Electronic properties of $CeNi_4Si$ compound

M. Falkowski[1], A. Kowalczyk[1], T. Toliński[1], and G. Chełkowska[2]

[1]*Institute of Molecular Physics, Polish Academy of Sciences*
M. Smoluchowskiego 17, 60-179 Poznań, Poland
[2]*Institute of Physics, University of Silesia, Uniwersytecka 4,40-007 Katowice, Poland*

Ce-based ternary intermetallic compounds are the subject of continuous interest because a wide variety of their ground state. The temperature dependence of the specific heat for the $CeNi_4Si$ is analyzed. These studied are supported by magnetic susceptibility, electrical resistivity and X-ray photoemission spectroscopy measurements. RNi_4Si compounds crystallize in the hexagonal $CaCu_5$-type structure, space group P6/mmm. R atoms occupy the (1a) site, Ni(1) the (2c) site and Ni(2) and Si are statistically distributed on the (3g) positions. $CeNi_4Si$ is paramagnetic and follows the Curie-Weiss law with μ_{eff}=0.52 μ_B/f.u. and θ_P=-2K. This effective paramagnetic moment is lower than the free Ce^{3+} value. The f-occupancy n_f and coupling Δ between the f level and the conduction state are derived to be about 0.91 and 36 meV, respectively. Both the susceptibility data and the XPS spectra have shown that Ce ions are in intermediate valence state.

Specific heat is a unique tool for obtaining information on magnetic properties, phase transitions and energy level distribution. This technique has appeared to be exceptionally useful in studies on such materials as ferromagnets, superconductors and heavy fermions. The total specific heat consists of electronic, phonon and magnetic contributions. The specific heat has been analyzed considering the electronic contribution, the Schottky anomaly, and the lattice contributions in frames of the Debye model. The scheme of the energy levels created by the crystal electric field split is determined from Schottky contribution to the specific heat.

Name of the presenting author (poster): Michał Falkowski
e-mail address: falkowski@ifmpan.poznan.pl
url's: http://www.ifmpan.poznan.pl