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Anisotropy of the electrical transport properties of $PrFe_4P_{12}$ in magnetic fields

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Pr-based filled skutterudite $PrFe_4P_{12}$ has attracted much attention because of demonstrating anomalous heavy-fermion (HF) behavior. In this study, we focus on the high-field HF state especially for H applied parallel to the [111] axis, in which no T^2-dependence in the electrical resistivity has been observed [1], and report the anisotropy of the transport properties of $PrFe_4P_{12}$ in magnetic fields around the [111] direction. Figure 1 shows the field-angle dependence of the electrical resistivity, $\rho(H,\theta)$, for the current along the $[1\bar{1}0]$ axis and the Hall resistivity, $\rho_{\rm H}(H,\theta)$, of $PrFe_4P_{12}$ above 9 T at $T \sim 0.4$ K, plotted as a function of the field angle θ tilted from the [111] to [110] axis within the $(1\bar{1}0)$ plane. In the vicinity of the [111] direction, an enhancement of $\rho(H,\theta)$ is observed, which is essentially consistent with the previous result [1] except for a fine peak structure in this experiment. Also for $\rho_{\rm H}(H,\theta)$ around the [111] direction, strange behavior such as a change of the sign with H is found. The origin of these anomalies is unclear at present, but might be strongly related to either non-fermi liquid behavior [1] or a new high-field ordered phase quite recently revealed by the dc magnetization and specific heat measurements [2].

[1] E. Kuramochi *et al.*, Acta Phys. Pol. B **34**, 1129 (2003).
[2] T. Tayama *et al.*, J. Phys. Soc. Jpn. **73**, 3258 (2004).

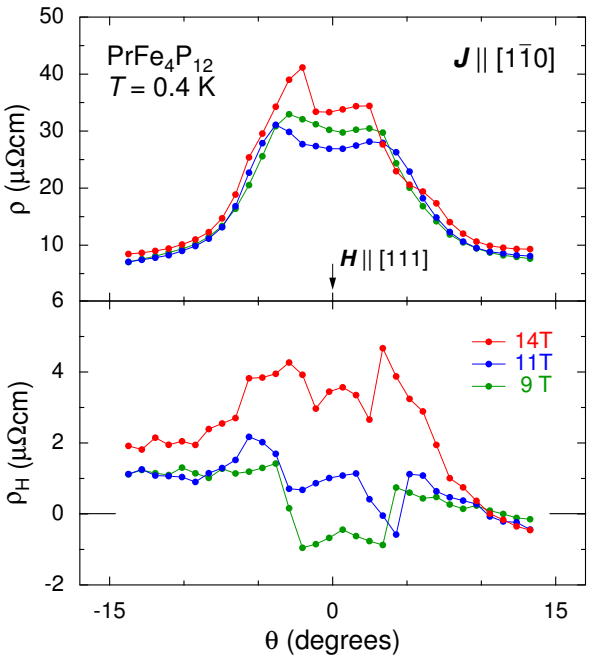

Figure 1: Field-angle dependence of $\rho(H,\theta)$ for $\boldsymbol{J} \parallel [1\bar{1}0]$ (upper panel) and $\rho_{\rm H}(H,\theta)$ (lower panel) of $PrFr_4P_{12}$ at $T = 0.4$ K, as a function of the field angle θ measured with respect to the [111] axis within the $(1\bar{1}0)$ plane.