ESRF	**Experiment title:** Soft X-ray magnetic circular dichroism on transition metal oxides. Part II: Electronic structure of $La_{1-x}Sr_xCoO_3$.	**Experiment number:** HE 44
Beamline: ID12B	**Date of experiment:** from: 14 / 11 / 96 to: 17 / 11 / 96	**Date of report:** 25 / 2 / 97
Shifts: 9	**Local contact(s):** J. B. Goedkoop, N. B. Brookes	*Received at ESRF:* 03 MAR 1997

Names and affiliations of applicants (* indicates experimentalists):

E. Pellegrin* and G. A. Sawatzky
Applied and Solid State Physics Laboratory, University of Groningen, Nijenborgh 4, NL-9747 AG Groningen, The Netherlands
R. van den Oetelaar* and C. F. J. Flipse*
Faculty of Physics, Eindboven University of Technology, P. 0. Box 513 , NL-5600 MB Eindhoven, The Netherlands
M. H. R. Lankhorst, H. J. M. Bouwmeester, and H. Verweij,
University of Twente, Department of Chemical Technology, Laboratory of Inorganic Materials Sciences, P. 0. Box 217, NL-7500 AE Enschede, The Netherlands

Report:

We have performed X-ray absorption and soft X-ray magnetic circular dichroism (SXMCD) measurements on the Mn*L*- and OK-absorption edges on a series of $La_{1-x}Sr_xCoO_3$ samples at low temperatures. This has been done using the recently developed *Magnetic* Mangle setup for magnetizing the sample with fields up to 0.6 Tesla. This technique offers the possibility to collect accurate SXMCD data on bulk samples as needed for the application of the SXMCD sum rules.

In the lower panel of Fig. 1 we present the Co*L* SXMCD spectrum of $La_{0.8}Sr_{0.2}CoO_3$ taken at 20 K with the sample being in the ferromagnetic cluster glass regime. The upper panel shows the difference spectrum and the integrated difference spectrum derived from the raw data. Application of the SXMCD sum rules results in a considerably high value of about 0.35 for ratio between the orbital and the spin magnetic moment indicating an enhanced spin-orbit coupling within the Co3d shell. Fig. 2 shows the OK SXMCD spectrum together with the corresponding difference spectrum. From the size and the polarization of the latter it can be concluded that there is a large spin magnetic moment on the 0 sites in the ground state feromagnetically coupled to the Co moments.

In Fig. 3 we present low-temperature OK-absorption edges of $La_{1-x}Sr_xCoO_3$ for different doping concentrations The comparison with earlier room-temperature data [see D. D. Sarma et al., Europhys. Lett. 19, 513 (1992)] suggests a dominating $d^6\underline{L}$ contribution to the ground state for the Co^{4+} sites where $\underline{L}$ denotes a hole on the 0 ligands. This would be consistent with the ferromagnetic ordering of the Co magnetic moments observed within the ferromagnetic clusters in this compound.

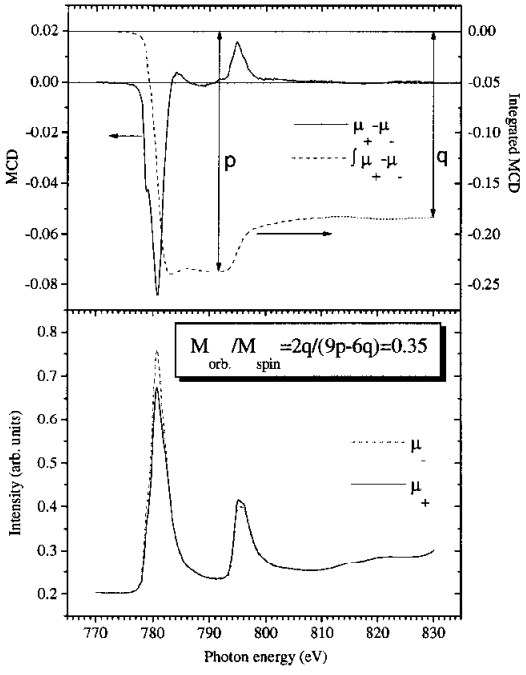

Fig. 1: (a) CoL SXMCD spectra of $La_{0.8}Sr_{0.2}CoO_3$ taken at 20 K. (b) SXMXD difference spectrum (solid line) and integrated difference spectrum (dashed line).

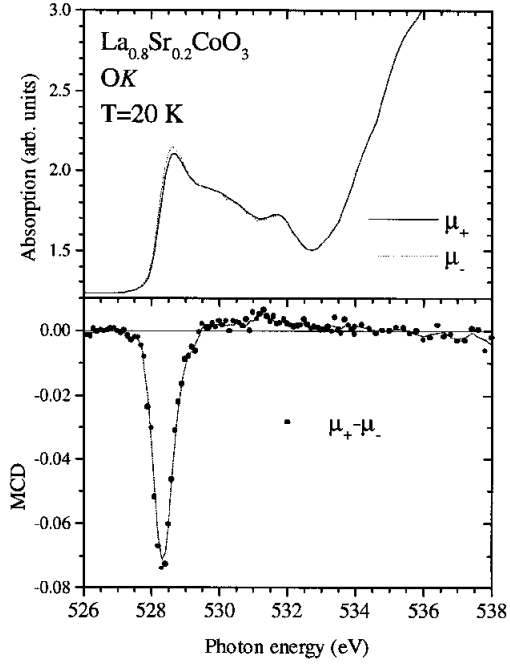

Fig.2 (a)OK SXMCD spectra of $La_{0.8}Sr_{0.2}CoO_3$. taken at 20 K. (b) SXMCD difference spectrum. The solid line in (b) is a guide to the eye.

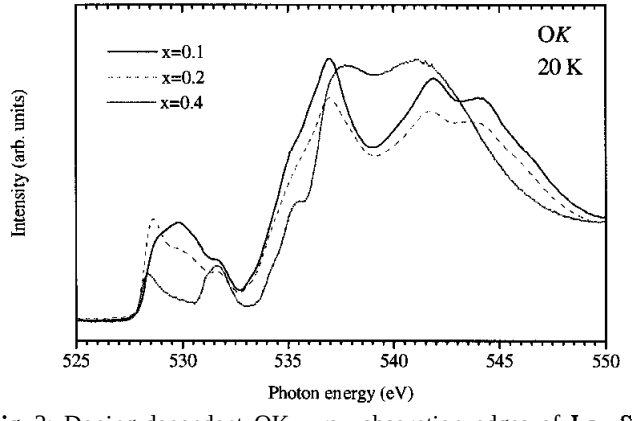

Fig. 3: Doping-dependent OK x-ray absorption edges of $La_{1-x}Sr_xCoO_3$ (x = 0.1, 0.2,0.4) taken at 20 K.