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Competing Ferromagnetic and Charge-Ordered States in Realistic Models for Manganites: the Origin of the CMR Effect CENGIZ ŞEN, National High Magnetic Field Lab and Florida State University, Tallahassee, FL, GONZALO ALVAREZ, Oak Ridge National Lab, Oak Ridge, TN, ELBIO DAGOTTO, Oak Ridge National Lab, Oak Ridge, TN and University of Tennessee, Knoxville, TN — The one-orbital model for manganites with cooperative phonons has been investigated via large-scale Monte Carlo (MC) simulations. Focusing on electronic density $n = 0.75$, a regime of competition between ferromagnetic (FM) metallic and charge-ordered (CO) insulating states was identified. In the vicinity of the associated bicritical point, colossal magnetoresistance (CMR) effects were observed. These effects appear even in the clean limit, but only by fine tuning parameters, while adding quenched disorder makes the CMR effects robust. The CMR magnitude is much larger than recently reported when randomly distributed polarons form the competing insulator. The crucial role of the superexchange coupling $J_{\rm AF}$ is discussed. The appearance of CMR effects is shown to be associated with the development of correlations among polarons above the spin ordering temperatures, in agreement with early neutron scattering investigations. These polarons tend to form small regions resembling the charge and spin arrangement of the low-temperature CO insulating state.

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