Magnetization reversal in $NdMn_{0.8}Fe_{0.2}O_3$ compound

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We report on magnetization and AC susceptibility measurements performed on $NdMn_{0.8}Fe_{0.2}O_3$ single crystal in temperature range 2 K – 390 K and in magnetic fields up to 7 T. We confirm Néel temperature $T_N \sim 57$ K in agreement with [1] and we report strong magnetocrystalline anisotropy in this compound. At $T = 2$ K, this anisotropy results to ferromagnetic-like hysteresis loop with coercive field of 1.32 T along b-axis and butterfly-type hysteresis loops for *a*- and *c*-axes with coercivity of 0.4 T and $\sim$ 0.1 T, respectively.

We also report the magnetization reversal process below T_N and in the field-cooled (FC) regime. Negative FC magnetization was observed for $\mu_0 H = 10^{-2}$ T and for all three main crystallographic axes, namely below 21.7(1) K; 25.9(1) K and 22.7(1) K for *a*-; *b*- and *c*-axis, respectively. One of the explanations is that both, Nd and Mn sublattices order already at T_N. Then, different temperature dependence of magnetic moment in these sublattices produces magnetization reversal process. This explanation directly supports the model presented in [2]. The second explanation of the effect can be found within the theory of cluster formation as presented in [3]. This scenario can be supported by the double peak in AC susceptibility at T_N and subsequent frequency-dependent bump in the imaginary part of AC susceptibility at 25 K $< T < T_N$. The detailed discussion and comparison of these two possible models will be provided in the contribution.

References:

[1] M. Mihalik *et al.*, J. Magn. Magn. Mater. 345, 125–133 (2013)
[2] M. Mihalik *et al.*, Phys. Rev. B 96, 134430 (2017)
[3] D. M. Pajerowski *et al.*, J. Magn. Magn. Mater 497, 165968 (2020)

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