Abstract of Presentation

Presentation Title:

Off-stoichiometry in Co_2FeSi thin films sputtered from stoichiometric targets revealed by nuclear magnetic resonance

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Abstract :

A successful application of spin-polarized materials in spintronic devices requires a detailed knowledge of the interplay between the structure and the magnetic and electronic properties. This is achieved by gaining knowledge of the local structure by means of Nuclear Magnetic Resonance (NMR). NMR probes the direct local environments of the active atoms and is thus able to resolve neighboring shells providing a unique tool to study the (local) structural properties of spin polarized materials [1,2].

This talk will focus on recent results of structural characterization of highly spin polarized Heusler compound by means of NMR, such as thin films of Co_2FeSi. Co_2FeSi is predicted to be a half-metallic ferromagnet with an extraordinary high magnetic moment and Curie temperature. However, a low tunnel magneto-resistance ratio, a lower spin polarization than predicted, and a lower magnetic moment were experimentally observed in thin film samples. The NMR study shows the main resonance line corresponding to ^{59}Co nuclei in the $L2_1$ environment but also additional resonance lines at the high frequency side of the main line with spacing between adjacent resonance lines of 32 MHz. The additional resonance lines correspond to ^{59}Co with more Fe next neighbours than expected for the $L2_1$ type ordering, which is interpreted as the formation of an off-stoichiometric film yielded by sputtering from a stoichiometric target. This off-stoichiometry might explain the observed deviations from the expected behaviour [3].

[1] S. Wurmehl, et al. , Appl. Phys. Lett. **91**, 052506 (2007).

[2] S. Wurmehl, J. T. Kohlhepp Topical review in J. Phys. D: Appl. Phys. **41** 173002 (2008).

[3] S. Wurmehl, J. T Kohlhepp, H. J. M. Swagten, B. Koopmans, submitted to J. Phys. D: Appl. Phys. (2009).