

Mössbauer studies of melt-spun Nd-Fe-Ti-Mo-N alloy

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$\text{NdFe}_{10.7}\text{Ti}_{1.2}\text{Mo}_{0.1}\text{N}_x$ alloys have been studied with x-ray diffraction, Mössbauer spectroscopy and vibrating sample magnetometer (VSM). $\text{NdFe}_{10}\text{-Ti}_{1.2}\text{Mo}_{0.1}$ alloy was prepared by arc-melting in an argon atmosphere. Nitrogenation was performed by heating the alloy powder in pure N_2 at 500 °C for 15 min. $\text{NdFe}_{10.7}\text{Ti}_{1.2}\text{Mo}_{0.1}\text{N}_x$ has a ThMn_{12} -type structure with $a_0=8.643$ Å and $c_0=4.819$ Å, contains some α -Fe precipitation confirmed with x-ray diffractometry and Mössbauer measurements. The Curie temperature (T_c) is $675 \text{ K} \pm 3$ K. Mössbauer spectroscopy was performed at various temperatures ranging from 13 to 800 K and each spectrum below T_c is fitted with six subspectra of Fe sites in the structure ($8i_1$, $8i_2$, $8j_2$, $8j_1$, $8f$ and α -Fe). The area fractions of the subspectra at 13 K were 9.2, 5.9, 11.4, 10.7, 38.8 and 24 %, respectively. The magnetic hyperfine fields for the Fe sites decrease in the order, $H_{\text{hf}}(8i) > H_{\text{hf}}(8j) > H_{\text{hf}}(8f)$. The Debye temperatures of $\text{NdFe}_{10.7}\text{Ti}_{1.2}\text{Mo}_{0.1}$ and $\text{NdFe}_{10.7}\text{Ti}_{1.2}\text{Mo}_{0.1}\text{N}_x$ were found to be $\Theta = 340 \pm 5$ K and $\Theta = 432 \pm 5$ K, respectively.

Key words: ThMn_{12} -type, VSM, Magnetic hyperfine field, Isomer shift, Spin wave, Debye temperature