Magnetic structure of the Mn_2GaC thin film (MAX phase) - ^{55}Mn Nuclear Magnetic Resonance study

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Mn_2GaC ternary compound belongs to the rich family of materials, known as the MAX phases. It presents an atomically laminated structure stacked along the hexagonal c-axis, where the Mn-C-Mn stacks are interleaved with the atomic layers of gallium. It is magnetically ordered with the critical temperature of the order-disorder transition of 507 K. At around 214 K this compound undergoes a first order phase transition, and the magnetic structure below the transition point turns out to be complex. The experiments of unpolarized neutron reflectometry have shown the features of antiferromagnetic order with periodicity of two unit cells, in consistence with the AFM$[0001]^A{}_4$ structure proposed from the theoretical calculations [1]. On the other hand, a nonzero magnetic remanence suggests long range ferromagnetic correlations [2]. In this work we used Nuclear Magnetic Resonance (NMR) technique to shed some light on the low temperature magnetic structure. We present the results of ^{55}Mn NMR experiment carried out on a 100 nm film sample at 4.2 K in zero field and in the external field up to 1T, as well as their implications on the microscopic magnetic order. Presence of a non-collinear magnetic structure inferred from NMR analysis will be discussed in the light of the latest theoretical magnetic ground-state search, assuming a biaxial in-plane strain, using Heisenberg Monte Carlo simulations [3].

References:

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