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Report:

We present the x-ray absorption spectroscopy (XAS) investigation performed at the L-edges of Ce and at the K-edge of iron in the intermetallic compounds $Ce(Fe_{1-x}Co_x)_2$. The main goal of this work was to elucidate the responsable mechanism of the change into the magnetic porperties of the system upon Fe substitution.

As shown in Fig.1, and contrary to previous assignements, the mixed-valence behavior of Ce, as determined from the Ce L_3-edge XANES spectra is preserved upon Fe substitution. Therefore no development of a localized 4f magnetic moment takes place at Ce atoms, driven by the Fe-Co substitution. This result is confirmed by the study performed at the $L_{2,3}$-edges by means of the XMCD technique. Indeed, as shown in Fig. 2, the XMCD signal at the Ce $L_{2,3}$-edges resembles the existence of configurational mixing in the ground state, as in the case of polarization averaged XAS spectra (see Fig. 1). Moreover, upon developing of a localized Ce 4f magnetic moment a change of sign of the XMCD signals should be observed, contrary to the our experimental results.

The comparison of the integrated XMCD recorded at different temperatures is reported in Fig. 2. For both Fe K-edge and Nd $L_{2,3}$-edges the signal grows in a continuous way when cooling down through Ts, showing a rounded maximum at about T_m= 110 K. This behavior describes the continuous increase of the tilting angle θ_t as the temperature decreases. This angular dependence of the XMCD signal can be used to investigate the mutual orientation of the Nd and Fe magnetic moments in the SRT phase. Indeed, a collinear arrangement between the Fe and Nd moments was derived from earlier magnetization and ^{57}Fe Mössbauer spectroscopy [2]. while from a ^{57}Fe Mössbauer experiment performed in a wider temperature range it was deduced that the tilting angle deviates substantially from collinearity [3], as found also in a recent neutron diffraction investigation [5].

Comparison of the temperature dependence of the integrated XMCD signals and the available data on μ_{Nd} and θ_t is illustrated in Fig. 2. A remarkable similarity between the behavior of the XMCD signal and that derived from Mössbauer data by assuming the non-collinearity of the Nd and Fe moments, is observed. On the contrary, comparison performed assuming collinearity is quite poor at low-temperature

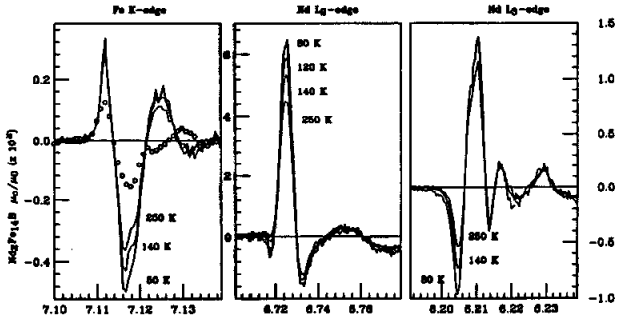

Fig. 1 XMCD signals at the $L_{2,3}$-edge of Nd and at the Fe K-edge recorded at different temperatures in the $Nd_2Fe_{14}B$ compound. The dots correpond to the Fe K-edge in the case of a metal foil.

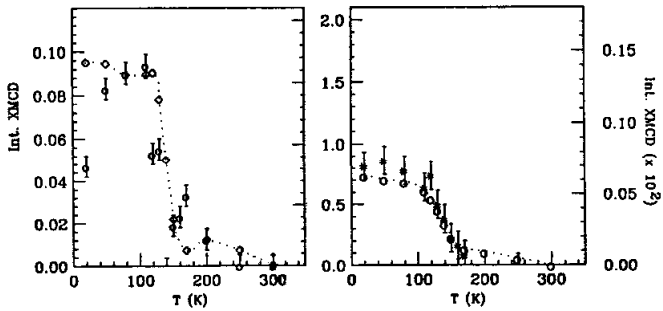

Fig. 2 Comparison of the temperature dependence of the integrated XMCD signals at the Nd L2-edge (left panel) and at the Fe K-edge (tight panel), and the projection along the x-ray wave vector of the Nd and Fe magnetic moments taken from Ref. 3 (diamond).

This work shows for the first the feasibility of the XMCD at the Fe K-edge to investigate order-order magnetic SRT transitions. The analysis of the temperature dependence of the dichroic signals at both Fe K-edge and Nd $L_{2,3}$-edges is in agreement with the existence of a non-collinear arrangement of the Nd and Fe magnetic moments below Ts.

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