

Crystallization and Magnetic Properties of $\text{Fe}_{84}\text{B}_9\text{Nb}_7$ Amorphous Ribbons

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Abstract— The amorphous $\text{Fe}_{84}\text{B}_9\text{Nb}_7$ and its nanocrystallization have been studied by x-ray, Mössbauer spectroscopy and magnetic moment measurements. The average hyperfine field $H_{\text{hf}}(T)$ of the amorphous state shows a temperature dependence of

$$[H_{\text{hf}}(T) - H_{\text{hf}}(0)] / H_{\text{hf}}(0) = -0.52 (T/T_C)^{3/2} - 0.34 (T/T_C)^{5/2}$$

for $T/T_C < 0.7$, indicative of spin-wave excitation. The quadrupole splitting just above the Curie temperature T_C is 0.41 mm/s, whereas the average quadrupole shift below T_C is zero. The Curie and crystallization temperatures are determined to be $T_C = 330$ K and $T_x = 750$ K, respectively, for a heating rate of 5 K/min. The occupied area of the nanocrystalline phase at the optimum annealing temperature is about 73%.