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SOFT X-RAY ABSORPTION SPECTROSCOPY AND MAGNETIC CIRCULAR AND LINEAR DICHROISM IN THIN FILMS

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X-ray absorption spectroscopy (XAS) is a spectroscopic technique whereby one excites a core electron into the valence bands. Depending on the edge the core-hole valence interaction can be very strong and for the transition metal $L_{2,3}$ edge and the rare-earth $M_{4,5}$ edges the spectra is strongly excitonic. The spectroscopy of these edges has developed into maturity in the last 25 years and the pioneering work of Fink, Thole, Sawatzky and Fugle, who used electron energy loss spectroscopy on narrow band and impurity systems has been very important for the development of soft x-ray absorption spectroscopy. They recognized, that the observed multiplet structures can provide an extremely detailed information about the local electronic structure of the ground and lower excited states of the system [1-3].

In this talk I will start by reviewing some of the aspects of XAS and show by examples from the literature how it can be used to probe the element specific magnetic spin and orbital moments, spin directions in anti-ferromagnets, valence, spin-states, orbital occupations and crystal fields. In the second half of the talk I will concentrate on work done in the group of L.H. Tjeng (Cologne) and discus the measurements of magnetic properties of thin films. With the use of linear dichroism, Csiszar *et al.* [4] have shown how one can, by applying different strain to the CoO thin film, tune the spin direction of the Co ion. They furthermore showed [5] how one can transfer the preferred spin direction from a film with high magneto anisotropy (CoO in this case) to a film with low magneto anisotropy (MnO). These are important findings for the field of exchange bias where one tries to pin the spin direction of a ferromagnet by an adjoined anti-ferromagnet.

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