erreichen, wurde bislang hauptsächlich versucht, die Grösse der beim Wachstumsprozess entstehenden Y_2BaCuO_5-Partikel zu verringern. Diese sind jedoch bislang für effektive Pinningzentren zu gross und ausserdem nicht ideal verteilt. Mit Hilfe der Nanotechnologie besteht jedoch die Möglichkeit, gezielt nicht-reaktive Nanopartikel in die HTSL-Proben einzubringen. Kürzlich gelang es, YBCO-Proben mit $Y_2Ba_4CuMO_x$-Partikeln (M = Zr, Nb) herzustellen, in denen die Nanopartikel Grössen zwischen 10 und 50 nm aufweisen. Mit Hilfe von AFM-Messungen untersuchen wir die Verteilung dieser Partikel und deren Grössenverteilung, und die Wechselwirkung zwischen diesen Partikeln und der umgebenden supraleitenden Matrix. Ausserdem wurden die lokalen Stromdichten mit Hilfe magneto-optischer Untersuchungen bestimmt.

Diese Arbeit wird unterstützt durch EFFORT und DAAD-PPP.

TT 36.6 Mi 11:15 TU H2053

Artificial modulation and anisotropy of flux pinning force in R123 composite films — •Chuanbing Cai, Jens Haenisch, Thomas Gemming, and Bernhard Holzapfel — IFW Dresden, D-01171 Dresden, Germany

Artificial flux pinning centers in R123 films has emerged much significant for both fundamental understanding and practical applications (especially for coated conductors). Using PLD technique, we prepared two types of composite films: i) superlattices consisting of three R123: $n\times$(Gd123$_d$/Nd123$_d$/Eu123$_d$), and ii) multilayer of $R123/Y_2O_3$: $n\times$(Y123$_{d1}$/YO$_{d2}$). They possess the potential of artificial flux pinning centers due to expitaxial strain fields and second phase additions, respectively. We show the tailorable flux pinning forces and their anisotropy by angular dependences of the transport critical current density. It is revealed that the strongest modulation of flux pinning takes place at field direction parallel to c while it is hardly variable at field direction perpendicular to c.

Pause

TT 36.7 Mi 11:45 TU H2053

Nanostrukturierte Flußhaftzentren in Hoch-T_c Supraleitern — •M. Winter[1], M. R. Koblischka[1], A. Hu[2], M. Muralidhar[2], U. Hartmann[1] und M. Murakami[3] — [1]FR Experimentalphysik, Universität des Saarlandes, Postfach 151150, D-66041 Saarbrücken — [2]SRL/ISTEC, 1-10-13 Shinonome, Koto-ku, Tokyo 135-0062, Japan — [3]Department of Materials Science and Engineering, Shibaura Institute of Technology, Shibaura 3-9-14, Minato-ku, Tokyo 108-8548, Japan

Die ideale Größe für Haftzentren in Supraleitern liegt bei der doppelten Kohärenzlänge, z.B. 4,5 nm in der ab-Ebene von $YBa_2Cu_3O_x$ (YBCO). Nichtleitende Einschlüsse, wie (SE)211-Partikel (Y_2BaCuO_5) mit typischen Größen von einigen hundert Nanometern bis hin zu Mikrometern wirken nur bei niedrigen Magnetfeldern als effektive Flußhaftzentren. Um hohe kritische Stromstärken auch bei hohen Feldern zu erreichen, müssen nanometergroße, nicht-supraleitende Strukturen innerhalb des gesamten Volumens des Supraleiters vorhanden sein. Wir haben schmelztexturierte $(Nd_{0.33}Eu_{0.28}Gd_{0.38})Ba_2Cu_3O_x$-, $(Nd_{0.33}Eu_{0.38}Gd_{0.28})Ba_2Cu_3O_x$- (NEG), $(Sm_{0.33}Eu_{0.33}Gd_{0.33})Ba_2Cu_3O_x$- (SEG) und $SmBa_2Cu_3O_x$- (SmBCO) Proben mit Rasterkraft- und Rastertunnel-Mikroskopie an Luft untersucht. Im Vergleich zu YBCO-Kristallen zeigen die SEG und NEG-Kristalle regelmäßige Streifen- und Kreuzstrukturen, etwa eine Größenordnung größer als die Kohärenzlänge. Es handelt sich dabei um periodische Variationen der chemischen Zusammensetzung, die zu örtlich unterschiedlichen supraleitenden Eigenschaften führt, so daß gewisse Phasen bei hohen Strömen oder hohen Feldern normalleitend werden und als Flußhaftzentren wirken können.

