EXAFS study for the ordering of manganese in $La_{0.7}Ca_{0.3-x}Ba_xMnO_3$

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Lanthanum manganites have been extensively studied for the application to magnetic devices since the colossal magnetoresistance of these compounds has been observed [1]. The critical temperatures, Tc, of manganites $La_{0.7}Ca_{0.3-x}Ba_xMnO_3$ increased as the content of Ba increased except the abrupt jump near the critical concentration. The step like behavior of the critical temperature for a similar compound has been known to be related to the structural phase transition [2]. To understand the step like behavior of Tc, the EXAFS technique is applied to the $La_{0.7}Ca_{0.3-x}Ba_xMnO_3$ compound system. The ordering between the manganese and oxygen was examined by this method.

The EXAFS analysis shows that the coordination numbers were not changed before and after the phase transition, the bonding distance between manganese and oxygen is about 1.94 ± 0.02Å, which is consistent with other work [3] and the Debye waller parameters were about σ^2 = 0.0037 ± 0.0005 $Å^2$ for x=0.0 and x=3.0, respectively. The value of Debye-Waller parameter for x=0.09 is about σ^2 = 0.0050 ± 0.0005 $Å^2$ in about phase transition concentration. Based on the Debye-Waller parameters, it is shown that the ordering between manganese and oxygen is significantly reduced near the phase transition concentration.

References

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