

# XRMR determination of the magnetic contribution to the dispersive part of susceptibility by shifts of Kiessig oscillations

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Magneto-Optical constant determination for X-rays in vicinity of the absorption edges remains one of the important experimental challenges in materials science. XMCD measurements give only the imaginary part of the refractive index (after proper but not reliable normalization). In soft X-ray region Faraday rotation and the shift of the Bragg peaks are successfully used for the absolute determination of the refractive part of this term. Here we have used the shift of the Kiessig oscillations on the reflectivity curves measured for the right and left circular polarized radiation in L-MOKE geometry for the direct determination of the refractive index in the hard X-ray range. The physics behind this effect is obviously the different phase shifts for the multiple reflected right and left circularly polarized waves in a magnetized thin film.

The sample Nb(4 nm)/YFe<sub>2</sub>(40 nm <110>)/Fe(1.5 nm)/Nb(50 nm) has been epitaxially grown on a sapphire substrate at the LPM, University of Nancy. YFe<sub>2</sub> is known to be a soft ferrimagnet [1], in which Y atoms carry a magnetic moment of *ca.* 0.4  $\mu_B$ . The X-ray reflectivity curves and corresponding asymmetry ratio have been measured at different energies near the Y L<sub>2,3</sub> edges (L<sub>3</sub>: 2071 – 2095 eV, L<sub>2</sub>: 2145 – 2185 eV). Results for the L<sub>3</sub> are reproduced in Fig.1. For data analysis we have used a modified version of the software package ASYM [2] that is based on the general theory of reflectivity.

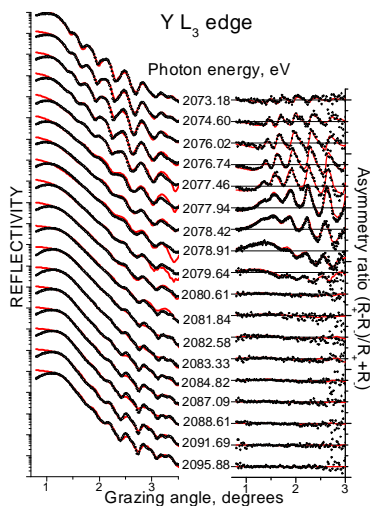


Fig. 1

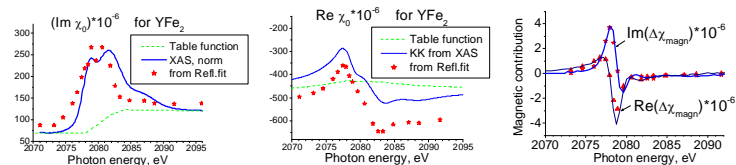


Fig. 2

Fit of the data provides us with the exact structure of our film and the complex susceptibility  $\chi_0$  and  $\Delta\chi_{\text{magn}}$  in YFe<sub>2</sub> layer as a function of energy (symbols in Fig. 2). These dependences are compared with properly normalized XAS, XMCD spectra and their Kramers-Kronig transforms (blue lines in Fig. 2). Excellent agreement of the results is observed though there is a difference of the absolute values for  $\text{Re } \chi$ .

## References

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