White line ratio for magnetic property studies

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The reduction of dimension of films is responsible for new physical properties. Electronic structures of thin films have to be investigated to understand these new properties. EELS is a powerful tool to study the electronic properties and quantification needs to be developed. The information contained in the white line ratio of 3d metals is especially a promising way of investigating the local physical properties. The determination of the magnetic moment using the L3/L2 ratio measurement is proposed in this work. Based on previous work by Falqui et al. [1], it has been shown that this ratio contains magnetic information.

We are indeed interested in new magnetic properties linked to the reduction of dimension. Many explanations for these new properties are proposed: new crystallographic structures, enhancement of the role of interfaces…. Studies are led to control these parameters and we investigate the link between structure and magnetism.

We will present experimental results on thin magnetic Co/Cr layers. The samples are studied to understand the influence of the interfaces and structural properties on Co magnetism.

Samples are epitaxially grown on a MgO substrate with a Co thickness from 5 to 12 monolayers. The structure of the cobalt layer is expected to be bcc for thin layers as observed in ref [2] and hcp or fcc for thicker layers. Magnetic measurements obtained by the L3/L2 ratio method are compared to results obtained with macroscopic techniques like SQUID (Superconducting Quantum Device). We also perform ab-initio calculations to predict the influence of the structure on the magnetic moment. The evolution of the L3/L2 ratio as a function of thickness will be presented and the influence of parameters like structure or magnetism will be discussed.

References