Colossal resistivity change besides magnetoresistance: an extended theoretical framework for electronic transport of manganites

SHUAI DONG, KEFENG WANG, Nanjing National Laboratory of Microstructures, Nanjing University, HAN ZHU, Department of Physics, Princeton University, Princeton, XIAOYAN YAO, Nanjing National Laboratory of Microstructures, Nanjing University, JUNMING LIU, Nanjing National Laboratory of Microstructures, Nanjing University & International Center for Materials physics, Chinese Academy of Sciences — Current theoretical approaches to manganites mainly stem from magnetic framework, in which the electronic transport is thought to be spin-dependent. However, quite a number of experimental observations can yet not be reasonably explained. An extended framework for electronic transport of manganites has been proposed, in which the total resistivity has been partitioned into two parts: $\rho_s$ and $\rho_c$ in terms of two different mechanisms: spin-dependent and charge-dependent. Correspondingly, the colossal magnetoresistance (CMR) classification inherited from Aliaga et al has been extended as: CMR2 and XR, where CMR2 is the classical spin-dependent process while XR is spin-independent. We emphasize the important role of XR which helps to understand the true mechanism of CMR.

1corresponding author

JunMing Liu
Nanjing National Laboratory of Microstructures, Nanjing University & International Center for Materials physics, Chinese Academy of Sciences