Soft X-ray magnetic circular dichroism in $Fe_{0.50}Co_{0.48}V_{0.02}$/Ti multilayer in transmission for polarimetry and component resolved magnetism

O. Zaharko, H. Grimmer, *PSI, Villigen, Switzerland*

H.- Ch. Mertins, F. Schäfers, *BESSY, Berlin, Germany*

A. Cervellino, *LfK, ETH Zurich, Switzerland*

We report on magnetic circular dichroism (MCD) at the $L_{2,3}$-edges of Fe and Co in an $Fe_{0.50}Co_{0.48}V_{0.02}$/Ti multilayer, *ex situ* grown on Si_3N_4, measured in transmission at the bending magnet beamline PM3 at BESSY I using the BESSY soft X-ray polarimeter [1]. A numerical calculation exploiting the angular dependence of the X-ray absorption spectra (XAS) is performed to determine (i) the absolute degree of circular polarization of the incoming radiation and (ii) the absorption cross sections of the Fe and Co atoms taking into account experimental complications. Leakage has been found numerically to be consistent. An atomic force microscopy study established the origin of the X-ray leakage to be the morphology of the Si_3N_4 substrate. The MCD asymmetries will be used to calibrate circular polarization of the synchrotron radiation in a new BESSY tunable polarimeter. The orbital and spin magnetic moments of the Fe and Co atoms are determined by the sum rules [2, 3] using a new approach to the integration of the spectra. The XAS and MCD spectra has been successfully fitted with Gaussian-convoluted Fano profiles allowing an analitic integration. The obtained component resolved magnetic information fits well the existing knowledge of the electronic structure of bulk bcc Fe-Co alloys. In addition an enhancement of magnetic moments is found due to interface effects.

[1] F. Schäfers et al. *Appl. Opt.* **38**, 4074 (1999).

[2] B. T. Thole, P. Carra, F. Sette, G. van der Laan *Phys. Rev. Lett.* **61**, 1943 (1992).

[3] P. Carra, B. T. Thole, M. Altarelli, X.-D. Wang *Phys. Rev. Lett.* **70**, 694 (1993).