

# **La<sub>0.7</sub>Ca<sub>0.3-x</sub>Ba<sub>x</sub>MnO<sub>3</sub> manganites: Local structure and transport properties**

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Electron-phonon interaction plays a significant role in forming of colossal magnetoresistance effect (CMR). Polaron formation was observed by neutron diffraction and by extended X-ray absorption fine structure (EXAFS) analysis. Local probe as given by the EXAFS is a useful method to study the polaronic charge and its dependence on temperature and ions size. Here we present the EXAFS study of polaronic charge in La<sub>0.7</sub>Ca<sub>0.3-x</sub>Ba<sub>x</sub>MnO<sub>3</sub> compositions.

The single phase La<sub>0.7</sub>Ca<sub>0.3-x</sub>Ba<sub>x</sub>MnO<sub>3</sub> manganites ( $x=0; 0.03; 0.06, \dots, 0.3$ ) were prepared by ceramic technology [1]. The Curie temperature was determined by extrapolation of the temperature dependence of the magnetization (down to zero magnetization). EXAFS experiments were carried out at the 7C EC beam line of the Pohang Light Source (PLS) in Korea. The atomic pair distribution functions (PDF) were obtained by regularization method [2] from filtered spectra. The PDF for the  $x=0.3$  sample showed a single peak function and for  $x=0.0, 0.03, 0.06, 0.09, 0.12$  compositions were asymmetric in agreement with a small Jahn-Teller elongation of two (short and long) bonds of the MnO<sub>6</sub> octahedron. Dispersion,  $\sigma^2_{\text{Mn-O}}$ , and asymmetry,  $\sigma^3_{\text{Mn-O}}$ , of the Mn-O bond distances varied significantly with  $x$  and showed a maximums at  $x=0.09$ . The maximum of  $\sigma^2_{\text{Mn-O}}$  is caused by increase of dynamic rms displacements of the Mn-O distances near the  $T_C$ . The observed  $x$  dependence of  $\sigma^3_{\text{Mn-O}}$  reflects the reduction of charge carriers mobility at approaching to  $T_C$  from low as well as high temperatures.

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1. A.N.Ulyanov, S.C.Yu, N.Yu.Starostyuk, N.E.Pismenova, et al, J. Appl. Phys. **91** (2002) 8900.

2. D.S.Yang and G.Bunker, Phys. Rev. B **54** (1996) 3169.