nieszka Kondrat[1], Jorge Hamann Borrero[1], Liran Wang[1], Günter Behr[1], Hans-Henning Klauss[3], Hubertus Luetkens[2], and Bernd Büchner[1] — [1]IFW Dresden, P.O. Box 270116, 01171 Dresden, Germany — [2]Laboratory for Muon-Spin Spectroscopy, Paul Scherrer Institut, CH-5232 Villigen PSI, Switzerland — [3]IFP, TU Dresden, D-01069 Dresden, Germany

We present specific heat and magnetisation data of $RFeAsO_{1-x}F_x$ with R=La, Ce, Pr, Sm, Gd in different applied magnetic fields. For the undoped compounds, i.e. $x = 0$, our data indicate only a weak dependence of both the spin-density-wave formation and the structural transition to the orthorhombic low-temperature phase on type of the R-ion. If R is magnetic, antiferromagnetic ordering of 4f-moments evolves at low temperatures which is also present at higher doping levels x for superconducting materials. The specific heat jump Δc_p at T_C is investigated and we discuss the interplay of magnetism and superconductivity based on our data.

TT 45.3 Fri 10:45 HSZ 03

Magnetic and superconducting properties of $REO_{1-x}F_xFeAs$ (RE=Ce, Sm, Pr, Gd) iron pnictide superconductors studied by muon spin relaxation — •H. Maeter[1], A. Kwadrin[1], H.-H. Klauss[1], H. Luetkens[2], R. Khasanov[2], A. Amato[2], R. Klingeler[3], C. Hess[3], J. Hamann-Borrero[3], N. Leps[3], A. Kondrat[3], G. Behr[3], J. Werner[3], and B. Büchner[3] — [1]Institut für Festkörperphysik, TU Dresden — [2]Laboratory for Muon-Spin Spectroscopy, Paul Scherrer Institut, CH-5232 Villigen, Switzerland — [3]Leibniz-Institut für Festkörper- und Werkstoffforschung Dresden

We have investigated the superconducting properties and the interplay of iron and rare earth magnetic order in the iron-pnictide system $REO_{1-x}F_xFeAs$ with RE=Ce, Gd, Pr, Sm and $0 \leq x \leq 0.5$ by means of muon spin relaxation (μ^+SR) and compare it with $LaO_{1-x}F_xFeAs$. We find that the undoped compounds show a variety of different magnetic coupling of the rare earth ion to the antiferromagnetic iron layers ranging from independent order to strong polarization of the rare earth moments by the ordered iron. Similar to $LaO_{1-x}F_xFeAs$ the orthorhombic phase transition in $REO_{1-x}F_xFeAs$ is also intimately connected to the suppression of magnetic order and the appearance of superconductivity.

TT 45.4 Fri 11:00 HSZ 03

Thermoelectric properties of undoped iron arsenides REOFeAs (RE = La, Ce, Pr, Sm, Gd) — •Agnieszka Kondrat[1], Jorge Enrique Hamann-Borrero[1], Norman Leps[1], Liran Wang[1], Martin Kosmala[2], Olaf Schumann[2], Jochen Werner[1], Guenter Behr[1], Markus Braden[2], Ruediger Klingeler[1], Hans-Henning Klauss[3], Hubertus Luetkens[4], Christian Hess[1], and Bernd Buechner[1] — [1]Leibniz Institute for Solid State and Materials Research Dresden, Germany — [2]II. Physikalisches Institut, Universitaet zu Koeln, Germany — [3]IFP, TU Dresden, Germany — [4]Laboratory for Muon Spin Spectroscopy, Paul Scherrer Institute, Villigen, Switzerland

Polycrystalline samples from the REOFeAs system were studied by means of electrical resistivity, thermal conductivity and thermoelectric power in temperature range 5-300K. All investigated compounds undergo a magnetic and a structural phase transition around 150K, which lead to profound anomalies in electrical, thermal and thermoelectric properties. We present the influence of substituting rare earth elements for La ion on the low temperature thermopower data. We discuss also the strong impact of magnetic field (B = 14T) on thermoelectric properties.

15 min. break

TT 45.5 Fri 11:30 HSZ 03

Probing the superconductive energy gap of the iron pnictide superconductor $Ba_{1-x}K_xFe_2As_2$ by point-contact and scanning tunnelling spectroscopy — •Gernot Goll[1], Michael Marz[1], Samuel Bouvron[1], Tihomir Tomanic[1], Veronika Fritsch[1], Hilbert v. Löhneysen[1,2], and Thomas Wolf[2] — [1]Physikalisches Institut, Universität Karlsruhe, 76128 Karlsruhe, Germany — [2]Institut für Festkörperphysik, Forschungszentrum Karlsruhe, 76021 Karlsruhe, Germany

