

## Mössbauer study of spin structure transformation from an incommensurate to a commensurate state

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**Abstract** We present crystallographic and magnetic properties of  $\text{NiCr}_{1.98}^{57}\text{Fe}_{0.02}\text{O}_4$  by using X-ray diffractometry (XRD), vibrating sample magnetometry (VSM), and Mössbauer spectroscopy. The lattice constants  $a_0$  were determined to be 8.318 Å. The ferrimagnetic Neel temperature ( $T_N$ ) for  $\text{NiCr}_{1.98}^{57}\text{Fe}_{0.02}\text{O}_4$  is determined to be 90 K. The Mössbauer absorption spectra for all chromites at 4.2 K show two well developed sextets superposed with small difference of hyperfine fields ( $H_{\text{hf}}$ ) caused by  $\text{Cr}^{3+}$  ions in two different magnetic sites. The values of the isomer shifts show that the charge states of Fe are  $\text{Fe}^{3+}$  for all temperature range. Ni-chromites Mössbauer spectra below  $T_N$  present a line broadening due to a Jahn–Teller distortion and show that spin structure behavior of Cr ions change from an incommensurate to a commensurate state.

**Keywords** Mössbauer spectroscopy · Chromite · Jahn–Teller distortion