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Investigation of the local Mn-O distortions in the concentration-induced Metal/Insulator transition materials, $\text{La}_{1-x}\text{Ca}_x\text{MnO}_3$ ($x=0.16-0.22$) using EXAFS.¹ YU JIANG, LISA DOWNWARD, FRANK BRIDGES, Physics Dept., University of California, Santa Cruz, JOHN NEUMEIER, Physics Dept., Montana State University — The pseudo-cubic manganites $\text{La}_{1-x}\text{Ca}_x\text{MnO}_3$ (LCMO) are CMR (Colossal Magnetoresistance) materials for x between approximately 0.2 and 0.5. They have a temperature driven Metal/Insulator (MI) transition at the ferromagnetic transition temperature T_c which is caused by Jahn-Teller-like distortions which form around Mn sites as T increases through T_c . Near $x=0.2$ the MI is driven by concentration. To investigate the concentration and temperature dependent local distortions for low doped powder samples (LCMO $x = 16\%$, 18% , 20% , 22%), we carried out EXAFS (Extended X-ray Absorption Fine Structure) experiment at SSRL (Stanford Synchrotron Radiation Laboratory). The results of our preliminary analysis show the following: (1) a sharp, step increase in σ^2 near T_c (σ is the width of the Mn-O pair distribution function (PDF)), (2) the magnitude of the step decreases rapidly with decreasing x , (3) the value of σ^2 at low T is close to the value for zero-point motion for $x = 0.22$, but increases substantially for lower x , indicating that in the magnetized state a large J-T distortions remain at low T for low x . Also the magnetization at low T is small for lower x , indicating that not all of the sample is ferromagnetic.

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