Magnetocrystalline anisotropy of hexagonal Co by relative intensities of electron magnetic circular dichroic signals

Tomohiro Kudo[1], Kazuyoshi Tatsumi[2], Shunsuke Muto[2], Klaus Leifer[3] and Jan Rusz[4]

[1] Graduate School of engineering, Nagoya University, Nagoya, Japan, [2] Eco Topia Science Institute, Nagoya University, Nagoya, Japan, [3] Department of Engineering Science, Uppsala University, Sweden, and [4] Department of Physics and Astronomy, Uppsala University, Sweden.

Energy integrated signal intensities of Electron Magnetic Circular Dichroism (EMCD) in TEM-EELS (I_{EMCD}) are proportional to the spin moment of the probed atoms (M_z) projected along the external magnetic field [1], *i.e.*, $I_{EMCD} = KM_z$, where the coefficient K depends significantly on the measurement conditions of the EELS detector position on the diffraction plane, sample thickness, convergent/collection angles and I_{EMCD} has not been used to quantitatively compare M_z between different orientations or different materials.

We try the quantitative comparison by setting similar measurement conditions for the Co $L_{2,3}$ EMCD with $z//c$ and $z\perp c$: The results show clear differences in the EMCD signal intensities, which are fitted with the theoretical curves calculated by the Dyndiff code [2], relative projected spin moment magnitude ($M_{z\perp c}$ / $M_{z//c}$) is estimated to be 0.66 ± 0.07, reasonably consistent with 0.75 ± 0.05 from the experimental magnetization curves of a planer shape Co.

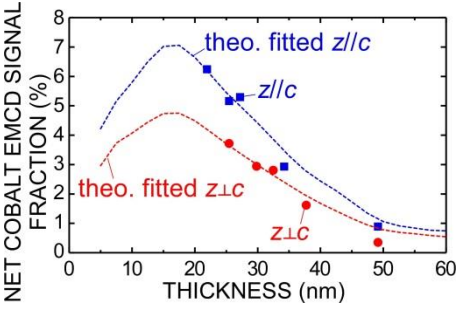

Figure: EMCD signal fractions of Co with two kinds of incidence direction and their theoretical curves.

[1] J. Rusz *et al.*, Phys. Rev. B 84 (2011) 064444.
[2] J. Rusz *et al.*, Ultramicroscopy 125 (2013) 81–88.