TEMPERATURE DEPENDENCE OF NMR IN MAGNETITE

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9.7 cm

We report the temperature dependence of ^{57}Fe NMR in a single crystal of Fe_3O_4 measured by the spin echo method between 4.2 and 140 K (temperature of the Vervey transition $T_V = 121$ K). We were able to register all lines detected at 4.2 K also at higher temperatures up to T_V. The spectra are compatible with the space group Cc, which predicts 8 and 16 lines for iron on tetrahedral (A) and octahedral (B) sites, respectively. One of the Fe(A) lines is doubly degenerate for all $T \leq T_V$, which fact restricts the possible models of the Fe^{2+} and Fe^{3+} ordering on the B sites. No traces were found of the motionally narrowed spectrum below T_V, which would correspond to the electrons on the B sites moving faster comparing to the characteristic time of the NMR measurement (10^{-8} s). At T_V the spectrum is simplified to two lines, one corresponding to Fe(A), the other to Fe(B) as expected for magnetization parallel to $\langle 001 \rangle$. Above T_V no remnant of the low temperature spectrum was found, indicating that if there is a short range order, it fluctuates faster than the NMR frequency.

13.4 cm

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