coupling.

TT 15.43 Tue 14:00 Poster B

Effect of a dc magnetic field on the microwave losses in MgB_2 thin films — •Roland Hott[1], Alexander G. Zaitsev[1], Rudolf Schneider[1], Thorsten Schwarz[2], and Jochen Geerk[1] — [1]Forschungszentrum Karlsruhe, Institut für Festkörperphysik, P.O. Box 3640, D-76021 Karlsruhe, Germany — [2]Forschungszentrum Karlsruhe, Institut für Synchrotronstrahlung, P.O. Box 3640, D-76021 Karlsruhe, Germany

The microwave surface impedance ($Z_s = R_s + iX_s$) of in situ MgB_2 thin films was measured as a function of temperature and parallel dc magnetic field at several frequencies between 5.7 and 18.5 GHz using a dielectric resonator technique. The results are consistent with the expectations for a classical type-II superconductor and, consequently, quite different from those of the high-T_c cuprates. The films cooled in zero field revealed a clear indication of the lower critical field B_{c1}, with a small hysteresis around $B \leq B_{c1}$. In higher fields ($B > B_{c1}$), the losses followed the Coffey-Clem and Brandt model, including the frequency dependences, whereas high-T_c Y-Ba-Cu-O films did not show a reasonable agreement with this model. Both the relatively high values of $\Delta X_s/\Delta R_s$ ratio and their frequency dependence indicate a weak effect of flux creep on the measured microwave loss in MgB_2 films. The temperature dependence of $\Delta X_s/\Delta R_s$ ratio can be described by a microscopic pinning model for BCS superconductors.

TT 15.44 Tue 14:00 Poster B

Static and time-resolved vortex dynamics in a-$Nb_{0.7}Ge_{0.3}$ — •Florian Otto[1], Martin Frisch[1], Ante Bilušić[1], Dinko Babić[2], Christoph Sürgers[3], and Christoph Strunk[1] — [1]Inst. for Exp. and Appl. Physics, Univ. Regensburg, Germany — [2]Dept. Physics, Univ. Zagreb, Croatia — [3]Phys. Inst. and DFG Center for Funct. Nanostr. (CFN), Univ. Karlsruhe, Germany

We investigate the motion of vortices in amorphous $Nb_{0.7}Ge_{0.3}$. Because of the very low pinning in this high-κ type-II superconductor, we are able to measure local and non-local transport in the flux-flow regime over large parts of the B-T-phase diagram [1]. Interestingly, there is a finite non-local response close to T_c, even when the applied magnetic field is zero. This points towards the presence of spontaneously formed vortex-antivortex pairs above the Berezinskii-Kosterlitz-Thouless transition. In addition, we report first non-local transport measurements in the time domain, using a boxcar averaging technique.

[1] A.Helzel et al., Phys. Rev. B **74**, 220510 (R) (2006)

TT 15.45 Tue 14:00 Poster B

Unexpected temperature-dependence of the critical current in NbN-microbridges — •Andreas Engel[1], Holger Bartolf[1], Luis Gomez[1], Andreas Schilling[1], Konstantin Il'in[2], Michael Siegel[2], Alexei Semenov[3], and Heinz-Wilhelm Hübers[3] — [1]Physics Institute, University of Zürich, Winterthurerstr. 190, CH-8057 Zürich — [2]Institute of Micro- and Nano-Electronic Systems, University of Karlsruhe, Hertzstr. 16, 76187 Karlsruhe — [3]DLR e.V. Institute of Planetary Research, Rutherfordstr. 2, 12489 Berlin

Superconducting micro- and nanostructures made from NbN ultrathin films are key elements of THz hot-electron bolometer mixers and single-photon detectors for the visible and near-infrared. Their detection mechanisms require operation with a biasing current close to but below the device's critical current I_c at temperatures well below their critical temperature. We studied the temperature-dependence $I_c(T)$ of up to 10 nm thick NbN bridges with widths between 100 nm and 10 μm. The temperature-dependence of the critical-current density j_c of sub-micrometer wide bridges is well described by the de-pairing j_c. They remain free of magnetic vortices due to a geometrically enhanced Bean-Livingston barrier. Micrometer-wide bridges show a cross-over from de-pairing to de-pinning j_c with decreasing temperature. Moreover, at low temperatures, when I_c is determined by the de-pinning of magnetic vortices due to the self-field of the applied current or small external magnetic fields, $I_c(T)$ may exhibit non-monotonic behavior, *i.e.* reduced I_c at lower temperature. We present experimental data of these unexpected features and discuss their possible reasons.

