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Crystallographic and Mössbauer Studies of Sintered Nd-Fe-B Magnet

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Nd-Ga-$Fe_{bal.}$-Nb-B alloy with $Nd_2Fe_{14}B$ structure was synthesized by using the strip casting method. The Nd-Ga-$Fe_{bal.}$-Nb-B alloy retains the tetragonal structure with lattice constants a_0 = 8.802, and c_0 = 12.215 Å. Mössbauer spectra were recorded at various temperatures ranging from 4.2 to 620 K. The Curie temperature (T_C), and Debye temperature (Θ_D) were determined to be T_C = 613, and Θ_D = 471.4 K, respectively. Each spectrum below T_C was fitted with six subspectra of Fe sites ($8j_1$, $8j_2$, $16k_1$, $16k_2$, $4c$, and $4e$) based on the occupancy of Fe ions probability distribution. The area ratios of subspectra at 4.2 K are 12.8, 12.8, 29.6, 29.1, 6.8, and 9.1%, respectively. The magnetic hyperfine fields (H_{hf}) for the Fe sites decrease in the order $H_{hf}(8j_2) > H_{hf}(16k_2) > H_{hf}(4c) > H_{hf}(16k_1) > H_{hf}(8j_1) > H_{hf}(4e)$.

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