HIGH T_C UPDATE

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NOTA BENE:

Pairing Symmetry in Electron-Doped Cuprates

The experimental evidence for d-wave pairing symmetry in the hole-doped cuprate superconductors is by now overwhelming. On the other hand, the existing data for the electron-doped superconductors have been interpreted as being consistent with s-wave pairing. Three preprints listed in this issue, however, now tell a different story. All three papers present strong experimental evidence in support of d-wave pairing symmetry for two of the electron-doped superconductors, *$Nd_{2-x}Ce_xCuO_{4-\delta}$ (NCCO)* and *$Pr_{2-x}Ce_xCuO_{4-\delta}$ (PCCO).*

Microwave-cavity-perturbation measurements of the temperature dependence of the penetration depth $\lambda(T)$ and conductivity $\sigma(T)$ of *PCCO* and *NCCO* crystals as well as parallel-plate-resonator measurements of $\lambda(T)$ in *PCCO* thin films have been carried out by J. D. Kokales et al. (Maryland). The authors found that $\lambda(T)$ has a power-law behavior for $T < T_c/3$, indicating the presence of line nodes in the superconducting gap and suggesting d-wave pairing symmetry. The authors also explain how paramagnetism due to rare-earth ions could have corrupted earlier data and led to an erroneous interpretation in terms of s-wave pairing. The authors also measured the real part of the conductivity and found it to be similar to that in the hole-doped cuprates.

A preprint by R. Prozorov (Illinois, Urbana-Champaign) et al. reports measurements of the in-plane magnetic penetration depth $\lambda(T)$ in single crystals of *PCCO* and *NCCO* using a tunnel-diode rf resonator. The authors found that in *PCCO,* $\lambda(T)$ exhibits a power-law variation from $T/T_c = 0.025$ up to 0.5. In *NCCO,* however, $\lambda(T)$ was found to be nonmonotonic, with a minimum at ~4 K and a pronounced upturn at lower temperatures due to the paramagnetic contribution of Nd^{3+} ions. These experiments also imply the presence of line nodes in the superconducting order parameter of electron-doped superconducting cuprates.

Phase-sensitive evidence that the electron-doped cuprates *NCCO* and *PCCO* have d-wave pairing symmetry has been found by C. C. Tsuei and J. R. Kirtley (IBM Yorktown). Using a scanning SQUID microscope, the authors observed a half flux quantum $\phi_0/2 = hc/4e$ in c-axis-oriented films of *NCCO* and *PCCO* epitaxially grown on tricrystal [100] *$SrTiO_3$* substrates designed to be frustrated for a $d_{x^2-y^2}$ order parameter. Deposition of the superconducting film on the substrate produces three grain boundaries extending outward from the tricrystal point. The frustrated configuration produces either three π-junctions or one π-junction and two 0-junctions. In either case, spontaneous Josephson currents across the grain boundaries always generate half flux quanta of magnitude $\phi_0/2$ (but of either sign), which are pinned to the tricrystal point by symmetry. The authors found that samples with two other configurations, designed to be unfrustrated for a d-wave superconductor, did not show the half-flux-quantum effect. The results show that both *NCCO* and *PCCO* have d-wave pairing symmetry.

$RBa_2Cu_3O_{7-\delta}$

Remarkably high trapped magnetic fields have been achieved by G. Fuchs et al. (IFW-Dresden) in zinc-doped, bulk melt-textured *$YBa_2Cu_3O_{7-\delta}$ (YBCO)* showing a pronounced peak effect in the field dependence of the critical current density. Trapped fields up to 1.1 T were found at 77 K at the surface of a *YBCO* disk (diameter 26 mm and height 12 mm). Very high trapped fields up to 14.35 T were achieved at 22.5 K in the gap between a *YBCO* disk pair (diameter 26 mm and height 24 mm) containing silver additions and fitted with girdles of stainless steel. The *YBCO* cracked when an attempt was made to trap a higher magnetic field at a lower temperature.

As reported by E. Mendoza et al. (Barcelona), a strong increase of the critical current density of *YBCO* melt-textured composites has been observed by adding *Ag_2O*

particles to the precursor mixture while the concentration of Y_2BaCuO_5 *(Y-211)* precipitates remained constant. Critical current density enhancements as high as 200% at 5 K [J_c^{ab}(5 K, 0 T) ~ 2.5×10^6 A/cm^2] and 1000% at 77 K and 2 T [J_c^{ab}(77 K, 2 T) ~ 2.2×10^4 A/cm^2 for **H** || c] were reached in samples with 20 wt% of Ag_2O. Critical current measurements at 77 K for **H** || ab also revealed J_c enhancements by 100% at 0 T and 140% at 2 T. Using scanning electron microscopy, the authors found that the improvement of the critical currents in the *YBCO-Ag* melt-textured composites is correlated with the reduction in the density of microcracks parallel to the ab plane.

Large-area high-resolution transmission electron microscopy (LA-HRTEM), which can image lattice defects over an area as wide as 20 μm × 20 μm, has been used by H. Suematsu (Tokyo Tech) et al. to investigate twin boundaries and their spacing d_{tw} in melt-grown *YBCO* exhibiting the peak effect. The authors found the strongest peak effect in samples with the shortest d_{tw}, and they found that a sample with the shortest d_{tw} had the widest oxygen-depleted regions near the twin boundaries. The authors thus suggest that the peak effect in melt-grown *YBCO* may be due to twin-boundary-induced oxygen modulation.

