Title: Magnetic and transport properties of f-electron compounds under extreme conditions

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Abstract: This thesis deals with the effect of hydrostatic and uniaxial pressures on the magnetic properties of selected compounds. Main emphasis was given to the $ErCo_2$ compound, its analogs with dysprosium and holmium at the rare-earth site and the influence of Si substitutions for the Co. In the case of pure $ErCo_2$, we observed for the first time the pressure induced change of the type of the magnetic phase transition from the first to second order-type and the decoupling of the ordering of Er and Co magnetic sublattices. These effects were only theoretically predicted in the previously published works. Tiny anomalies in the bulk properties related to the existence and short-range ordering of Co magnetic moments in the paramagnetic phase ($T > T_C$), recently deduced from the XMCD experiments at ambient pressure, were successfully observed in this high pressure study as well.

Series of high pressure experiments on the UNiGa single crystal, compound with high anisotropy and rich ambient-pressure phase diagram, has been performed. Besides the measurements under hydrostatic conditions, the experiments under uniaxial compression along the crystallographic c-axis of the compound's hexagonal structure, have been prepared as well.

Important aspect of the presented work lies in the instrumentation development for studying the material properties under high pressures. Methods for sensitive measurements of the AC susceptibility and the specific heat under high pressures were implemented for the piston-cylinder pressure cells under the pressures up to 3 GPa within the PPMS aparatus (Quantum Design, 14 T magnet, 1.8 – 380 K). Set of several new pressure cells for measuring both, the bulk (DC magnetization, AC susceptibility, electrical conductivity) and the microscopic (neutron diffraction) properties under uniaxial compression of the sample along desired direction, was constructed and succesfully tested. Finally, the diamond anvil pressure cell for

precise magnetization measurement within commercial SQUID magnetometer under very high pressures has been constructed. Pressures up to 15 GPa have been achieved in the first tests, while preserving a remarkable sensitivity down to 10^{-6} emu. To our best knowledge, there currently exist only one such a device in the world with comparable capabilities. Without this advances in the available experimental methods, most of the physical effects studied in this thesis would not be possible.

Keywords: rare-earth intermetallic compounds, uranium compounds, magnetic properties, high pressures