compared to the one of the bulk transition metals. Now we have focused on superconducting properties of lead particles of a well defined single grain size of 19 nm. As for Pd and Pt, these metal nanoclusters have been deposited on a biological template, a purified self-assembling paracrystalline surface layer (S-layer) of Bacillus sphaericus JG-A12 which is composed of identical protein monomers. After a determination of their grain size using x-ray powder diffraction, we have investigated their superconducting B-T phase diagram by means of SQUID magnetometry. The Pb clusters reveal a superconducting critical field of the size of several Tesla which is strongly enhanced compared to the corresponding critical magnetic field of 0.09 T for bulk Pb.

TT 8.23 Mon 14:00 Poster A

Strong anisotropic superconducting behavior in the dichalcogenide $SnSe_2$ intercalated with cobaltocene — •Robert Miller[1], Sandra Altmannshofer[1], Ernst-Wilhelm Scheidt[1], Rudolf Herrmann[1], Franz Mayr[2], Dietrich Einzel[3], and Wolfgang Scherer[1] — [1]CPM, Institut für Physik, Universität Augsburg, 86135 Augsburg, Germany — [2]EP V – EKM, Institut für Physik, Universität Augsburg, 86135 Augsburg, Germany — [3]Walther-Meissner-Institut für Tieftemperaturforschung, 85748 Garching, Germany

We present a detailed study of the layered dichalcogenide $SnSe_2$ intercalated with the organometallic donor molecule cobaltocene, which exhibits a superconducting transition at $T_c = 6\,K$. The extremely anisotropic superconducting behavior is reflected by an in-plane and off-plane resistivity, which deviate from each other by a factor of 200 just before superconductivity sets in. Furthermore, this strong anisotropy leads to two different superconducting transition temperatures, one goes in line with the in-plane and the other with the off-plane superconductivity . In addition, specific heat studies clearly characterize the intercalated $SnSe_2$ as a bulk superconductor with these two different T_c's.

TT 8.24 Mon 14:00 Poster A

Superconducting transport properties of Co-Pt/Nb/Co-Pt triple layers with perpendicular magnetic anisotropy — •Ajay Singh[1], Christoph Sürgers[1,2], and Hilbert v. Löhneysen[1,2,3] — [1]Physikalisches Institut, Universität Karlsruhe, D-76128 Karlsruhe — [2]Center for Functional Nanostructures, Universität Karlsruhe, D-76128 Karlsruhe — [3]Forschungszentrum Karlsruhe, Institut für Festkörperphysik, D-76021 Karlsruhe

In a superconducting spin switch the transition temperature T_c of a superconductor (S) sandwiched between two ferromagnets (F) depends on the relative orientation of the F layer magnetizations. We report on the superconducting transport properties of FSF triple layers, where F is a Co-Pt multilayer with perpendicular magnetic anisotropy and S is Nb. T_c is lower for the antiparallel (AP) compared to the parallel (P) state. This is explained by the enhanced reflection of spin-polarized charge carriers into the S layer for the AP state. T_c is independent of the magnetization orientation if an insulating barrier is introduced between F and S at each of the two interfaces. We also provide additional data in order to prove that the T_c difference is likely to be related to the proximity effect and not due to residual magnetic stray fields of the F layers.

TT 8.25 Mon 14:00 Poster A

Electronic Transport in Superconductor-Ferromagnet-Heterostructures — •Dagmar Rall[1], Jakob Brauer[1], Detlef Beckmann[1], and Hilbert v. Löhneysen[2,3] — [1]Forschungszentrum Karlsruhe, Institut für Nanotechnologie — [2]Forschungszentrum Karlsruhe, Institut für Festkörperphysik — [3]Physikalisches Institut, Universität Karlsruhe

Electronic transport in nanoscale superconductor-ferromagnet (SF) contacts at very low temperature is studied in order to identify nonlocal Andreev bound states. The samples consist of two parallel ferromagnetic film strips between superconducting leads. The strips are magnetized to exhibit a magnetic field which discourages direct Andreev reflection at the respective SF - interfaces. However, if the magnatization is antiparallel and the distances sufficiently small, the setup allows for a non-local reflection of the electrons in one strip to holes in the other strips and vice versa. This way, a bound state may form, giving rise to a Josephson current across the junction.

