Dichroic effects in Mn 2*p* resonant x-ray emission spectroscopy in $La_{2/3}Sr_{1/3}MnO_3$

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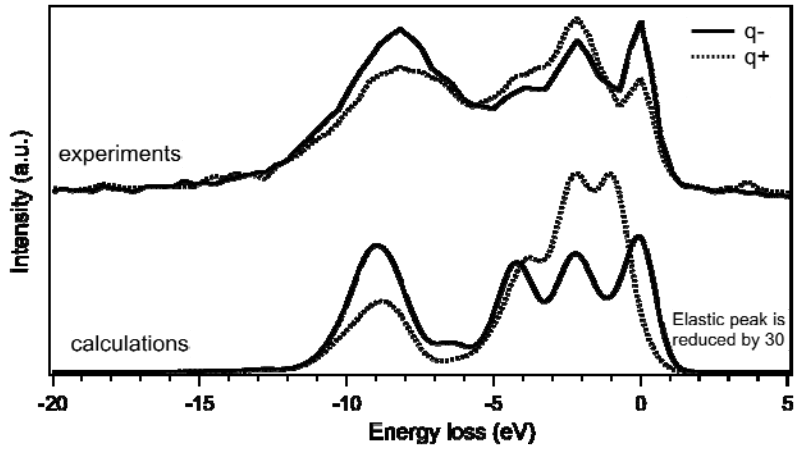
Manganese perovskites exhibit unique physical properties, such as a colossal magnetoresistance and a very high spin polarization, which make them attractive for potential technological applications. The understanding of these properties is a challenge because they are due to interplay between charge, spin, and orbital degeneracies. Thus studies on the electronic structure of $La_{2/3}Sr_{1/3}MnO_3$ (LSMO) are relevant not only for the manganites but also for half-metallic materials. LSMO is also a good candidate to investigate dichroic effects in x-ray emission and their dependence on the incident photon energy.

We have studied the electronic structure LSMO by resonant X-ray emission spectroscopy (RXES) at the Mn $L_{2,3}$ edges using circularly polarized light and magnetized samples. For an excitation at the L_3 resonance energy, one distinguishes three features: the elastic peak, an inelastic dispersive peak and a non-dispersive peak. We measured RXES spectra for both helicities of light at several photon energies across the $L_{2,3}$ absorption edges. The RXES cross-section is then expected to be a combination of dichroic effects both in absorption and emission. The elastic peak is dichroic as a result of the dichroism in the first step of the scattering process, i.e., the absorption step. We observe notable differences in dichroism between the inelastic and the elastic peaks: at some photon energies the inelastic signal shows a much bigger dichroism; it even changes sign as compared to the elastic recombination. The calculations using Anderson impurity model show major contribution of Mn^{3+} ions to the RXES dichroic signal.



RXES dichroic spectra measured at the Mn L_3 edge (on L_3 resonance) compared to the calculations that include a contribution of Mn^{3+} ions only. q- and q+ denote the photon helicity parallel and antiparallel to the magnetization, respectively.

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