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Structural insight of the charge-ordering phenomena in manganites

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Recent experiments using x-ray absorption spectroscopy (XAS) and x-ray resonant scattering (XRS) techniques show that the conventional description of the so-called charge ordering phases of manganites in terms of Mn^{3+}/Mn^{4+} ionic ordering is far from reality. I present here the XRS study of the low temperature phase of $Nd_{0.5}Sr_{0.5}MnO_3$ manganite. Strong resonances are observed in the energy dependent spectra of (300), (030) and (05/20) reflections. Their azimuthal and polarization dependencies are well explained by the anisotropy of the local geometrical structure. Two different Mn sites were found. One of them is surrounded by a tetragonal distorted oxygen octahedron, whereas the other site has a nearly regular octahedral environment. The charge separation between the intermediate valence states is less than 0.2 e-. The analysis performed resolves some of the apparent contradictions with previous XRS and XAS experiments in manganites. These results joined to those recently obtained on the Verwey transition in magnetite indicate that the electronic states in transition-metal oxides need to be described in terms of band states instead of localized ones. Colaborators: G. Subías, J. Blasco, M. G. Proietti, M. Sánchez and J. Herrero-Martin