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Orbital and oxygen vacancy ordering in $La_{1-x}Sr_xMnO_{3-\delta}$ (x$\geq$0.8, $\delta \geq$0.15) LEOPOLDO SUESCUN, Materials Science Division, Argonne National Laboratory, Argonne, IL 60439 & Department of Physics, Northern Illinois University, DeKalb, IL 60115, BOGDAN DABROWSKI, MSD, ANL, Argonne, IL 60439 & Dept. of Physics, NIU, DeKalb, IL 60115, JAMES MAIS, Dept. of Physics, NIU, DeKalb, IL 60115, STANISLAW KOLESNIK, Dept. of Physics, NIU, DeKalb, IL 60115, JAMES RICHARDSON, Intense Pulsed Neutron Source Division, ANL, Argonne, IL 60439, JAMES JORGENSEN, MSD, ANL, Argonne, IL 60439 — We have developed synthesis method, obtained, and studied the highly Sr substituted LSM manganites. New oxygen and orbital ordered perovskite type phase $SrMnO_{2.6}$ (nominally $Sr_5Mn_5O_{13}$) was found tetragonal P4/m, a=8.61328(18) and c=3.80997(11) Å. Mn ion shows charge separation to Mn^{3+} in a pyramidal and Mn^{4+} in a regular octahedral coordination. Nonstoichiometry has been observed with oxygen compositions between $0.25< \delta <0.4$; upon oxidation a monoclinic distortion is observed. Analogous tetragonal and monoclinic phases have been found for $La_{1-x}Sr_xMnO_{3-\delta}$ ($0.3< \delta <0.5$) with x=0.05 and 0.2, respectively. In-situ neutron powder diffraction as well as susceptibility measurements show different magnetic arrangements below RT depending on x and δ. This work was supported by the U.S. Department of Transportation and NSF-DMR-0302617.

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