

Pressure characterization of the EuRu_2P_2 single crystal

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Eu-based compounds are specific among other rare-earth-based ones for the unusual properties due to the presence of the Eu element. The rare earth elements are usually trivalent if contained in the compound, on the contrary the divalent (magnetic Eu^{2+}) electronic state is more stable than the trivalent (nonmagnetic Eu^{3+}) one [1]. Since the energy difference between the Eu^{2+} and Eu^{3+} states is not extensively large, the Eu^{2+} electronic state can be changed by several methods. Among them the application of external pressure plays an irreplaceable role [2].

We focus on the EuRu_2P_2 compound due to its presumable close location to the valence change. The flux growth method was found as a successful way to prepare a single-crystalline sample.

We have performed a thorough investigation of the transport and magnetic properties under ambient and hydrostatic pressures with magnetic field applied along particular crystallographic directions. We confirm the Curie temperature $T_c = 29\text{K}$ (at ambient pressure) from the results of the magnetization, heat capacity and resistivity measurements. Saturated magnetization of $7 \mu_B/\text{f. u.}$ at 2K, which is in a good agreement with the magnetic moment of free Eu^{2+} ($7 \mu_B/\text{Eu}$) and agrees well with reported data in [2]. Relatively small but nonzero magnetocrystalline anisotropy occurs with a-axis as the easy direction in our experimental data and agrees well with our theoretical calculations.

Resistivity, AC susceptibility and magnetization measurements under hydrostatic pressures were used to study the evolution of ambient pressure anomalies and to map the magnetic phased diagram as a function of temperature, magnetic field and hydrostatic pressure. The measurements indicate interesting region around 1.4GPa (Fig.1), where the Curie temperature rapidly drops, however the character of observed properties does not indicate the expected valence transition.

Details of the obtained results and their evaluation will be subject of this presentation.

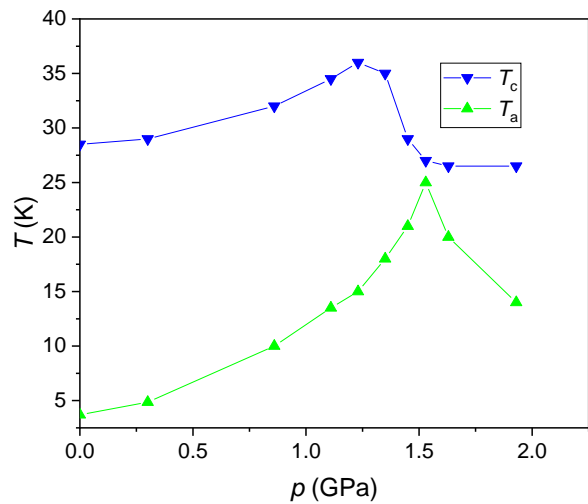


Figure 1. Curie temperature and anomaly evolution of EuRu_2P_2 with respect to the pressure

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