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Phase separations in $La_{1-x}Ca_xMnO_3$ at critical doping levels J. TAO, Q. JIE, Q. LI, Y. ZHU, Condensed Matter Physics & Materials Science Department, Brookhaven National Lab, D. NIEBIESKIKWIAT, Colegio de Ciencias e Ingeniería, Universidad San Francisco de Quito, Ecuador, M.B. SALAMON, Department of Physics, University of Texas at Dallas, S.J. PENNYCOOK, Materials Science & Technology Division, Oak Ridge National Lab — $La_{1-x}Ca_xMnO_3$ specimens have been widely studied for their rich and complex physics. There is a boundary in the phase diagram at $x = 0.50$. At low temperatures, the system is ferromagnetic for x less than 0.5 while charge ordering phase is favored for x equal to or greater than 0.5. The mechanism for this drastic change over the continuous doping still remains unclear. Here we report our electron diffraction study on bulk $La_{1-x}Ca_xMnO_3$ at the critical doping $x = 0.48$ and 0.50. Lorentz microscopy is also employed in the study to obtain the magnetic domain information during the phase transitions in these two specimens. The observed structure is integrated with the measured properties and it shows novel phenomena of the materials at nanoscale. This work is funded by U.S. DOE/BES under Contract No. DE-AC02-98CH10886.

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