Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Charge/Orbital Ordered Phases of $La_{2-2x}Sr_{1+2x}Mn_2O_{7-\delta}$[1] KENNETH GRAY, HONG ZHENG, QING'AN LI, JOHN MITCHELL, Argonne National Laboratory — Our studies have significantly modified the conventionally-held view of the phase diagram of $La_{2-2x}Sr_{1+2x}Mn_2O_{7-\delta}$ for two compositions exhibiting charge (and orbital) order (CO), i.e., at hole doping levels, h=x-δ, of $\sim$0.5 and $\sim$0.6. These CO states are stable over very narrow doping ranges (Δh$\sim \pm$0.005) at the lowest temperatures, but those ranges increase at higher temperatures (to Δh$\sim \pm$0.02) in a manner consistent with simple entropy considerations. Such narrow ranges dictate the crucial need for crystal homogeneity. Attesting to such homogeneity is a conductivity ratio of $>10^{10}$ upon crossing the first-order phase boundary from CO at h=0.60 to AAFM at h$\sim$0.59 or h$\sim$0.61 plus two findings that were missed in the existing literature: that these CO phases are the ground state at the lowest temperatures and, for h$\sim$0.5, that coexistence of the CO and AAFM phase is absent at any temperature.

[1]Work supported by U.S. D.O.E. under contract # DE-AC02-06CH11357.

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Date submitted: 25 Nov 2008 Electronic form version 1.4