

The effect of manganese ions in a $\text{MnCr}_{1.98}^{57}\text{Fe}_{0.02}\text{O}_4$ by Mössbauer spectroscopy

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Polycrystalline $\text{MnCr}_{1.98}^{57}\text{Fe}_{0.02}\text{O}_4$ compound was prepared by a wet-chemical process. The crystal structure was found to be a cubic spinel with a space group of $Fd3m$. The lattice constant a_0 and the internal structural parameter x of the oxygen were determined to be 8.444 Å and 0.263, respectively. Mössbauer spectra of $\text{MnCr}_{1.98}^{57}\text{Fe}_{0.02}\text{O}_4$ were taken from 4.2 to 295 K. The absorption spectra show well-developed two sextets, superposed with small difference in hyperfine fields of 482 and 472 kOe below the Néel temperature of 50 K, and a paramagnetic doublet above the Néel temperature. We have observed a sudden change in sextet around 22 K, which corresponds to the spin structure transition temperature. Even though the values of the magnetic hyperfine fields of $\text{MnCr}_{1.98}^{57}\text{Fe}_{0.02}\text{O}_4$ on B sites are close to those of $\text{CoCr}_{1.98}^{57}\text{Fe}_{0.02}\text{O}_4$, there is a noticeable difference in the Néel temperature between them, which is due to the A - B superexchange interaction with spin-orbit coupling attributable to ionic bond lengths. © 2008 American Institute of Physics. [DOI: [10.1063/1.2838468](https://doi.org/10.1063/1.2838468)]