

Abstract

Electron magnetic resonance study of the $\text{Ni}_{50-x}\text{Co}_x\text{Mn}_{35.5}\text{In}_{14.5}$ Heusler alloys

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The dissertation presents the magnetic properties of Heusler alloys $\text{Ni}_{50-x}\text{Co}_x\text{Mn}_{35.5}\text{In}_{14.5}$ ($x = 0, 3, 5$) in form of ribbons determined using electron magnetic resonance (EMR), and in particular, the discussion on how annealing and cobalt content affect these properties.

The temperature dependence of the EMR spectra was registered for: as cast ribbons of $\text{Ni}_{50-x}\text{Co}_x\text{Mn}_{35.5}\text{In}_{14.5}$ ($x = 0, 3, 5$), these ribbons annealed at 1173 K, ribbon of $\text{Ni}_{50}\text{Mn}_{35.5}\text{In}_{14.5}$ annealed at 600 K and powder of $\text{Ni}_{47}\text{Co}_3\text{Mn}_{35.5}\text{In}_{14.5}$. Additionally, the temperature dependences of magnetization for these samples (except for the sample in the form of powder) were measured. The obtained resonance lines in the paramagnetic temperature range were well fitted by Dysonian line shape. The temperature dependences of linewidth ΔB of EMR signals were discussed based on the value of fitting parameters. $\Delta B(T)$ was used to determine the Curie temperature. Two other methods were also used for calculation of Curie temperature, i.e. the temperature dependence of the inverse of integral intensity $1/I_{int}(T)$ of EMR line and the magnetization derivative relative to temperature $dM(T)/dT$. Furthermore, the characteristic temperatures of structural phase transitions were determined. The EMR spectra registered for samples which exhibit a ferromagnetic ordering in parental phase contain an additional line in the low field region. This line is known in the literature as *low-field microwave absorption*.

The morphology and composition of annealed samples were examined using a scanning electron microscope equipped with EDX. These studies reveal the existence of a second phase with increased cobalt content located on the grains borders on the surface of the $\text{Ni}_{47}\text{Co}_3\text{Mn}_{35.5}\text{In}_{14.5}$ and $\text{Ni}_{45}\text{Co}_5\text{Mn}_{35.5}\text{In}_{14.5}$ ribbons.