Non-collinear spin arrangement in Mn_2FeReO_6 seen by ^{55}Mn NMR

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Mn_2FeReO_6 is the first synthesized compound with a double-perovskite structure that has magnetic transition metals at all cation positions [1]. This compound reveals three different spin-ordering regimes as a function of temperature. In particular, a magnetic reorientation taking place at 75 K leads to a switch from negative to positive magnetoresistance [1]. Based on the neutron diffraction studies a non-collinear spin arrangement has been postulated below 75 K [1,2]. To investigate more closely the low-temperature magnetic structure we performed the ^{55}Mn NMR experiments at 4.2 K on a polycrystalline Mn_2FeReO_6 sample in magnetic fields ranging from 0 up to 6 T. The zero-field NMR spectrum features two broad ^{55}Mn NMR lines, centered around 580 MHz and 600 MHz, respectively, revealing the manganese valence state Mn^{2+}. These two signals display a large distribution of local magnetic susceptibility, evidenced by the NMR experiments performed as a function of the r.f. field amplitude at each frequency. On the other hand the in-field experiments enabled a deconvolution of the NMR spectrum, revealing that each of the two broad lines consists of the two main components. The respective NMR frequencies display a strikingly similar variation as a function of the external magnetic field intensity, evidencing four main contributions NMR signals and confirming a non-collinear arrangement of the Mn magnetic moments at low temperature, as suggested in ref.1,2.

References:

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