Abstract submitted to the
NATO ADVANCED RESEARCH WORKSHOP
New materials for thermoelectric applications: theory and experiment
September 19 - 25, 2011 Hvar, Croatia

Thermoelectric properties of the Kondo insulator $CeRu_4Sn_6$ [1]

J. Hänel, H. Winkler, M. Ikeda, K.-A. Lorenzer, A. Prokofiev, S. Paschen
Institute of Solid State Physics, Vienna University of Technology, 1040 Vienna, Austria
Submitted : 12-09-2011
Keywords : $CeRu_4Sn_6$, Kondo insulator, thermoelectrics

Kondo insulators represent a special class of heavy fermion systems where a half-filled conduction band hybridizes with an almost dispersionless 4f level resulting in a heavy quasiparticle band with a small energy gap of a few meV at the Fermi level [1]. The tetragonal crystal structure of the Kondo insulator $CeRu_4Sn_6$ places it inbetween the archetypal cubic Kondo insulators like YbB_{12} or $Ce_3Bi_4Pt_3$ and the orthorhombic ŤKondo semimetalsŤ CeNiSn and CeRhSb [1, 2, 3]. Investigations of possible anisotropies - or even nodes - of the Kondo insulating gap in $CeRu_4Sn_6$ are of central interest.
Previous measurements on single crystalline $CeRu_4Sn_6$ showed a large anisotropy of physical properties such as the electrical resistivity, the magnetic suscpetibility and the specific heat [4]. Interestingly this anisotropy is observed not only in the tetragonal, but also in a quasi-cubic unit cell formed by the c-axis and the diagonal of the a-a-plane, c'. In this work we present thermopower data of single crystalline $CeRu_4Sn_6$. A large anisotropy between the c-axis and the tetragonal plane is observed. We analyse the low-temperature thermopower and compare it to the linear coefficient of the specific heat. In addition, we compare the thermoelectric figure of merit ZT of our single crystals with polycrystal data.

[1] G. Aeppli and Z. Fisk, Comments Condens. Matter Phys. **16**, 155 (1992).
[2] R. Pöttgen, R.-D. Hoffmann, E. V. Sampathkumaran, I. Das, B. D. Mosel, and R. Müllmann, J. Solid State Chem. **134**, 326 (1997).
[3] A.M. Strydom, Z. Guo, S. Paschen, R. Viennois, and F. Steglich, Physica B **293**, 359 (2005).
[4] S. Paschen, H. Winkler, T. Nezu, M. Kriegisch, G. Hilscher, J. Custers, and A. Prokofiev, J. Phys.: Conf. Ser. **200**, 012156 (2010).

[1] This work was supported by the ERC Advanced Researcher Grant No. 227378 and the FWF Grant No. I 623-N16