Pure and chemically doped $YbRh_2Si_2$: how does the antiferromagnetic order vanish?

Cornelius Krellner,* T. Westerkamp, A. Pikul,
S. Hartmann, N. Oeschler, C. Geibel, and F. Steglich
Max Planck Institute for Chemical Physics of Solids, D-01187 Dresden, Germany

Abstract

In recent years $YbRh_2Si_2$ ($T_N = 70\,\mathrm{mK}$) has been intensively investigated due to its proximity to an antiferromagnetic quantum critical point (QCP). The transition from a magnetically ordered ground state to a non-magnetic one was studied by applying a small magnetic field or negative chemical pressure using Ge- or La-doping. More recently the stoichiometric isoelectronic compound $YbIr_2Si_2$ was found to be on the non-magnetic side of the QCP. Therefore the series $Yb(Rh_{1-x}Ir_x)_2Si_2$ is ideally suited to study the phenomena of a quantum phase transition. In this contribution we report on the growth of single crystals with $x = 0$, 0.02, 0.06, 0.2, and 1. The low temperature properties of the resistivity and specific heat for the different concentrations will be presented. In addition we show detailed specific heat measurements for $x = 0$ around T_N. The observed antiferromagnetic transition in high quality single crystals of $YbRh_2Si_2$ is very sharp and can only be fitted with an unconventional critical exponent.

*Electronic address: krellner@cpfs.mpg.de