The size of the superconductive energy gap and its directional dependence is one of the central issues of studies on the recently discovered iron pnictide superconductors. The knowledge of both properties is essential for the characterization and a closer understanding of the mechanism of superconductivity. We report on point-contact measurements on $(Ba,K)Fe_2As_2$/Pt point contacts. $(Ba,K)Fe_2As_2$ single crystals were prepared by the flux-growth technique with Sn flux. Superconductivity was probed by resistivity and magnetization measurements. A superconducting transition temperature $T_c^{50\%} = 26.5$ K was found resistively for $x = 0.28$. Andreev reflection of charge carriers at the superconductor/normal metal interface of $Ba_{0.72}K_{0.28}Fe_2As_2$/Pt point contacts was utilized to determine the energy gap for current flow parallel and perpendicular to the FeAs planes. In first measurements, with current flow within the plane, the diffential conductance versus voltage curves reveal a multi-gap nature of the superconductive order parameter with a small gap of about 3 meV and a larger one with 7-8 meV.

TT 45.6 Fri 11:45 HSZ 03

Magnetism, superconductivity, and pairing symmetry in Fe-based superconductors. — •Dmitri Efremov[1], Ilya Eremin[2], and Andrey Chubukov[3] — [1]TU Dresden — [2]MPIPKS Dresden — [3]Universtity of Wisconsin

We analyze antiferromagnetism and superconductivity in novel $Fe-$based superconductors within the itinerant model of small electron and hole pockets near $(0,0)$ and (π,π). We argue that the effective interactions in both channels logarithmically flow towards the same values at low energies, *i.e.*, antiferromagnetism and superconductivity must be treated on equal footings. The magnetic instability comes first for equal sizes of the two pockets, but looses to superconductivity upon doping. The superconducting gap has no nodes, but changes sign between the two Fermi surfaces (extended s-wave symmetry). We argue that the T dependencies of the spin susceptibility and NMR relaxation rate for such state are exponential only at very low T, and can be well fitted by power-laws over a wide T range below T_c.

TT 45.7 Fri 12:00 HSZ 03

Orbital and spin effects for the upper critical field in strongly disordered iron pnictide superconductors — •Guenter Fuchs[1], Stefan-Ludwig Drechsler[1], Nadezhda Kozlova[1], Konstantin Nenkov[1], Guenter Behr[1], Ernest Arushanov[1,2], Jens Freudenberger[1], Ruediger Klingeler[1], Anke Koehler[1], Bernd Buechner[1], and Ludwig Schultz[1] — [1]IFW-Dresden, P.O. Box 270116, D-01171 Dresden, Germany — [2]Inst. of Appl. Phys., Acad. Sci. Moldova, Chisinau, Moldova

We report upper critical field $B_{c2}(T)$ [1], resistivity, and Hall data for disordered (arsenic deficient) $LaO_{0.9}F_{0.1}FeAs_{1-\delta}$ in a wide temperature and field range up to 47 T. Due to the large linear initial slope of $B_{c2} \approx$ -5.4 to -6.6T/K near $T_c \approx 28.5$ K the T-dependence of the in-plane $B_{c2}(T)$ shows a clear flattening already near 23 K above 30 T which is intepreted as the onset of a Pauli-limited behavior with $B_{c2}(0) \approx 63$ to 68 T. Our results are discussed in terms of disorder effects within scenarios for conventional and unconventional superconductivity (SC). Proposed unconventional p- and d-wave scenarios of SC can be discarded for our samples. The enhancement of the upper critical field slope near T_c by strong disorder provides evidence for an important *attractive* intraband contribution to the pairing of Cooper pairs in the Fe pnictides. We compare our results with B_{c2}-data in the literature which show often no Pauli-limiting behavior. A novel disorder related scenario of a complex interplay of SC with two different competing magnetic instabilities is proposed.

[1] G. Fuchs, S.-L. Drechsler, N. Kozlova *et al.*, PRL **101** in press

TT 45.8 Fri 12:15 HSZ 03

Absorption spectroscopy of rare earth oxypnictides — •Friedrich Roth[1], Thomas Kroll[1], Andreas Koitzsch[1], Roberto Kraus[1], Günter Behr[1], Guoli Sun[2], Dunlu Sun[2], Chengtian Lin[2], Bernd Büchner[1], and Martin Knupfer[1] — [1]Institute for Solid State Research, IFW-Dresden, P.O. Box 270116, D-01171 Dresden, Germany — [2]Max-Planck-Institute for Solid State Research, Heisenbergstraße 1, D-70569 Stuttgart, Germany

A large oxypnictides family LnFeAsO (Ln= La, Ce, Pr, Nd, Sm, Gd) has been found to be superconducting with a transition temperature up to 55K and high upper critical fields. The onset of the superconducting critical temperature T_c in these compounds increases with the reduction of the rare-earth ionic size, and the highest T_c obtained so far is 55K in doped SmFeAsO. In this contribution we present results of x-ray absorption (XAS) spectroscopy measurements on the soft X-ray regime for polycrystalline LaFeAsO, CeFeAsO, SmFeAsO and GdFeAsO at various temperature as well as for $Ba_{1-x}K_xFe_2As_2$ single crystals.