Abstract for an Invited Paper
for the MAR06 Meeting of
The American Physical Society

Computational Studies of Magnetoresistance in Double-Exchange-Based Models for Manganites[1]

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Double-exchange-based models for manganites are studied using Monte Carlo techniques, with both exact-diagonalization and polynomial-expansion of the fermionic sector. One and two- orbital models are investigated, with and without phonons. We focus our analysis on the study of the resistance (R) vs. temperature (T) using the Landauer formalism. Highlights of investigations by our group and others are: (1) R vs. T curves, parametric with magnetic fields, that closely resemble experimental data for the case of one orbital and considering cooperative phonons; and (2) an insulator to bad metal transition induced by quenched disorder for the two-orbital model. In spite of these positive results, we remark that this is just the beginning of a frontal attack to the manganite problem using realistic models and efficient algorithms that scale linearly with the lattice volume. Future directions and open problems will also be discussed.

[1]Research performed at the Oak Ridge National Laboratory, managed by UT-Battelle, LLC, for the U.S. Department of Energy under Contract DE-AC05-00OR22725.