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Structure driven collapse of charge ordering in $La_{0.5}Ca_{0.5}MnO_3$ nanoparticles A.K. RAYCHAUDHURI, TAPATI SARKAR, S.N. Bose National Centre for Basic Sciences, E. BOZIN, Columbia University , T. PROFFEN, Los Alamos National Laboratory, T. CHATTERJI, Inst.Laue -Langevin, S. BILLINGE, Columbia University — High resolution X-Ray and neutron diffraction had been used to show that size reduction below a certain size ($<$ 150nm) can lead to a collapse of the charge and orbitally ordered as well as the Antiferromagnetic ground state of the half doped manganite $La_{0.5}Ca_{0.5}MnO_3$. This leads to a ferromagnetic ground state. We show that the phenomena is linked to the structural changes that accompany the size reduction. The low temperature (T$\sim$15K) structure of the nanocrystals is significantly different from that of the bulk. The structure of the nanoparticles shows a distortion albeit different from that seen in the bulk which is driven by the Jahn – Teller distortion. The Rietveld analysis along with analysis of the Pair Distribution Function data show that there are differences in the way the MnO_6 octahedra are distorted in the bulk and the nanocrystals. We find that in the nanocrystals the structural distortion sets in at room temperature and shows very little variation on cooling. The Bragg peak of the ferromagnetic order in the nanoparticles was found to have the same indexes and approximately same d – spacing as that seen in ferromagnetic $La_{0.67}Ca_{0.33}MnO_3$.

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