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\[ ^{115}\text{Sn} \text{ solid state NMR as a local probe for correlations in CeRu}_2\text{Si}_2 \] — Eva Maria Brüning, Michael Baenziger, André Gippus, André Strydov, Silke Bühler-Paschen, and Frank Steglich

1 Max-Planck-Institute for Chemical Physics of Solids, Dresden, Germany
2 Moscow State University, Faculty of Physics, Moscow, Russia
3 Department of Physics, APU, University of Johannesburg, South Africa

A \(^{115}\text{Sn} \) NMR study on the tetragonal semimetal CeRu\(_2\)Si\(_2\) and the metallic structural homologue LaRu\(_2\)Si\(_2\) is presented. At low fields (1.8 T, 28.5 MHz) a broad NMR line with small (-0.33%) and nearly independent negative Knight shift \( K(T) \) is observed, whereas at larger fields (up to 7.5 T) a structure in the spectra could be resolved. The NMR spectra are well represented by a superposition of two broadened anisotropic lines \( S/1/2 \), consistent with the two different \( \text{Si} \) sites in the tetragonal structure. The behavior of the spin-lattice relaxation rate \( 1/T_1 \) at 28.5 MHz above approximately \( T = 20 \) K is consistent with a narrow-gap semiconductor \( (1/T_1 \sim T \exp(-\Delta/k_B T), \Delta/k_B = 33 \) K). The formation of correlations become apparent below \( T^* = 10 \) K where an upturn is observed in \( 1/T_1 \). This is consistent with the specific heat results in the framework of the Körning model where \( (T T^*)^{-1} \propto K^2 \propto N(x) \propto (C/T)^2 \) is valid. \( 1/T_1 \) investigations at higher fields show the suppression of the low-temperature upturn. In conclusion the results for CeRu\(_2\)Si\(_2\) suggest the formation of a ground state of strongly correlated quasiparticles within a low-carrier density.

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Quantum Critical Behavior in CeNi\(_2\)CuGe\(_6\), - W. Scheidt, W. Scheerer, G. Hilscher, and H. Michor

Chemische Physik und Materialwissenschaften, Universität Augsburg, 86150 Augsburg, Germany
4 Institut für Festkörperphysik, TU Wien, A-1040 Wien, Austria

CeNi\(_2\)Ge\(_6\) exhibits unusual non-Fermi liquid (nFL) behavior with the largest ever recorded value of the electronic specific heat \( \Delta C_p \sim 5.5 \text{ K} \text{mol}^{-1} \) without showing any trace of magnetic order [1]. Specific heat measurements show that the logarithmic increase of the Sommerfeld coefficient flattens off below 200 mK indicating coherent effects, whereas substitution of Ce by La in CeNi\(_2\)Ge\(_6\) supports a single ion scenario as the main reason for the nFL behavior. Here we report on new substitution experiments replacing Ni by Cu. Specific heat and susceptibility results will be discussed in the framework of a quantum critical phase transition scenario.


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Suppression of magnetic order in YbNi\(_{5}\).\text{Ge}_{6} - K. Grube, W. Knapo, C. Meinigast, S. Drottzer, M. Uhrak, F. Werner, P. Adermann, and H. von Löwenstein

4 Forschungszentrum Karlsruhe, Institut für Festkörperforschung, TH, Germany
5 Institut für Physik, Universität Augsburg, 86135 Augsburg, Germany
6 Physikalisches Institut, Universität Karlsruhe (TH), Germany

YbNi\(_{5}\)Ge\(_{6}\) shows moderately heavy-fermion behavior with antiferromagnetic long-range order below \( T_N = 5.1 \) K. We have studied the thermodynamic and transport properties of single crystals grown using the flux method with specific heat, DC magnetization, and resistivity measurements in magnetic fields up to 14 T. The magnetic order is suppressed in a magnetic field of 1 T. On the other hand, YbNiGe\(_{2}\) shows a very small magnetic susceptibility and no sign of magnetic order down to the lowest measured temperature of 1.9 K, indicating an intermediate-valent state. Preliminary experiments on polycrystalline YbNi\(_{5}\)Ge\(_{6}\) samples exhibit signs of magnetic ordering below 3 K. We report on the magnetic phase diagram of YbNi\(_{5}\)Ge\(_{6}\) and the dependence of the specific heat on the Ge content.

