

XRD and EPR studies of La-deficient $\text{La}_{0.54}\text{Ca}_{0.32}\text{MnO}_{3-\delta}$ **P.H. Quang^{1,2}, H.T. Nhan¹, A.N. Ulyanov¹, N.H. Sinh², S.C. Yu^{*1}**¹Department of Physics, Chungbuk National University, Cheongju 361-763, South Korea²Cryogenics Laboratory, Faculty of Physics, College of Natural Science, Hanoi University, 334 Nguyen Trai Road, Thanh xuan, Hanoi, Vietnam

*Corresponding author: e-mail: scyu@chungbuk.ac.kr, Phone: +82 43 261 2269, Fax: +82 43 275 6416

From our previous work [1] it is suggested that the La-deficient compound of $\text{La}_{0.54}\text{Ca}_{0.32}\text{MnO}_{3-\delta}$ is a suitable candidate for application as a working substance in magnetic refrigeration. It has the values of 300 K for Curie temperature and 5.5 J/kg K for magnetic-entropy change at the Curie temperature upon at 5 T magnetic field variation. In this work, we have performed X-ray diffraction (XRD) and electron paramagnetic resonance (EPR) measurements in La-deficient sample of $\text{La}_{0.54}\text{Ca}_{0.32}\text{MnO}_{3-\delta}$. From X-ray pattern it is found that the crystal structure of $\text{La}_{0.54}\text{Ca}_{0.32}\text{MnO}_3$ has been distorted by the La-deficiency. Above Curie temperature T_C , the EPR signal shows a single line which has a Lorentzian line shape with $g = 2$, independent of T . The temperature dependences of EPR line intensity $I(T)$ and line-width $\Delta H_{pp}(T)$ are compared with those of the $\text{La}_{0.67}\text{Ca}_{0.33}\text{MnO}_3$. A deviation of $I(T)$ from Curie-Weiss law has been also observed near T_C . The best fit of $I(T)$ curve using the exponential law yields a value of activation energy $E_a = 0.22$ eV. For $T > 1.1 T_C$, $\Delta H_{pp}(T)$ increases linearly with T with a high value of slope $b = 5.48$ Oe/K. This feature is likely a result of the larger lattice distortion in this compound.

References

- [1] N.H. Sinh, N.P. Thuy, J. Magn. Magn. Mater. 262 (2003) 502.