TT 15.46 Tue 14:00 Poster B

Flux dynamics in HT-superconductor thin films influenced by a surface acoustic wave — •Munise Rakel[1], Arno Wirsig[1], Carsten Hucho[1], and Joachim Albrecht[2] — [1]Paul-Drude-Institut, 10117 Berlin, Germany — [2]Max-Planck-Institut für Metallforschung, 70569 Stuttgart, Germany

We report on magneto-optic investigations of the influence of a traveling strain wave on the magnetic flux density distribution in a type-II superconductor. The investigations are performed on a thin film of YBCO on a piezoelectric substrate using a custom-made magneto-optical microscope. The strain wave is generated by interdigital transducers on the piezoelectric substrate. An external magnetic field applied perpendicular to the surface enters the polycrystalline superconductor depending on the pinning properties. Strain-wave induced pinning-changes or SAW-induced depinning is reported to result in changes in the flux dynamics. We analyze magneto-optic greyscale images of films with dynamically altered pin-state to yield information on the influence of the combined dynamic strain- and electric field on the pinning behavior of the superconducting film.

TT 15.47 Tue 14:00 Poster B

Reconstruction of the electric field distributions for flux dynamics studies in superconducting thin films — •Carolina Romero-Salazar[1], Omar Augusto-Flores[2], and Christian Jooss[1] — [1]Institut fuer Materialphysik, Friedrich Hund Platz 1, 37077 Goettingen, Germany — [2]Instituto de Fisica, Universidad Autonoma de Puebla, Apdo. Post. J-48, Puebla, Mexico

It is well known that in type-II superconductors there are electric fields due to vortex motion. The space-resolved study allows for insights into the mechanism of vortex dynamics and the occurrence of local losses. This is an important and challenging problem for the development of high-current carrying applications with low electromagnetic losses. The electric field in high- T_c superconducting films is reconstructed employing magneto-optical imaging of the magnetic induction $B_z(r)$ distributions. We developed a consistent method to calculate both dynamic and static contributions of the electric field, for a thin film in the so called perpendicular geometry. We investigate the contrasts between our technique, which employs magnetic relaxation measurements, and the theoretical scheme which requires an effective material law, $E = \rho J$, obtained from current transport experiments. Understanding the vortex dynamics in homogeneous superconducting films, provides a necessary background to study materials with complicate structures as patterned holes or inhomogeneous pinning.

TT 15.48 Tue 14:00 Poster B

Nernst effect of Ni-doped $NdBa_2Cu_3O_{7-\delta}$ — •Niko Johannsen[1], Thomas Wolf[2], Alexander V. Sologubenko[1], Thomas Lorenz[1], Axel Freimuth[1], and John A. Mydosh[1] — [1]II. Physikalisches Institut, University of Cologne, Germany — [2]Forschungszentrum Karlsruhe, Germany

The mechanism of high-temperature superconductivity is still unsolved. Possible relations to other phenomena such as the pseudogap may play a key role towards an understanding of this mechanism. Using the Nernst effect, we are able to detect vortex-like excitations very sensitively. In $NdBa_2\{Cu_{1-y}Ni_y\}_3O_{7-\delta}$, magnetic Ni-impurities suppress T_c and at the same time enhance the pseudogap. So, this is an ideal system to study possible relations between the pseudogap and superconductivity via the Nernst effect. We present measurements on a series of optimally doped (O_7) and two underdoped ($O_{6.8}$, $O_{6.9}$) samples with Ni contents ranging from y=0 to 0.12. For the optimally doped samples, the onset temperature of the anomalous Nernst signal (T^ν) decreases with increasing Ni content as does T_c. The underdoped ($O_{6.8}$) samples show a slightly different behavior. T^ν is not affected by an increase of the Ni content. The slope of T^ν of the intermediate doping level ($O_{6.9}$) lies between the aforementioned two. None of the detected anomalous vortex Nernst signals shows a relation to the enhanced pseudogap in this system.

TT 15.49 Tue 14:00 Poster B

Proximity Effect in Nb/Au and NbN/Au bi-layers for THz Antenna Structures of HEB Mixers — •Axel Stockhausen[1], Konstantin Il'in[1], Michael Siegel[1], Alexei Semenov[2], Heinz-Wilhelm Hübers[2], Reinhard Schneider[3], and Dagmar Gerthsen[3] — [1]IMS, University of Karlsruhe, Karlsruhe, Germany — [2]DLR e.V. Institute of Planetary Research, Berlin, Germany — [3]LEM, University of Karlsruhe, Karlsruhe, Germany

Hot-electron Bolometer (HEB) mixers are high sensitive heterodyne detectors made from ultra-thin (< 5 nm) NbN film deposited on Si substrate. For proper operation of these devices in THz frequency range a superconducting detecting element is embedded into antenna