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Groupe d'Étude de la Matière Condensée

LINEAR AND QUADRATIC MAGNETO- OPTICAL EFFECTS OF DEEP AND SHALLOW STATES AB-INITIO CALCULATION & EXPERIMENT

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In this presentation, the approach to ab-initio calculation of linear (transverse) and quadratic (magnetic linear dichroism) magneto-optical effects by means of the single electron picture within the framework of density functional theory will be explained. Results of calculation will be demonstrated on ferromagnetic body-centered cubic (bcc) Fe, and face-centered cubic (fcc) and hexagonal close-packed (hcp) Co. The excitation stemming from semi-core 3p levels were considered. The calculated results show similarities as well as differences between L_{2,3} and M_{2,3} edges, where at the latter spin-orbit interaction is of the same order as the exchange interaction.

The quadratic magneto-optical effect is strongly dependent on the magnetization direction with respect to the crystal axes. Full angular dependence on the orientation of the magnetization in the crystal will be presented and the angular dependence of the dielectric function tensor elements will be analyzed using symmetry arguments. The effect of the substrate, capping layer, layer thickness on reflection coefficients as well as different models of the surface and inter-layer roughness will be discussed.

The calculated data will be compared with experimental spectra of bcc Fe, and fcc/hcp Co. The spectral change between two magnetization directions allows to distinguish between fcc and hcp or twinned hcp structure for the majority phase in Co sample.