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Spin polarized extended x-ray absorption fine structure of Fe

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Magnetic Circular Dichroism (MCD) is the only technique available that can be used to study atom-specific magnetic moments in multi-element materials. The difference in the spin-dependent absorption amplitudes beyond the absorption edges of the magnetic atoms is referred to as spin-polarized extended X-ray absorption fine structure (SPEXAFS). A previous study [1] at the Gd L_{III} and L_{II} edges has shown a SPEXAFS signal and presented interpretations as to the signal's source and usefulness. We have made in-situ transmission EXAFS and SPEXAFS measurements at the Fe L_{III} and L_{II} absorption edges on a thin Fe film deposited on pyrolene. The standard type of analysis for EXAFS is not possible for this data since the Fe L_{II} absorption edge and EXAFS signal is present (beginning only 13 eV above the Fe LIII absorption edge). In order to overcome this problem, we have applied an iterative Van Cittert deconvolution to the Fe L_{III}/L_{II} data and extracted the signal due only to the Fe L_{III} absorption edge of Fe.

Comparison of the deconvoluted Fe L_{III} EXAFS data with theoretically generated Fe L_{III} data using FEFF5 shows very good agreement. Similarly, we have applied the same itterative Van Cittert deconvolution to the SPEXAFS signal from the Fe L_{III}/L_{II} edge data. Results from this experiment, suggestions for a standardized deconvolution of the data for proper analysis procedures, interpretations of the data and the possible usefulness of these results will be presented.

[1] M. Knulle, D. Ahlers, G. Schutz, Solid State Comm. (accepted for publication).