ESRF	**Experiment title:** Spin-dependent electronic correlations in epitaxially grown ultrathin ferromagnetic alloy films		**Experiment number:** HE-148
Beamline: 26	**Date of experiment:** from: 2/4/97	to: 8/4/97	**Date of report:** 18/8/97
Shifts: 21	**Local contact(s):** Dr. Nicholas Brookes, Dr. Marco Finazzi		*Received at ESRF:* 27 AOUT 1997

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Report: Magnetic Dichroism in angular resolved photoemission from core levels is a very useful technique that can give information on the magnetic properties of solids, being sensitive to the exchange interaction between the spin polarized valence band and the core hole formed in the photoemission process [1]. In this kind of experiment one measures the changes of the core level spectra (in line shape or intensity) upon change of the relative orientation of the light polarization and magnetization. Using circularly polarized light, Magnetic Dichroism can be observed both if the magnetization vector M is normal (transverse geometry) or within the plane (parallel geometry) defined by the electron and photon wavevectors, k and **q** respectively [l], [2]. Magnetic Dichroism using linearly polarized light (or even unpolarized light) appears only in a transverse geometry. In this experiment at ESRF we have investigated the Magnetic Dichroism in photoemission from 2p core levels of ultrathin films of pure Ni and NiCo alloys. The purpose was to study the behaviour of the many body features present in the Ni-2p spectrum [4] for different thickness and concentration of the film, in the two experimental geometries. In Fig. 1 we report the dichroic asymmetry relative to measurements collected along the normal to the sample, for a film of Ni of 15 ML of thickness grown on a buffer layer of 5 ML of Co on Cu(l00), using the transverse (panel a) and parallel (panel b) geometry. The Co buffer layer insures that the magnetization direction of Ni is along the surface plane. The shape of the asymmetry presents a typical plus/minus feature [1], with a positive maximum located at - 1.1 eV and the negative minimum at 1 eV in the case of the j=3/2 level, while for the j=1/2 state is visible only the negative feature centered at about 15 eV. At 6 eV it is clearly visible a large negative structure, that has been attributed to the majority character of the „6 eV“ satellite of the Ni spectra [3], [4]. This satellite is attributed to a reminiscence of the localized nature of the d electrons and arises due to the interaction of valence states with the core hole formed in the photoemission process (screening). In case of magnetic materials as Ni, Fe and Co, the satellites are spin polarized and carry information about spin dependent correlations and screening processes. The spin polarization of the many-body satellites gives rise to characteristics features in the magnetic dichroism spectra [4]. From a comparison between panels a) and b) of Fig. 1 it appears that the features in the asymmetry curves for the two different geometries are equivalent in shape and energy position, while their intensity is reduced when the magnetization is normal to the (q,k) plane. This finding is in agreement with an atomic description of the photoemission process [l]; in fact within this description the dichroism observed in the two experimental geometries (magnetization in and out of plane) is characterized by the same state multipole ρ_{10}, while the scale factor is different [1]. Therefore the qualitative information which can be extracted from these experiments are equivalent. This shows as a simple atomic model can describe quite well the photoemission process. In case of binary alloys (for example NiCo) the valence band is modified, due to the chemical bonding between the two species. This modification could induce also a change in the satellite structure observed in the pure elements, due to a variation of the valence bandwidth W, and in their spin polarization [4]. At this purpose we have studied Ni-2p specra for NiCo alloys at different Ni concentrations. In Fig. 2 we report the asymmetry curves relative to the systems $Ni_{80}Co_{20}$, $Ni_{50}Co_{50}$ and $Ni_{20}Co_{80}$, measured with the magnetization in the **(q,k)** plane. The asymmetry curves present the plus/minus feature relative to the j= 3/2 state and the large negative structure relative to the „6 eV“ satellite. The asymmetry curves do not show a variation for the different compositions of the alloy. A comparison with the asymmetry curve reported in Fig. 1 panel b) for the pure Ni film reveals as the feature relative to the satellite is similar for the two systems, while the plus/minus structure relative to the j=3/2 level is reduced in the alloy. This shows that the bonding between Ni and Co does not modify the correlation effects, while it influences the dichroism of the j=3/2 state.

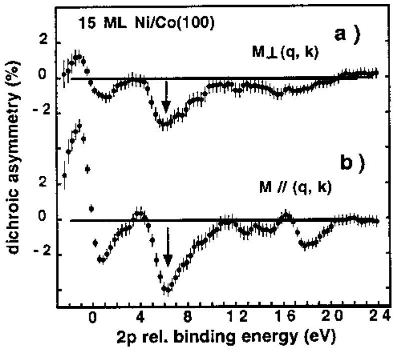

Fig. 1

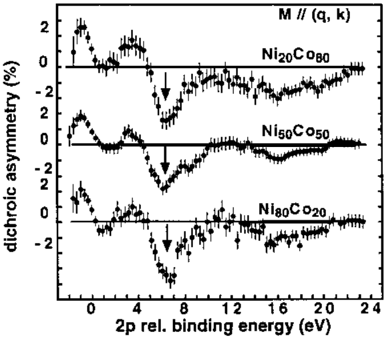

Fig. 2

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