Measurements of critical current densities and trapped fields in melt-grown $(Nd,Eu,Gd)Ba_2Cu_3O_{7-\delta}$ *(NEG-123)* containing sub-micron $(Nd,Eu,Gd)_2BaCuO_5$ *(NEG-211)* particles are reported in two preprints by M. Muralidhar et al. (SRL-ISTEC). The authors found that an *NEG-123* sample containing 10 mol% *NEG-211* with additions of both CeO_2 and *Pt* exhibited an enhanced fishtail effect with a critical current density J_c(77 K, 3 T) = 7.4×10^4 A/cm^2 for **H** || c.

A preprint by C.-J. Kim (KAERI) et al. reports an investigation of the melting and resolidification of $Sm_{1.8}Ba_{2.4}Cu_{3.4}O_x$ in the *Ba-Cu-O* melt. The experiments were carried out to explain why $SmBa_2Cu_3O_{7-\delta}$ *(Sm-123)* seeds used for top-seeded melt growth of *Y-123* have been observed to melt during processing even at temperatures below the melting point of *Sm-123*.

Bi Cuprates

The influence of neutron irradiation on the superconducting properties of $Bi_2Sr_2Ca_2Cu_3O_{10+\delta}$ *(Bi-2223)* tapes containing different amounts of ^{235}U has been studied by S. Tönies (TU-Vienna) et al. Irradiation by thermal neutrons causes fission of uranium nuclei into two fission fragments, which create fission tracks (columnar defects) in the sample, whereas irradiation by fast neutrons produces spherical cascade defects. The authors found that thermal neutron irradiation enhances the critical current densities at higher fields, reduces the J_c anisotropy, and shifts the irreversibility line to higher fields.

Intrinsic tunneling measurements on a series of $Bi_2Sr_2CaCu_2O_{8+\delta}$ *(Bi-2212)* single crystals near optimal doping have been carried out by P. Müller (Erlangen) et al. For slightly overdoped samples, the authors found that the superconducting gap remains finite at T_c and that it continuously evolves into the pseudogap structure. The same behavior was observed in external magnetic fields above H_{c2}. For optimally or slightly underdoped samples, however, the authors found that the superconducting gap closes completely at T_c and coexists with the pseudogap below T_c. The results suggest that the superconducting gap and the pseudogap have different origins.

Sr_2RuO_4

The diffracted neutron scattering intensities from the square magnetic flux lattice in the perovskite superconductor Sr_2RuO_4, which is thought to exhibit p-wave pairing with a two-component order parameter, have been measured by P. G. Kealey (Birmingham) et al. The relative intensities of the different flux-lattice Bragg reflections over a wide range of field and temperature are inconsistent with a single-component Ginzburg-Landau theory, but they qualitatively agree with a two-component p-wave Ginzburg-Landau theory.

A preprint by K. Halterman and O. T. Valls (Minnesota) considers the Maxwell-London electrodynamics of three-dimensional superconductors in p-wave pairing states with nodal points or lines in the energy gap. The authors find that the current-velocity relation is then nonlinear in the applied field: cubic for point nodes and quadratic for lines. The authors obtain explicit angular and depth-dependent expressions for measurable quantities such as the transverse magnetic moment and the associated torque. The dependencies are different for point and line nodes and thus can be used to distinguish between different order parameters.

Other Cuprates

Muon spin relaxation (μSR) and low-field ac susceptibility measurements in a series of high-quality samples of $La_{2-x}Sr_xCuO_4$ (x = 0.08-0.24) as a function of temperature have been carried out by C. Panagopoulos (IRC-Cambridge) et al. The authors found that superconductivity coexists with low-temperature spin-glass order up to the optimally doped region where the normal-state pseudogap also closes. The systematic depletion of the superfluid density with underdoping, while antiferromagnetic correlations are increasing, indicates competition, rather than cooperation, between antiferromagnetic correlations and superconductivity.

As reported by F. Cordero (Roma) et al., an increase of the acoustic absorption upon cooling has been found in $La_{2-x}Sr_xCuO_4$ (x = 0.019, 0.03, and 0.06) close to the

temperatures at which freezing of the spin fluctuations in antiferromagnetically correlated clusters is expected to occur. The authors attribute the acoustic absorption to changes in the sizes of the quasi-frozen clusters induced by the vibration stress through magnetoelastic coupling.

Polycrystalline samples of the electron-doped high-T_c superconductor $Pr_{1.85}Ce_{0.15}CuO_{4-y}$ have been prepared by A. Conceição et al. (São Paulo) using different starting materials: (a) a mixture of simple oxides Pr_6O_{11}, CeO_2, and CuO, (b) a mixture of the oxides Pr_6O_{11} and CuO, and an intermediate compound $PrCeO_2$, and (c) a sol-gel precursor. Structural, transport, and magnetic measurements revealed that complete diffusion of *Ce* into Pr_2CuO_{4-y} occurred only in samples prepared using a sol-gel precursor.

A study of the influence of oxygen nonstoichiometry and hole distribution upon the irreversibility line $H_{irr}(T)$ in multilayered copper oxides has been carried out by M. Karppinen (Tokyo Tech and Helsinki University of Technology) et al. The authors conclude that the enhancement of the H_{irr} characteristics with increasing oxygen content is due not to the increase in the oxygen content itself nor to the resulting shrinkage of the nonsuperconductive blocking blocks, but instead is attributable to the hole concentrations in both the superconductive and nonsuperconductive blocks of the multilayered structure. The authors suggest that structures with a more homogeneous hole distribution along the stacking direction show higher irreversibility lines (H_{irr} vs T/T_c), even though such a hole distribution works against optimizing T_c.

