

The influence of Fe on the magnetic properties and electronic structure in the $Tb(Ni_{1-x}Fe_x)_3$ intermetallic compounds

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We present and discuss magnetic properties and electronic structure of $Tb(Ni_{1-x}Fe_x)_3$ crystalline compounds. The magnetic properties have been investigated in the broad temperature range 2K – 1100K by using the SQUID magnetometer as well as the Faraday type magnetic balance and ^{57}Fe Mössbauer spectra have been collected at 300K. Partial substitution of Ni by Fe atoms is reflected in the increase of the Curie temperature (T_C) up to 851K ($x=0.4$) and subsequent decrease of T_C value to 655K with further iron doping up to $x=1.0$. Simultaneously in the same range of x concentration the value of the saturation magnetic moment (M_S) exhibits the gradual decrease from $7.60 \mu_B/f.u$ ($x = 0.0$) to $3.42 \mu_B/f.u$ ($x = 1.0$). The maximum values of the magnetic entropy change (ΔS_m) indicates a significant decrease from 1.56 J/kgK ($x=0.0$) to 0.24 J/kgK ($x=0.2$). The mean hyperfine magnetic field increases with increase of the Fe concentration. The XPS spectra have been measured at the room temperature. The valence band spectra as well as the core level lines have been analyzed as the influence of Ni//Fe substitution on the electronic structure.