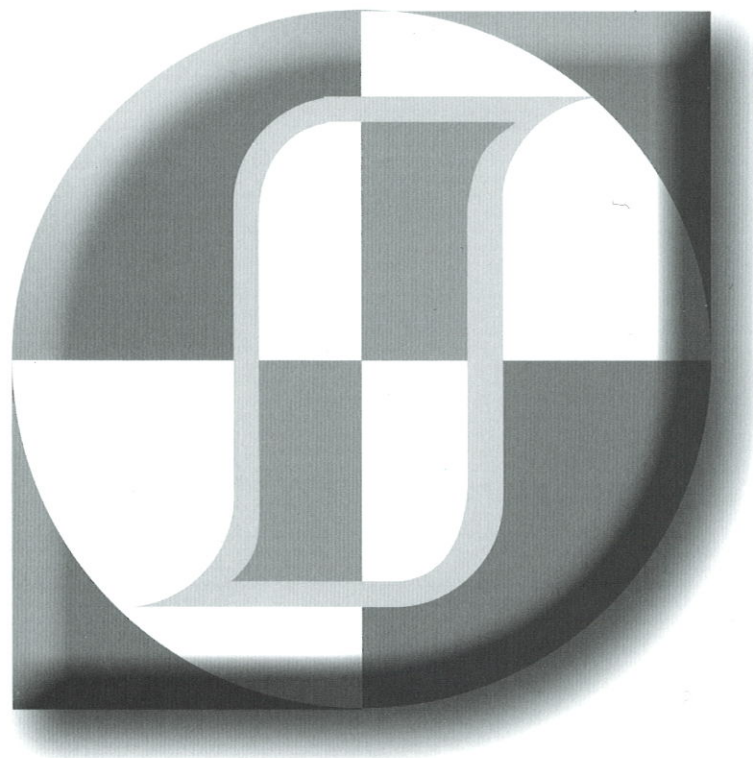


# International Symposium on Magnetism and Magnetic Materials 2017

**ABSTRACTS**



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# Phase transition studies of the mixed olivine $\text{LiFe}_{0.8}\text{Zn}_{0.2}\text{PO}_4$ by Mössbauer spectroscopy

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The  $\text{LiFe}_{0.8}\text{Zn}_{0.2}\text{PO}_4$  polycrystalline sample has been investigated by X-ray diffraction, vibrating sample magnetometer and Mössbauer spectroscopy. The crystal structure of the  $\text{LiFe}_{0.8}\text{Zn}_{0.2}\text{PO}_4$  sample by using Rietveld refinement was determined to be orthorhombic with the space group  $Pnma$ . The lattice constants were  $a_0 = 10.2918 \text{ \AA}$ ,  $b_0 = 5.9986 \text{ \AA}$ ,  $c_0 = 4.6949 \text{ \AA}$ , respectively. The temperature dependence of zero-field cooled (ZFC) and field-cooled (FC) magnetization for  $\text{LiFe}_{0.8}\text{Zn}_{0.2}\text{PO}_4$  under an applied field of 1000 Oe. The Néel temperature ( $T_N$ ) of the sample is determined to be 43 K. The susceptibility curve of  $\text{LiFe}_{0.8}\text{Zn}_{0.2}\text{PO}_4$  indicates that the sample antiferromagnetically ordered with decreasing  $T_N$  due to Zn substitution. Also, we observed that the change in slope below the spin reorientation temperature ( $T_S$ ). The value of  $T_S$  was analyzed 13 K. The Mössbauer spectra of  $\text{LiFe}_{0.8}\text{Zn}_{0.2}\text{PO}_4$  were analyzed at various temperatures in order to verify the hyperfine interaction, state in terms of the Fe nucleus. The spectra of  $\text{LiFe}_{0.8}\text{Zn}_{0.2}\text{PO}_4$  sample were a fitted asymmetrical 8-line pattern under  $T_N$ . The magnetic hyperfine field ( $H_{hf}$ ), electric quadrupole splitting ( $\Delta E_Q$ ) and isomer shift ( $\delta$ ) values of the  $\text{LiFe}_{0.8}\text{Zn}_{0.2}\text{PO}_4$  at 4.2 K were determined to be  $H_{hf} = 122.7 \text{ kOe}$ ,  $\Delta E_Q = 2.74 \text{ mm/s}$ ,  $\delta = 1.24 \text{ mm/s}$ . The polar angle ( $\theta$ ) is  $10^\circ$ , the azimuthal angle  $\phi = 0^\circ$ , the asymmetric parameter  $\eta = 0.8$ , the ratio of electric quadrupole interaction to magnetic dipole interaction  $R = 3.3$ . From these results, we can be explained that the change of Zn substitution can weaken superexchange interaction that of between the Fe ions.

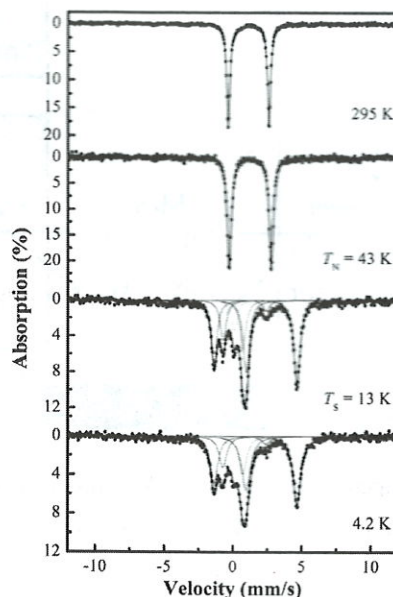


Fig. 1. Mössbauer spectra of  $\text{LiFe}_{0.8}\text{Zn}_{0.2}\text{PO}_4$  at various temperature.