Nearly single-phase superconducting $(Tl_{1-x}Hg_x)_2Sr_2Ca_2Cu_3O_y$ samples have been prepared by E. Kandyel et al. (SRL-ISTEC) using high pressures. As-prepared samples with x = 0.35 and 0.65 and nominally optimal oxygen contents were found to be overdoped, showing T_c = 103 K and 80 K, respectively. Reducing treatments in Ar/H_2 were found to increase T_c up to 116 K and 118 K, respectively, in the two compounds.

Films

A two-layer process for depositing biaxially textured *Tl*-based cuprates via electrodeposition (ED) on *Ag*-coated, single-crystal substrates is reported in a preprint by R. N. Bhattacharya (NREL) et al. Pole-figure measurements of two-layer, electrodeposited *(Tl,Bi)-(Sr,Ba)-Ca-Cu-O [(Tl,Bi)-1223]* films on 300 Å $Ag/LaAlO_3$ showed strong biaxial texturing. The omega and phi scans of 1.6 μm $(Ti,Bi)_{0.9}Sr_{1.6}Ba_{0.4}Ca_2Cu_3Ag_{0.2}O_X$ films showed a full width at half maximum (FWHM) of only 0.92° and 0.6°, respectively, indicating a film of very high quality. Transport measurements for these films showed values of $T_c \approx 110$ K and $J_c > 10^6$ A/cm^2 at 77 K in zero field. The authors conclude that ED processing of *Tl*-based oxide superconductors deserves more attention as a viable candidate for the production of high-temperature superconducting tape operating near 77 K.

A preprint by D. P. Almond (Bath) et al. reports that modulated optical reflectance (MOR) is a convenient, room-temperature, noncontact, nondestructive, and high-spatial-resolution means of assessing the quality of high-temperature-superconducting (HTS) thin films. Room-temperature MOR characterizations of a number of 8 GHz planar HTS resonators indicating a range of property variations and local degradations in HTS film performance were found to be consistent with results obtained at low temperatures by the electron-beam-induced voltage-contrast technique. The microwave performance of some of the resonators exhibited nonlinear characteristics that can be explained by HTS defects revealed by the MOR technique.

Applications

As noted in a preprint by B. H. Moeckly and Y. M. Zhang (Conductus), $SrTiO_3$ *(STO)* thin films are promising for a variety of applications requiring tunability. The preprint describes the growth and characterization of *STO* thin films including their dielectric properties. The authors also present attempts at reducing the loss tangent of these films, and they discuss the integration of *STO* films with HTS microwave filters for trimming purposes.

A preprint by T. W. Clinton and M. Johnson (NRL) reports that a bilayer ferromagnetic film, consisting of soft and hard magnetic layers separated by a nonmagnetic layer, has been incorporated into a magnetoquenched superconducting valve, making it possible to control the valve with uniaxial magnetic fields. The authors demonstrated device switching with fields as small as 20 Oe. The switch is inherently nonvolatile, has linear output characteristics, and requires a single inductively coupled “write wire” for integrated operation, all of which make it promising for application as a storage cell in a high-density superconducting random access memory.

Electrical machines having rotors constructed from different numbers of type-II superconducting segments are modeled in a preprint by G. J. Barnes et al. (Oxford). The authors compute the torque when hollow cylindrical rotors are subjected to a rotating applied field that induces currents in the superconducting pieces. Using the critical state model and the finite-element method, the authors solve numerically for the resulting current and field distributions. The results indicate the number of segments that will result in the largest torque for a given rotor size, critical current density, and applied field amplitude.

The 43 Hz ac losses in multifilamentary *AgAu*(10 wt%)/*Bi-2223* tapes with filaments twisted at different pitches have been measured by E. Martínez (Southampton) et al. in perpendicular ac fields at 77 K. Using simultaneous measurements of the first and higher harmonics of the voltage induced in the pickup coil, the authors separated the main loss contributions (superconductor and coupling-current losses). The authors found that a very small pitch (< 5 mm) is necessary for a considerably lower loss than that of the untwisted tapes. The authors also analyze the dependence of the coupling field and coupling current losses upon the twist pitch, and they compare the results with theoretical predictions.

Vortices

A detailed, quantitative study of the Josephson coupling energy in the vortex-liquid, Bragg-glass, and vortex-glass phases of *Bi-2212* has been carried out by M. B. Gaifullin (ISSP-Tokyo and CREST) et al. using the Josephson plasma resonance. The measurements revealed distinct features in the T- and H- dependencies of the plasma frequency ω_{pl} for each of these three vortex phases. The authors found that ω_{pl} shows a dramatic change when going across either the Bragg-glass to vortex-glass or the Bragg-glass to vortex-liquid transition line. The authors provide a quantitative discussion of the properties of these phase transitions, including the first-order nature of the transition from the Bragg glass to the vortex glass.

The Josephson plasma resonance in underdoped *Bi-2212* single crystals has been observed by I. Kakeya et al. (Tsukuba) when a magnetic field is applied nearly parallel to the ab plane. The resonance mode splits into two branches at higher and lower temperatures, and a definite gap appears in the temperature region between them. As the field is tilted away from the ab plane, the branches gradually merge into a single mode, which is a continuation of the mode when the field is applied along the c axis.

A vortex-glass transition due to point disorder existing on the superconducting layers in layered superconductors has been studied by R. Ikeda and H. Adachi (Kyoto) for an applied magnetic field parallel to the layers. The authors' calculation of tilt responses indicates that, irrespective of the magnitude of the field, the resulting Josephson-vortex-glass phase should have a transverse Meissner effect only for a tilt perpendicular to the layers, just as in the case of a planar splayed-glass phase.

