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Study on $La_{1-x}Ca_xMnO_3$ films by x-ray absorption spectroscopy

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Perovskite-like manganese oxides have been intensively studied because of their interesting science, connected with the discovery of colossal magnetoresistance, and their potential device applications. Especially, $La_{1-x}Ca_xMnO_3$ thin films are known to be the most suitable candidate for the practical applications, partly because it displays high metal-insulator transition temperature and Curie point. The $La_{1-x}Ca_xMnO_3$ thin film has Mn^{3+} and Mn^{4+} mixed valence state and shows various physical properties by the mixed state variation. In this study, a $LaAlO_3$ (001) single crystal was used for the substrate and the rf magnetron sputtering method was employed for the deposition. The crystal structures of the films were determined by using x-ray diffraction. We observed that the properties of $La_{1-x}Ca_xMnO_3$ films turn out to be strongly relevant to the mixed valence state, by means of the La $M_{4,5}$-, the Ca $L_{2,3}$-, the Mn $L_{2,3}$- and the O K-edge of the near- edge x-ray absorption fine structure (NEXAFS). The NEXAFS spectra were obtained at the U7 undulator beamline of the Pohang Light Source.