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## **Anisotropic x-ray magnetic linear dichroism at Fe, Co and Ni L edges: Interfacial coupling revisited**

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The detailed knowledge of the spin arrangements in engineered magnetic nanostructures comprised of multiple magnetic species is essential to tailor their properties for device applications e.g. in information storage technology. Soft x-ray magnetic dichroism spectroscopies play a very important role in improving our understanding of complex heteromagnetic nanostructures since they provide elemental and chemical site-specific magnetic information with high sensitivity and tunable probing depth. X-ray spectromicroscopy techniques such as photoemission electron microscopy (PEEM), scanning transmission x-ray microscopy (STXM) or full field x-ray microscopy add spatial resolution down to a few nm.

We present the observation as well as theoretical description of anisotropic x ray magnetic linear dichroism (XMLD) on thin films at the Fe L<sub>3,2</sub> edges in Fe<sub>3</sub>O<sub>4</sub> [1], the Ni L<sub>3,2</sub> edges in NiFe<sub>2</sub>O<sub>4</sub> and NiO [2], and Co L<sub>3,2</sub> in CoFe<sub>2</sub>O<sub>4</sub> and CoO [3]. We show unambiguously that - contrary to current belief - spectral shape and magnitude of the XMLD is not only determined by the relative orientation of magnetic moments and x ray polarization but that their orientation relative to the crystallographic axes has to be taken into account for the accurate interpretation of the XMLD data.

The observed anisotropy of XMLD is a general phenomenon and is expected for any magnetic system. Consequently, conclusions based on the interpretation of XMLD spectra without accounting for the XMLD anisotropy have to be reconsidered. We will revisit some of the previous experimental results and reinterpret the experimental data based on our findings. Applying our results to Co/NiO(001) interfaces, we find perpendicular coupling between Ni and Co moments. The results are important considering the growing interest in understanding exchange-biased systems

[1] E. Arenholz, G. van der Laan, R.V. Chopdekar, Y. Suzuki, Phys. Rev. B 74, 094407 (2006)

[2] E. Arenholz, G. van der Laan, R.V. Chopdekar, Y. Suzuki, Phys. Rev. Lett. 98, 197201 (2007)

[3] G. van der Laan, E. Arenholz, R.V. Chopdekar, Y. Suzuki, Phys. Rev. B, accepted (2008)

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