Crystallographic and magnetic properties of $NdFe_{10.7}TiM_{0.3}$(M=B, Ti)

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$NdFe_{10.7}TiM_{0.3}$(M=B, Ti) has been studied with x-ray diffraction, Mössbauer spectroscopy, and a vibrating sample magnetometer. The alloys were prepared by arc-melting under an argon atmosphere. The $NdFe_{10.7}TiB_{0.3}$ exhibits a pure single phase, whereas the $NdFe_{10.7}Ti_{1.3}$ contains some α-Fe, from x-ray and Mössbauer measurements. The $NdFe_{10.7}TiB_{0.3}$ has the $ThMn_{12}$-type tetragonal structure with a_0=8.587 Å and c_0=4.788 Å. The Curie temperature (T_C) is 570 K from Mössbauer spectroscopy performed at various temperatures ranging from 13 to 770 K. Each spectrum below T_C was fitted with five subspectra of Fe sites in the structure ($8i_1$, $8i_2$, $8j_1$, $8j_2$, and $8f$). The area fraction of the subspectra at room temperature are 16.4%, 8.2%, 14.8%, 21.3%, and 39.3%, respectively. Magnetic hyperfine fields for the Fe sites decrease on the order of $H_{hf}(8i)>H_{hf}(8j)>H_{hf}(8f)$. The average hyperfine field $H_{hf}(T)$ of the $NdFe_{10.7}TiB_{0.3}$ shows a temperature dependence of $[H_{hf}(T)-H_{hf}(O)]/H_{hf}(O)=-0.39(T/T_C)^{3/2}-0.17(T/T_C)^{5/2}$ for $T/T_C<0.7$, indicative of spin-wave excitation. Annealing the alloy at around T_C for 60 min resulted in a two phase microstructure consisting of a $ThMn_{12}$-type structure and α-Fe. [S0021-8979(96)31908-4]