The behavior of the B vs H constitutive relation near H_{c1} in disordered type-II superconductors has been calculated by R. A. Lehrer and D. R. Nelson (Harvard). The authors stress that the Abrikosov result, $B \propto [\ln(H - H_{c1})]^{-2}$, which is valid in the absence of disorder and thermal fluctuations, changes significantly in the presence of disorder. The authors present new expressions for B vs H for various types of quenched disorder in two- and three-dimensional superconductors.

An approach to calculate the attractive long-range vortex-vortex interaction of the van der Waals type present in anisotropic and layered superconductors has been developed by H. P. Büchler (ETH-Zürich) et al. The mapping of the statistical mechanics of two-dimensional charged bosons allows for the definition of a Casimir problem: Two half spaces of vortex matter separated by a gap are mapped to two dielectric half planes of charged bosons interacting via a massive gauge field. The authors determine the attractive Casimir force between the two half planes and show that it agrees with the pairwise summation of the van der Waals forces between vortices.

The magnetic field generated by a vortex in an anisotropic layered superconducting film of finite thickness has been calculated by E. Sardella (Bauru). The film surfaces are assumed to be parallel to the bc face of the crystal, and the axis of the vortex line is assumed to be along the a axis, parallel to the superconducting planes and perpendicular to the film surface.

The influence of defects on the Bean-Livingston surface energy barrier has been investigated by A. Yu. Aladyshkin et al. (Nizhny Novgorod). The authors find that surface imperfections can result in a decrease of the critical field H* of the first vortex entry into a superconductor, and they present results for vortex nucleation near a wedge-like crack.

Molecular dynamics simulations of driven vortices in highly anisotropic layered superconductors in the presence of an external homogeneous force and point disorder have been carried out by A. B. Kolton (Bariloche) et al. The authors found that just above the critical current, in the plastic-flow regime, 2D pancake vortices are completely uncorrelated in the c direction. However, as the current increases, there is an onset of correlation along the c axis at a transition, coinciding with a peak in the differential resistance, from plastic flow to a moving smectic phase.

A preprint by R. P. Huebener (Tübingen) et al. reports that at intermediate fields $B_{c1} << B < B_{c2}$ and at temperatures $T << T_c$, the flux-flow resistance of the cuprate superconductor $Nd_{2-x}Ce_xCuO_y$ *(NCCO)* displays two intrinsic steps as a function of the electric field. To explain this strongly nonlinear behavior, the authors propose a scenario based on two subbands between the Fermi energy and the gap energy, leading to Bloch oscillations and Zener breakdown for quasiparticle dynamics. The subbands originate from the Andreev bound states in the core of an isolated vortex and the interaction between vortices. The authors

note that the proposed scenario appears to explain the observed magnetic field and temperature dependence of the flux-flow resistance steps.

As stressed in a preprint by E. Goldobin (Jülich) et al., a Josephson vortex moving at a high velocity parallel to the layers of a Josephson multilayer (e.g., a high-temperature superconductor such as *Bi-2212*) can emit electromagnetic waves (Cherenkov radiation), which can lead to the formation of novel stable dynamic states consisting of several bunched vortices of the same polarity. The authors find such bunched states in numerical simulations of two and three coupled junctions. At a given driving current, several bunched states are stable and move at velocities that are higher than the single-vortex velocity.

Theory

As emphasized in a preprint by D. Pines (Los Alamos and Illinois), the major challenge in understanding the cuprate superconductors has been determining the evolution with doping and temperature of their anomalous normal-state behavior. Key to this understanding is the experimentally determined magnetic phase diagram for the cuprates, which provides information on the protected magnetic properties of the normal state, i.e., generic behavior that is reliably the same from one system to the next, regardless of details. The author discusses the constraints this places on candidate quantum protectorates [Luttinger liquids, nearly antiferromagnetic Fermi liquids, nearly charge-ordered Fermi liquids, mesoscopically ordered phases (stripes), and quantum critical behavior], and he presents the case for one of these, the nearly antiferromagnetic Fermi liquid.

The doping dependence of the strong antiferromagnetic spin fluctuations in the cuprate superconductors is considered in a preprint by D. K. Morr (Illinois, Urbana-Champaign) et al. The authors conclude that a single theoretical scenario can describe both inelastic neutron scattering (INS) experiments and nuclear magnetic resonance (NMR) experiments if one assumes spatially inhomogeneous but locally commensurate spin correlations.

A preprint by S. Saito (Waseda) et al. have used the extended attractive Hubbard model to perform a variational analysis on the evolution of superconductivity from the weak to the strong coupling regime. In contrast to a crossover without a thermodynamic anomaly found in a dilute system, the authors find a quantum phase transition, driven by charge-density-wave instabilities, near half filling.

A preprint by J. Bouvier and J. Bok (Paris) points out that underdoped cuprates are disordered materials with diffusion coefficients as low as 10^{-5} m^2s^{-1}. Under these conditions, the Coulomb interaction between electrons must be taken into account, the main effect being to open a gap in the density of states near the Fermi level. The authors find that this model explains most of the observed features of the pseudogap in the normal state, including its magnitude, anisotropy, and variation with doping.

The spectral properties of the underdoped cuprates are described by L. Benfatto et al. (Roma) as resulting from a momentum-dependent pseudogap in the normal-state spectrum. The authors assert that such a model accounts, within a BCS approach, for the doping dependence of the critical temperature and the two-parameter leading-edge shift observed in the cuprates.

