Abstract

This thesis mainly deals on single-layered manganites $Re_{1-x}A_{1+x}MnO_4$ with $Re = La$, Pr, Nd and $A = Sr$, Ca and with doping levels $0.25 \leq x \leq 0.67$. The complex interplay between charge, orbital, and magnetic degrees of freedom has been studied by neutron diffraction techniques.

Magnetic excitations on half-doped $La_{0.5}Sr_{1.5}MnO_4$, $Pr_{0.5}Ca_{1.5}MnO_4$, and $Nd_{0.5}Sr_{0.5}MnO_3$ yield qualitatively a comparable spin-wave dispersion. In $La_{0.5}Sr_{1.5}MnO_4$ it has been possible to study magnetic excitations of the acoustical and those of all optical branches whereas in $Pr_{0.5}Ca_{1.5}MnO_4$ and in the perovskite $Nd_{0.5}Sr_{0.5}MnO_3$ excitations up to about 12 meV were recorded. The perfect agreement between experimental data and a theoretical description by linear spin-wave theory based on AFM CE-type ordering is evident and a qualitative validation of the Goodenough model could be confirmed.

The ground state of charge-, orbital-, and antiferromagnetic ordering in overdoped 214-manganites $Re_{1-x}A_{1+x}MnO_4$ with doping $0.5 \leq x \leq 0.67$ has been studied by an area detector. In contrast to half-doped manganites incommensurate superstructure reflections associated with charge and orbital ordering were found. Satellites referring to magnetic ordering of Mn^{3+} moments are incommensurate as well while magnetic superstructure reflections of Mn^{4+} spins have been recorded at half-indexed i.e. at commensurate position for the doping level $0.5 < x \leq 0.60$. This finding appears inverse for the doping $x = 2/3$ as superstructure reflections associated with magnetic ordering of Mn^{4+} spins were detected at incommensurate and of Mn^{3+} spins at commensurate positions. For the first time, a full consistent model based on stripe ordering of extra Mn^{4+} ions could be developed to describe the studied ordering parameters.

Magnetic excitations in $Pr_{0.33}Ca_{1.67}MnO_4$ and $Nd_{0.33}Sr_{1.67}MnO_4$ exhibit a qualitatively comparable spin-wave dispersion as the highly discussed hourglass dispersion in high-T_c copper-oxides. The tight connection between the magnetic correlation lengths and the magnetic excitation spectrum at low energies could be depicted.

The ground state of electron-doped $La_{1-x}Sr_{1+x}MnO_4$ with $x = 0.4$, 0.33, 0.25 as well as that of $Pr_{0.6}Ca_{1.4}MnO_4$ has been characterized. Former experimental studies were not able to clearly connect slightly electron-doped ($x \approx 0.40$) and highly electron-doped ($x \approx 0.125$) 214-manganites. The experimental data clearly show incommensurate superstructure reflections associated with orbital ordering in agreement to hole-doped manganites. However, the incommensurabil-

ity is smaller compared to the overdoped systems. The experimental observation can be explained by an orbital flop of the e_g orbital on Mn^{3+} site out-of the MnO_2 plane.