Crystallization and Mössbauer studies of melt-spun $NdFe_{10.7}TiB_{0.3}N_{\delta}$ alloys

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Magnetic properties of melt-spun $NdFe_{10.7}TiB_{0.3}N_{\delta}$ ribbons have been investigated as functions of quenching rate and nitriding period. $NdFe_{10.7}TiB_{0.3}$ were prepared with substrate velocity $v_s \leqslant 18$ m/s and were nitrogenated at 500 °C for 15 min. The $NdFe_{10.7}TiB_{0.3}N_{\delta}$ retains the $ThMn_{12}$-type tetragonal structure with lattice constants $a_0 = 8.640$ Å and $c_0 = 4.811$ Å, but with an increase in the unit cell volume. The $NdFe_{10.7}TiB_{0.3}N_{\delta}$ was confirmed to have uniaxial anisotropy by x-ray diffraction. Mössbauer spectra were taken at various temperatures ranging from 13 to 855 K. The Curie and Debye temperatures are determined to be $T_c = 833$ K and $\Theta = 390$ K, respectively. Each spectrum below T_c was fitted with six subspectra of Fe sites ($8i_1$, $8i_2$, $8j_2$, $8j_1$, $8f$, and α-Fe). The area fraction of the subspectra at 13 K are 10.2%, 8.2%, 16.5%, 17.5%, 44.3%, and 3.3%, respectively. The magnetic hyperfine fields for the Fe sites decrease in the order, $H_{\mathrm{hf}}(8i) > H_{\mathrm{hf}}(8j) > H_{\mathrm{hf}}(8f)$. [S0021-8979(98)22811-8]