TT 36.8 Mi 12:00 TU H2053

Charge density distributions induced by flux creep in superconducting YBCO films — •Volker Born and Christian Jooss — Institut für Materialphysik, Friedrich-Hund-Platz 1, 37077 Göttingen

A moving vortex in a superconductor represents an electric dipol where the induced charge is distributed over its spatial magnetic extension. On mesoscopic length scales of $\approx 1\mu$m (averaging over the spatial structure of individuals vortices) all dipols cancel, if ensembles of vortices move homogeneously. However, a mesoscopic charge density distribution arises if gradients of the vortex velocity perpendicular to their direction of motion exist. An excellent tool to study these charge densities is time and space resolved magneto-optics with spatial resolutions down to $\approx 1\mu$m. Here, we report on charge densities being induced into superconducting $YBa_2Cu_3O_7$ thin films by thermally activated flux creep in constant external magnetic fields. We discuss briefly our method how to obtain the total electric field, the polarisation distribution and the charge density distribution. The main focus is directed to the vortex motion at current domain boundaries, grain boundaries and circular defects which builds up complex patterns of charge density distributions.

TT 36.9 Mi 12:15 TU H2053

Investigation of the $j_c(T)$-behavior to answer the question of pinning in $YBa_2Cu_3O_{7-\delta}$ thin-films — •Sebastian Brück[1] and Joachim Albrecht[1,2] — [1]Max-Planck-Institut für Metallforschung, Heisenbergstrasse 3, D-70569 Stuttgart, Germany — [2]Max-Planck-Institut für Festkörperforschung, Heisenbergstrasse 1, D-70569 Stuttgart, Germany

Thin films of the high-temperature superconductor $YBa_2Cu_3O_{7-\delta}$ (YBCO) grown on $SrTiO_3$ (STO) substrates which partly experience a moderate nanostructuring of the surface, show an imposing increase of the critical current density where the surface is treated. The magneto-optical imaging technique joint by a numerical inversion scheme is used to obtain the current density distribution in such films with high spatial resolution enabling one to directly compare j_c in different parts of the sample. It will be shown that a detailed investigation of the temperature behavior of j_c, taking into account the distinctions between untreated and structured part, can provide deeper insights into the actual pinning scenario. By comparing the experimental results with theoretical models, evidence is found for the important role of intergranular low-angle grain boundaries for the increase of j_c as well as for the pinning scenario in general.

TT 36.10 Mi 12:30 TU H2053

Origin of the Resistive Transitions Broadening in Superconducting MgB2 Films — •A. S. Sidorenko[1,2,3], V. I. Zdravkov[2,3], E. Nold[4], Th. Koch[5], Th. Schimmel[1,5], S. Horn[2], C. Müller[2], A. Wixforth[2], and R. Tidecks[2] — [1]Institute of Applied Physics, Universität Karlsruhe, D-76128 Karlsruhe — [2]Institut für Physik, Universität Augsburg, D-86159 Augsburg — [3]Institute of Applied Physics, MD-2028 Kishinev, Moldova — [4]Institute of Materials Research I, Forschungszentrum Karlsruhe, D-76021 Karlsruhe — [5]Institute of Nanotechnology, Forschungszentrum Karlsruhe, D-76021 Karlsruhe

The discovery of superconductivity in MgB2, the material with hexagonal layered crystal structure, raised questions about its transport properties. The crystal structure of MgB2 and the band structure calculations suggest that the quasi-two-dimensional (2D) boron planes are mainly responsible for the charge transport. Therefore the superconducting properties of MgB2 are expected to reflect this 2D character. On the other hand, the layered structure should also influence the magnetic flux penetration and flux motion in the presence of an external magnetic field. In particular, thermally activated vortex creep processes (TAFF) play a crucial role in the resistive transitions broadening for MgB2 as well as for artificial multilayered systems. In the present work we report about experimental studies of the origin of resistive transitions broadening for MgB2 thin films.

TT 36.11 Mi 12:45 TU H2053

Flux-lattice melting in two-dimensional disordered superconductors — •Thomas Nattermann[1] und Li Mai Suan[2] — [1]Institut für Theoretische Physik der Universität zu Köln, Zülpicher Str. 77, 50937 Köln — [2]Institute of Physics, Polish Academy of Sciences,

The flux line lattice melting transition in two-dimensional pure and disordered superconductors is studied by a Monte Carlo simulation using the lowest Landau level approximation and quasi-periodic boundary condition on a plane. The position of the melting line was determined from the diffraction pattern of the superconducting order parameter. In the clean case we confirmed the results from earlier studies which show the existence of a quasi-long range ordered vortex lattice at low temperatures. Adding frozen disorder to the system the melting transition line is shifted to slightly lower fields. The correlations of the order parameter for translational long range order of the vortex positions seem to decay slightly faster than a power law (in agreement with the theory of Carpentier and Le Doussal) although a simple power law decay cannot be excluded. The corresponding positional glass correlation function decays as a power law establishing the existence of a quasi-long range ordered positional glass formed by the vortices. The correlation function characterizing a phase coherent vortex glass decays however exponentially ruling out the possible existence of a phase coherent vortex glass phase.