

Abstract

The aim of this thesis is a research of the influence of symmetry on the magnetic and superconducting properties of rare-earth intermetallics. Polycrystalline samples of the YIr_2Si_2 , LaIr_2Si_2 and SmIr_2Si_2 compounds were successfully prepared both in the low temperature (LT) and high temperature (HT) phase. Low temperature phases have been prepared by controlled heat treatment. The correctness of the thermal treatment has been confirmed by DTA analysis. Composition of both phases has been confirmed by EDX analysis and by XRPD. Lattice parameters were compared with the results of the theoretical calculations with very satisfying agreement in the case of YIr_2Si_2 compound. The heat capacity measurements confirmed existence of superconductivity in the HT form of the YIr_2Si_2 compound at $T_{\text{SC}} = 2.50\text{ K}$ and the LaIr_2Si_2 compound at $T_{\text{SC}} = 1.49\text{ K}$. No sign of the superconductivity was found in the LT-phase of both compounds down to temperature 0.35 K . The heat capacity results have been supported by the resistivity measurement. Heat capacity measurements of the SmIr_2Si_2 compound revealed magnetic transitions at temperatures ($T_1 = 1.7\text{ K}$, $T_2 = 6.2\text{ K}$ and $T_3 = 18.8\text{ K}$) for the high temperature phase and at temperatures ($T_1 = 1.9\text{ K}$, $T_2 = 6.1\text{ K}$ and $T_3 = 38.9\text{ K}$) for the low temperature phase. Weak hint of transition has been indicated at temperature $T_4 = 0.5\text{ K}$ for both polymorphs. It can denote another magnetic transition or nuclear Schottky contribution to the specific heat. The magnetism of the both polymorphs is given by characteristic features of the Sm^{3+} ion. The existence of the Sm^{3+} ion was confirmed by susceptibility behaviour which well follows modified Curie Weiss law.