TT 8.26 Mon 14:00 Poster A

Nonlocal transport in superconductor/normal metal heterostructures — •Jakob Brauer[1], Detlef Beckmann[1], and Hilbert v. Löhneysen[2,3] — [1]Forschungszentrum Karlsruhe, INT — [2]Forschungszentrum Karlsruhe, IFP — [3]Physikalisches Institut, Universität Karlsruhe

Injection of electrons from a normal metal into a superconductor with electron energies below the superconducting gap Δ (measured from the Fermi energy) is only possible by means of Andreev reflection, where an incident electron gets reflected as a hole with opposite spin at the NS interface.

If multiple interfaces are present nonlocal (or crossed) Andreev reflection (CAR) and electron cotunneling (EC) can occur. For an electron injected at an interface A, CAR leads to an emitted hole at a different interface B. On the other hand electron cotunneling yields an emitted electron at B.

To observe these effects we examine samples created by e-beam lithography and shadow evaporation technique. These consist of multiple NS (copper/aluminium) tunnel junctions with spatial seperation of injector and detector contacts of around 150 nm. We present experimental data on local and nonlocal electronic transport measurements.

TT 8.27 Mon 14:00 Poster A

Enhanced stray field compensation in Nb/FePt bilayers — •Silvia Haindl, Martin Weisheit, Sebastian Fähler, Ludwig Schultz, and Bernhard Holzapfel — Institute for Metallic Materials, IFW, Postfach 27 01 16, 01171 Dresden, Germany

Epitaxial Nb/FePt thin film bilayers were prepared by pulsed laser deposition under UHV conditions. FePt is a highly coercive ferromagnet and therefore shows no switching in the field range of the superconducting phase at low temperatures. With the magnetic moments of the FePt grains aligned perpendicular to the film plane, the stray field between the individual grains acts already on the superconductor in the field-free case. Under application of a magnetic field, the stray field can be compensated, accompanied by an observable increase of the transition temperature. Using hard magnetic materials an enhanced effect of stray field compensation was observed when 0.25 T of applied field raises T_C about 0.5 K. The B(T)-phase diagram of the heterostructures was investigated, and its behavior was controlled by varying the FePt layer thickness.

TT 8.28 Mon 14:00 Poster A

Odd Triplet Superconductivity in Superconductor/Ferromagnet Structure with a Spiral Magnetic Structure — •Alexandra Anishchanka — Querenburger Hoehe, 97, Bochum, 44801, Deutschland

We analyze a superconductor-ferromagnet (S/F) system with a spiral magnetic structure in the ferromagnet F for a weak and strong exchange field. The long-range triplet component (LRTC) penetrating into the ferromagnet over a long distance is calculated for both cases. In the dirty limit (or weak ferromagnetism) we study the LRTC for conical ferromagnets. Its spatial dependence undergoes a qualitative change as a function of the cone angle ϑ. At small angles ϑ the LRTC decays in the ferromagnet exponentially in a monotonic way. If the angle ϑ exceeds a certain value, the exponential decay of the LRTC is accompanied by oscillations with a period that depends on ϑ. This oscillatory behavior leads to a similar dependence of the Josephson critical current in SFS junctions on the thickness of the F layer. In the case of a strong ferromagnet the LRTC decays over the length which is determined by the wave vector of the magnetic spiral and by the exchange field.

TT 8.29 Mon 14:00 Poster A

A quest for the optimal design of π-coupled Josephson junctions — •Dirk Sprungmann, Kurt Westerholt, and Hartmut Zabel — Institut für Experimentalphysik/Festkörperphysik, Ruhr-Universität Bochum, 44780 Bochum

In recent years investigations of so called π-coupled Josephson junctions became very popular. In an ordinary currentless SIS or SNS junction the pair wave functions on both sides of the tunnel barrier have a phase shift of zero. By introducing a thin ferromagnetic layer with a certain thickness d_{Fc} between the two superconductors it is possible, to obtain a phase shift of π between the two superconducting layers in the ground state. This causes a sign change of the critical Josephson current I_c and leads to a crossover within the $I_c(d_F)$-curve. To establish a solid basis to analyse these electronic components systematically, we first tried to find an optimal design of the junction. In order to avoid any breaking of the vacuum and to keep all the interfaces in the junction clean, we checked two in-situ preparation procedures, in which only shadow masks and dry-etching processes are applied. We