The effect of magnetic fields on pseudogap phenomena in the high-T_c cuprates has been theoretically investigated by Y. Yanase and K. Yamada (Kyoto). The authors can explain high-magnetic-field NMR experiments from underdoped to overdoped cuprates, as well as the behavior of the in-plane resistivity, the Hall coefficient, and the c-axis resistivity in the pseudogap phase.

The quasiparticle energy spectrum in clean ferromagnetic weak links between conventional superconductors has been calculated by L. Dobrosavljevic-Grujic et al. (Belgrade). Large peaks in the density of states, due to a special case of Andreev reflection at the ferromagnetic barrier, correspond to spin-split bound states. The authors obtain the energies of these states as a function of the barrier thickness, exchange-field strength, and the macroscopic phase difference ϕ at the link. In the ground state, ϕ can be 0 or π, depending upon the influence of the ferromagnetic barrier.

Macroscopic quantum tunneling of the magnetic moment in a single-domain particle placed above the surface of a superconductor has been studied by E. M. Chudnovsky (CUNY) and J. R. Friedman (SUNY-Stony Brook). Such a setup allows one to manipulate the height of the energy barrier while preserving the degeneracy of the ground state. The authors compute the tunneling amplitude and the effect of dissipation in the superconductor.

Overviews

As noted in a review by T. Tohyama and S. Maekawa (Tohoku), angle-resolved photoemission spectroscopy (ARPES) has been developed rapidly over the last decade, with improvements in the energy and momentum resolution. ARPES is now the most powerful technique for investigating the high-T_c cuprate superconductors. The authors review recent ARPES data on the cuprates from a theoretical point of view, with emphasis on the systematic evolution of the spectral weight near the momentum $(\pi,0)$ from insulator to overdoped systems. The authors also review the effects

of charge stripes on the ARPES spectra and discuss recent experimental and theoretical efforts to understand the superconducting state and the pseudogap phenomenon (145 refs.).

Flux pinning in *123*-type high-T_c superconductors has been reviewed by M. R. Koblischka et al. (SRL-ISTEC). The authors first discuss the various pinning sites found in high-T_c superconductors, their interactions with vortices, and their effect on magnetization curves. Next, they discuss the scaling of pinning forces and compare the behavior in the cuprates with that in conventional superconductors. The authors summarize their results in the form of a pinning-force diagram for bulk high-T_c superconductors. The authors conclude that (a) the pinning mechanism that produces the peak in J_c vs H_a is δT_c pinning, and (b) the ideal pinning center for high-T_c materials at ~77 K is a superconducting one that provides a scatter in T_c (83 refs.).

Selected problems of fundamental importance for spintronics and spin-polarized transport, some of them with a special emphasis on their applications in quantum computing and coherent control of quantum dynamics, are reviewed in a preprint by S. Das Sarma et al. (Maryland). The authors discuss a specific example of a magnetic semiconductor/superconductor interface, which displays many intricacies introduced by a complex spin-dependent interface in spin-polarized transport. The authors propose that pairs of entangled electrons in a superconductor (Cooper pairs) can be transferred to a nonsuperconducting region and subsequently separated for a transport study of the spin entanglement (49 refs.).

A paper by M. Däumling (NKT) et al. summarizes the authors' investigations of ac losses in the current generation of power cables consisting of successive layers of helically wound superconducting *Bi-2223* tapes. The authors discuss ac losses in superconducting tapes, the distribution of currents and fields in power cables, and measurement methods and results (42 refs.).

As noted in a brief overview by B. H. Moeckly (Conductus), HTS interface-engineered Josephson junctions have generated interest because of their excellent stability and uniformity compared with the results of other HTS junction technologies. The author presents a concise summary of some of the main results and then discusses the problems that must be overcome to realize HTS digital circuit applications (7 refs.)

Contributed by John R. Clem

Contents:

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A. Yu. Aladyshkin, A. S. Mel'nikov, I. A. Shereshevsky, and I. D. Tokman, "Influence of Surface Irregularities on Barriers for Vortex Entry in Type-II Superconductors." Institute for Physics of Microstructures, Russian Academy of Sciences, Nizhny Novgorod 603600, GSP-105, RUSSIA; preprint also available at http://xxx.lanl.gov/abs/cond-mat/9911430.

J. A. Alarco, J. D. Riches, and J. C. Barry, "Observation of Exsolution Textures Within *Ba-Cu-O*-Rich Solidified Melts of *Y-Ba-Cu-O* Materials and Their Relationship to *Y123* Nucleation and Texturing." To be published in Physica C (in press). Centre for Microscopy and Microanalysis, The University of Queensland, Queensland 4072, AUSTRALIA; telephone +61 7 3365 4045; telefax + 61 7 3365 4422; e-mail j.alarco@mailbox.uq.edu.au. Key words: *Y-Ba-Cu-O,* phase diagram, solidification, melt processing. 74.72.Bk; 81.30.-t; 81.10.-h.

D. P. Almond, P. Nokrach, E.W.R. Stokes, A. Porch, S.A.L. Foulds, F. Wellhöfer, J. R. Powell, and J. S. Abell, "Modulated Optical Reflectance Characterization of High Temperature Superconducting Thin Film Microwave Devices." To be published in J. Appl. Phys. Department of Materials Science and Engineering, University of Bath, Bath BA2 7AY, UNITED KINGDOM; telephone +44 1225 826826; telefax +44 1225 826098.

G. J. Barnes, M. D. McCulloch, and D. Dew-Hughes, "Torque from Hysteresis Machines with Type-II Superconducting Segmented Rotors." To be published in Physica C (in press). Department of Engineering Science, University

of Oxford, Parks Road, Oxford OX1 3PJ, UNITED KINGDOM; telephone +44 1865 273001; telefax +44 1865 273010; e-mail gary.barnes@eng.ox.ac.uk. Key words: HTS, motor, hysteresis, simulation. 74.60.-w; 74.25.Ha; 07.05.-t.

