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Large lattice distortions associated with the magnetic transition in La0.7Sr0.3MnO3 DMITRY REZNIK, Department of Physics, University of Colorado-Boulder, FRANK WEBER, Institute of Solid State Physics, Karlsruhe Institute of Technology, OLEG PROKHNENKO, DIMITRI ARGURIOU, Helmholtz-Zentrum Berlin für Materialien und Energie — Colossal magnetoresistance (CMR) is associated with the phase transition from a metallic ferromagnetic to insulating paramagnetic phase, which can be controlled by an applied magnetic field. The insulating phase occurs due to trapping of the charge carriers by polaronic lattice distortions, which raise the resistivity. Theories based on local physics predict that the magnitude of the resistivity jump at Tc is determined by how much, on average, the amplitude of these distortions increases at the phase transition. Using neutron scattering, we measured the average distortion amplitude in La0.7Sr0.3MnO3. Surprisingly, its increase from below to above Tc is just as large as in other manganites, which have a much larger resistivity jump. This result suggests that the strength of CMR is determined not by the size of distortions, but by their cooperative nature specific to each compound. Existing theories need to be extended to include correlations between different unit cells to explain and predict the strength of CMR.

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