The influence of Yb substitution on the magnetic, electric properties and electronic structure of Yb$_x$Gd$_{1-x}$Ni$_5$ system.

A. Bajorek $^a$, G. Chelkowska $^a$

$^a$A. Chelkowski Institute of Physics, University of Silesia, Uniwersytecka 4, 40 - 007 Katowice, Poland

The crystal and electronic structure, magnetic and electric properties of intermetallic compounds Yb$_x$Gd$_{1-x}$Ni$_5$ (x = 0.0, 0.2, 0.4, 0.5 are presented. The change of crystal structure parameters was obtained from XRD measurements which show that all studied compounds crystallize in the hexagonal CaCu$_5$ type of crystal structure. The ordering temperatures $T_C$ were identified from the temperature dependence of AC magnetic susceptibility as well as from the temperature dependence of electrical resistance $R(T)$. The values of $T_C$ obtained from both methods decrease with the increasing of ytterbium concentration. The same behaviour was evidenced for the effective magnetic moment estimated from the temperature dependence of DC magnetic susceptibility. The analysis of the electronic structure studied by XPS method shows that the valence band spectra near by Fermi level are dominated by Ni$^{3d}$ states. The multiplet structure visible in valence bands is typical for Yb$^{3+}$ ions. The satellite structure for Ni$^{2p}$ core level lines suggest that Ni$^{3d}$ band is not fully filled.

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Corresponding author:
Anna Bajorek

Address for correspondence:
A. Chelkowski Institute of Physics, Solid State Division, University of Silesia, Uniwersytecka 4, 40 - 007 Katowice

Email address:
anna.bajorek@us.edu.pl