Pieder Beeli, "Impedance Mismatch: A New Length Scale in the Electrodynamics of a Superconductor-Metal System." To be published in Physica C (in press). Department of Physics, Colorado State University, Fort Collins, CO 80521; telephone (970) 491-5289; telefax (970) 491-7947; e-mail pbeeli@lamar.colostate.edu. Key words: impedance mismatch, superconducting film, length scale, bilayer.

L. Benfatto, S. Caprara, and C. Di Castro, "A Model for Gap and Pseudogap Evolution in High-T_c Superconductors." Dipartimento di Fisica, Università di Roma "La Sapienza" and Istituto Nazionale per la Fisica della Materia, Unità di Roma 1, Piazzale Aldo Moro 5, I-00185 Rome, ITALY; e-mail Lara.Benfatto@roma1.infn.it; preprint also available at http://xxx.lanl.gov/abs/cond-mat/0002250. 74.25.Dw; 71.10.Hf; 74.20.Fg.

R. N. Bhattacharya, H. L. Wu, Y.-T. Wang, R. D. Blaugher, S. X. Yang, D. Z. Wang, Z. F. Ren, Y. Tu, D. T. Verebelyi, and D. K. Christen, "Improved Electrodeposition Process for the Preparation of Superconducting Thallium Oxide Films." To be published in Physica C (in press). National Renewable Energy Laboratory, 1617 Cole Boulevard, Golden, CO 80401-3393; telephone (303) 384-6477; telefax (303) 384-6430; e-mail raghu_bhattacharya@nrel.gov. Key words: thick film, electrodeposition, *Tl*-oxides.

J. Bouvier and J. Bok, "Pseudogap in the Normal State of Cuprates." To be published in the Proc. of the 6th Int. Conf. on Mater. and Mech. of Supercond. and High Temp. Supercond. (M^2S-HTSC-VI), Houston, Tex., Feb. 20-25, 2000. Laboratory of Statistical Physics, Ecole Supérieure de Physique et Chimie Industrielles (ESPCI), 10 rue Vauquelin, F-75231 Paris Cedex 05, FRANCE.

H. P. Büchler, H. G. Katzgraber, and G. Blatter, "Casimir Force Between Two Half Spaces of Vortex Matter in Anisotropic Superconductors." Submitted to Physica C. Theoretische Physik, Eidgenössische Technische Hochschule-Hönggerberg, CH-8093 Zürich, SWITZERLAND; H. G. Katzgraber's e-mail at U. of California at Santa Cruz dummkopf@debussy.ucsc.edu; preprint also available at http://xxx.lanl.gov/abs/cond-mat/0002183.

Eugene M. Chudnovsky and Jonathan R. Friedman, "Macroscopic Quantum Coherence in a Magnetic Nanoparticle Above the Surface of a Superconductor." Submitted to Phys. Rev. Lett. Department of Physics and Astronomy, CUNY Lehman College, 250 Bedford Park Boulevard West, Bronx, NY 10468-1589; Jonathan R. Friedman's e-mail jrf@warp.physics.sunysb.edu; preprint also available at http://xxx.lanl.gov/abs/cond-mat/0002255. 75.45.+j; 75.50.Tt; 74.25.Nf.

T. W. Clinton and Mark Johnson, "Magnetoquenched Superconducting Valve with Bilayer Ferromagnetic Film for Uniaxial Switching." To published in Appl. Phys. Lett. Seagate Technology, 2403 Sidney Street, Pittsburgh, PA 15203-2116; telephone (412) 918-7000; telefax (412) 918-7010; e-mail thomas_w_clinton@notes.seagate.com.

A. Conceição, C. H. Cohenca, and R. F. Jardim, "Structural, Transport, and Magnetic Properties of $Pr_{1.85}Ce_{0.15}CuO_{4-y}$ Prepared Through Different Precursors." To be published in Physica C. Contact R. F. Jardim, Instituto de Física, Universidade de São Paulo, C.P. 66318, 05315-970 São Paulo, SP, BRAZIL; telephone +55 11 818-6891 or -6896; telefax +55 11 818-6984; e-mail rjardim@if.usp.br. Key words: electron-doped superconductors, sol-gel synthesis, x-ray powder diffraction, electrical resistivity, magnetization. 74.72.Jt; 74.80.Bj; 74.62.Bf.

F. Cordero, R. Cantelli, A. Paolone, and M. Ferretti, "Observation of the Cluster Spin-Glass Phase in $La_{2-x}Sr_xCuO_4$ by Anelastic Spectroscopy." Submitted to Phys. Rev. B. Istituto di Acustica "O.M. Corbino," CNR, Area della Ricerca di Roma-Tor Vergata, Via del Fosso del Cavaliere 100, I-00133 Rome, ITALY; telephone +39 06 4993 4114; telefax +39 06 2066 0061; e-mail cordero@idac.rm.cnr.it; preprint also available at http://xxx.lanl.gov/abs/cond-mat/0002009.

S. Das Sarma, Jaroslav Fabian, Xuedong Hu, and Igor Zutic, "Theoretical Perspectives on Spintronics and Spin-Polarized Transport." To be published in IEEE Trans. Magn. Department of Physics, University of Maryland, College Park, MD 20742-4111; e-mail dassarma@physics.umd.edu; preprint also available at http://xxx.lanl.gov/abs/cond-mat/0002256. Key words: spintronics, spin-polarized transport, spin coherence, spin-hot-spot model, spin-based quantum computation, quantum information, spin entanglement, hybrid semiconductor structures, spin injection, Andreev reflection.