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High temperature specific heat and crystal field of the non-Fermi-Liquid system YbRh\(_2\)Si\(_2\) - J. Ferstl, C. Geibel, O. Stockert, and F. Steglich

1 Max-Planck-Institute for Chemical Physics of Solids, Nöthnitzer Straße 40, 01187 Dresden, Germany
2 Department of Physics, Indian Institute of Technology, Kanpur-208016, India

The heavy fermion system YbRh\(_2\)Si\(_2\) has attracted considerably interest in the last years, being located very close to a quantum critical point (QCP). Strong Kondo-like fluctuations lead to a very weak magnetic order with a transition temperature of only \( T_N = 70 \) mK at ambient pressure. A lot of physical investigations were done in the low-temperature region, but much less investigations and analysis were devoted to the behaviour at higher temperatures. We shall present measurements of the specific heat \( C_p \) at higher temperatures. The results are analysed in view of crystal field (CEF) effects and discussed in comparison with results from inelastic neutron scattering. \( C_p \) of YbRh\(_2\)Si\(_2\) and LaRh\(_2\)Si\(_2\) were measured in the temperature range 2 K \( \leq T \leq 300 \) K. From the magnetic data deduced the contribution \( C_M \) of the Yb-f-electrons. We confirm the presence of a broad maximum between 40 K and 80 K in \( C_M \). This maximum can be related to the first excited CEF level which, according to neutron data, is located around 17 meV. While \( C_M \) is more conclusive than neutron data for this lowest excited CEF level, \( C_M(T) \) is less conclusive for the higher levels, for which neutron data gave rather precise excitation energies of 25 meV and 43 meV. Thus the combination of specific heat and neutron data allows a more reliable determination of the whole CEF scheme.

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How many Kondo-ions are seen by the electron spin resonance in Yb\(_1-x\)Rh\(_x\)Si\(_2\) - J. Würkhoop, J. Sichelschmidt, S. Maquilón, L. Pham, Z. Fisk, C. Krellner, J. Ferstl, H.-A. Krug von Nidda, C. Geibel, and F. Steglich

1 Max-Planck-Institut für Chemische Physik fester Stoffe, D-01187 Dresden, Germany
2 Department of Physics, University of California, Davis, CA 95616 USA
3 Experimentalphysik V, Elektronische Korrelationen und Magnetismus, Institut für Physik, Universität Augsburg, 86135 Augsburg, Germany

The heavy-fermion compound YbRh\(_2\)Si\(_2\) is located very close to a magnetic field induced quantum critical point. The unexpected observation of electron spin resonance (ESR) of the Kondo-ion Yb\(_{1-x}\)Rh\(_x\)Si\(_2\) below the Kondo temperature \( T_K \approx 25 \) K might be a direct verification of the localized moment scenario of quantum criticality [1]. We present the ESR of Yb\(_1-x\)Rh\(_x\)Si\(_2\) \( R = La, Lu \). The ESR-line observed at \( x = 30 \) K. The intensity changes with increasing \( x \). Taking advantage of an improved crystal growth process, we found that the crystal quality and the residual linewidth of the ESR signal are closely related. This suggests that the so-called ESR-bottleneck effect is important for the observability of the ESR-line well below the Kondo temperature. We found that the ESR signal intensity also depends on the Yb-concentration.


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Possible critical pressure-induced valence fluctuation in EuCu\(_3\)Ge\(_6\) - Gabriel Alejandro Dionicio, Herbert Wilhelm, Zakir Hossain, and Christoph Geibel

1 Max-Planck-Institute for Chemical Physics of Solids, 01187 Dresden, Germany
2 Department of Physics, Indian Institute of Technology, Kanpur-208016, India

By means of electrical resistivity measurements under pressure, we investigated the possibility of inducing a valence fluctuating regime in EuCu\(_3\)Ge\(_6\) at low temperatures. The results are discussed in terms of a possible scenario for unconventional superconductivity driven by virtual exchange fluctuation of the charge density [1]. This mechanism was proposed to explain the high pressure superconducting dome in EuCu\(_3\)Ge\(_6\). The electrical resistivity measurements were performed up to 10 GPa in the temperature range 100 mK \( < T < 300 \) K. A tentative phase diagram is presented and the results are compared with the studies performed in the alloy CeCu\(_3\)(Si\(_{6-x}\)Ge\(_x\))\(_{12}\).


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Fading of the magnetic order transition in CePt\(_3\)Si at low temperatures - Johannes Speehling, Olaf Zellesnik, Andreas Eichler, and Ernsty Bauer

1 Inst. f. Angewandte Physik, TU Braunschweig, D-38106 Braunschweig, Germany
2 Inst. f. Festkörperphysik, TU Wien, A-1040 Wien, Austria

We have carried out specific heat measurements on CePt\(_3\)Si at low temperatures from ambient pressure up to 1.5 GPa. A maximum of