M. Däumling, S. Krüger Olsen, C. Træholt, D.W.A. Willén, A. Kühle, C. N. Rasmussen, C. Rasmussen, O. Tønnesen, and J. Østergaard, "ac Loss in Superconducting Power Cables." To be published in Studies of High Temp. Supercond., Vol. 32, edited by A. Narlikar (Nova Science Publishers, New York). NKT Research Center, Priorparken 878, DK-2605 Brøndby, DENMARK.

L. Dobrosavljevic-Grujic, R. Zikic, and Z. Radovic, "Quasiparticle Energy Spectrum in Ferromagnetic Josephson Weak Links." To be published in Physica C (in press). Institute of Physics, P.O. Box 57, 11080 Belgrade, Serbia, YUGOSLAVIA; telephone +381 11 3162 758; telefax +381

11 3162 190; e-mail dobrosav@phy.bg.ac.yu. Key words: density of states, π contact, zero-energy bound states, spin-polarized ground states. 74.50.+r.

M. Eisterer and H. W. Weber, "Determination of the J(E) Characteristic by ac Measurements." To be published in Physica C. Atominstitut der Österreichischen Universitäten, A-1020 Wien, AUSTRIA; H. W. Weber's e-mail weber@ati.ac.at.

M. Eisterer, S. Tönies, H. W. Weber, R. Weinstein, R. Sawh, and Y. Ren, "High Critical Currents Due to Fission Tracks in $YBa_2Cu_3O_{7-\delta}$." To be published in Physica C. Atominstitut der Österreichischen Universitäten, A-1020 Wien, AUSTRIA; H. W. Weber's e-mail weber@ati.ac.at.

T. Endo, M. Tada, K.-I. Itoh, J. Yamada, and H. Kohmoto, "Why Oxygen Molecule is More Effective on Crystal Growth of Nondoped *Bi2201* Thin Films?" To be published in the Proc. of the Int. School on Crystal Growth Methods and Processes, Chennai, India, Jan. 24 - Feb. 4, 2000. Faculty of Engineering, Mie University, 1515 Kamihama, Tsu, Mie 514-8507, JAPAN; telephone +81 592 32 1211; telefax +81 592 31 9471; e-mail endo@cm.elec.mie-u.ac.jp.

T. Endo, M. Tada, and J. Yamada, "Why Oxygen Plasma is More Effective on Crystal Growth of *Ca*-Doped *Bi2201* Thin Films?" To be published in the Proc. of the Int. School on Crystal Growth Methods and Processes, Chennai, India, Jan. 24 - Feb. 4, 2000. Faculty of Engineering, Mie University, 1515 Kamihama, Tsu, Mie 514-8507, JAPAN; telephone +81 592 32 1211; telefax +81 592 31 9471; e-mail endo@cm.elec.mie-u.ac.jp.

Hanno Essén, "Circulating Electrons, Superconductivity, and the Darwin-Breit Interaction." Dept. of Mechanics, Royal Institute of Technology, SE-100 44 Stockholm, SWEDEN; e-mail hanno@mech.kth.se; preprint also available at http://xxx.lanl.gov/abs/cond-mat/0002096. 74.20.-z; 74.20.Hi.

D. E. Feldman, "No Quasi-Long-Range Order in Strongly Disordered Vortex Glasses: A Rigorous Proof." Department of Condensed Matter Physics, Weizmann Institute of Science, Rehovot 76100, ISRAEL; e-mail feldman@figaro.weizmann.ac.il; preprint also available at http://xxx.lanl.gov/abs/cond-mat/0002109.

G. Fuchs, P. Schätzle, G. Krabbes, S. Gruss, P. Verges, K.-H. Müller, J. Fink, and L. Schultz, "Trapped Magnetic Fields Larger than 14 Tesla in Bulk $YBa_2Cu_3O_{7-x}$." To be published in Appl. Phys. Lett. Institut für Festkörper- und Werkstofforschung Dresden, Postfach 270016, D-01171 Dresden, GERMANY.

M. B. Gaifullin, Yuji Matsuda, N. Chikumoto, J. Shimoyama, and K. Kishio, "Abrupt Change of Josephson Plasma Frequency at the Phase Boundary of the Bragg Glass in $Bi_2Sr_2CaCu_2O_{8+\delta}$." To be published in Phys. Rev. Lett. Contact Yuji Matsuda, Institute for Solid State Physics, University of Tokyo, Roppongi 7-22-1, Minato-ku, Tokyo 106, JAPAN; e-mail ym@issp.u-tokyo.ac.jp; preprint also available at http://xxx.lanl.gov/abs/cond-mat/0002196. 74.25.Nf; 74.50.+r; 74.60.Ec; 74.72.Hs.

E. Goldobin, B. A. Malomed, and A. V. Ustinov, "Bunching Fluxons by the Cherenkov Radiation in Josephson Multilayers." Submitted to Phys. Rev. B. Institute of Thin Film and Ion Technology, Research Center Jülich GmbH (FZJ), D-52425 Jülich, GERMANY; e-mail e.goldobin@fz-juelich.de; preprint also available at http://xxx.lanl.gov/abs/cond-mat/0002051. 74.50.+r; 74.80.Dm; 41.60.Bq.

Klaus Halterman and Oriol T. Valls, "Nonlinear Electrodynamics of p-Wave Superconductors." Submitted to Phys. Rev. B. School of Physics and Astronomy and Minnesota Supercomputer Institute, University of Minnesota, Minneapolis, MN 55455-0149; e-mail khalter@physics.spa.umn.edu; Oriol T. Valls' e-mail otvalls@tc.umn.edu.

R. P. Huebener, O. M. Stoll, A. Wehner, and M. Naito, "Flux-Flow Resistance in the Cuprate Superconductor $Nd_{2-x}Ce_xCuO_y$: Subbands, Bloch Oscillations, and Zener Breakdown." To be published in Physica C. Physikalisches Institut, Lehrstuhl Experimentalphysik II, Universität Tübingen, Morgenstelle 14, D-72076 Tübingen, GERMANY. 74.25.Fy; 74.60.Ge; 74.72.Jt.

Ryusuke Ikeda and Hiroto Adachi, "Josephson-Vortex-Glass Transition in Strong Fields." Department of Physics, Kyoto University, Kyoto 606-8502, JAPAN; e-mail ikeda@ton.scphys.kyoto-u.ac.jp. Key words: type-II superconductors, vortex states, Josephson vortex, vortex-glass.

Itsuhiro Kakeya, Tomoyuki Wada, Ryo Nakamura, and Kazuo Kadowaki, "Josephson Plasma Mode in Fields Parallel to Layers of $Bi_2Sr_2CaCu_2O_{8+\delta}$." Institute of Materials Science, University of Tsukuba, 1-1-1 Ten-nodai, Tsukuba, Ibaraki 305-8573, JAPAN.

Itsuhiro Kakeya, Tomoyuki Wada, Ryo Nakamura, and Kazuo Kadowaki, "Josephson Plasma Resonance in $Bi_2Sr_2CaCu_2O_{8+\delta}$ Under Parallel Magnetic Field." Presented at the Int. Conf. on Phys. and Chem. of Molecular and Oxide Supercond. (MOS'99), Stockholm, Sweden, July 28-Aug. 2, 1999. Institute of Materials Science, University of Tsukuba, 1-1-1 Ten-nodai, Tsukuba, Ibaraki 305-8573, JAPAN. 74.50.+r; 72.30.+q; 74.60.Ge.

E. Kandyel, X.-J. Wu, and S. Tajima, "Annealing Effects on Structure and Superconductivity of $(Tl_{1-x}Hg_x)_2Sr_2Ca_2Cu_3O_y$." To be published in J. Phys. Chem. Solids. Superconductivity Research

Laboratory, International Superconductivity Technology Center (ISTEC), 10-13 Shinonome 1-chome, Koto-ku, Tokyo 135-0062, JAPAN. Key words: superconductors, high pressure, superconductivity, crystal structure.

M. Karppinen, H. Yamauchi, T. Nakane, and M. Kotiranta, "Oxygen Non-stoichiometry and Hole Distribution in Multi-layered Copper Oxides: Understanding of the Magnetic-Irreversibility Characteristics." To be published in Physica C. Contact H. Yamauchi, Materials & Structures Laboratory, Tokyo Institute of Technology, 4259 Nagatsuta, Midori-ku, Yokohama 227, JAPAN; phone +81 45 924-5315; fax +81 45 924-5365 or -5360; e-mail yamauchi@materia.titech.ac.jp.

P. G. Kealy, T. M. Riseman, E. M. Forgan, L. M. Galvin, A. P. Mackenzie, S. L. Lee, D. McK. Paul, R. Cubitt, D. F. Agterberg, R. Heeb, Z. Q. Mao, and Y. Maeno, "A Reconstruction from Small-Angle Neutron Scattering Measurements of the Real Space Magnetic Field Distribution in the Mixed State of Sr_2RuO_4." Submitted to Phys. Rev. Lett. School of Physics and Astronomy, University of Birmingham, Birmingham B15 2TT, UNITED KINGDOM; e-mail P.G.Kealey@bham.ac.uk; preprint also available at http://xxx.lanl.gov/abs/cond-mat/0002112. 61.12.Ex; 74.60.Ge; 74.70.Tx.

H. R. Khan, K. Lüders, K. Kajikawa, M. Baenitz, and C. Ecker, "Irreversibility Fields of Polycrystalline $Hg_{(1-x)}Pb_xBa_2Ca_2Cu_3O_y$ Superconductors." Department of Materials Physics, Forschungsinstitut für Edelmetalle und Metallchemie, D-73525 Schwäbisch Gmünd, GERMANY.

Chan-Joong Kim, Young A. Jee, Gye-Won Hong, Tae-Hyun Sung, Young-Hee Han, Sang-Chul Han, and Sang-Jun Kim, "Investigation of Melting and Resolidification of $Sm_{1.8}Ba_{2.4}Cu_{3.4}O_X$ in *Ba-Cu-O* Melt at the Temperature Below its Melting Point." To be published in J. Mater. Sci. Lett. Superconductivity Research Laboratory, Korea Atomic Energy Research Institute, P.O. Box 105, Yusung, Taejon 305-600, SOUTH KOREA; phone +82 42 868 8908; fax +82 42 862 5496; e-mail cjkim2@nanum.kaeri.re.kr.

Hyeong-Jin Kim, Jae-Hyuk Choi, Mun-Seog Kim, Sung-Ik Lee, and Jin-Tae Kim, "Magnetization Study of Organic Superconductor κ-$(BEDT\text{-}TTF)_2Cu(NCS)_2$." To be published in Physica C (in press). National Creative Research Initiative Center for Superconductivity, Department of Physics, Pohang University of Science and Technology, Pohang, Kyungbuk 790-784, SOUTH KOREA; telephone +82 562 279 5498; telefax +82 562 279 5299; e-mail hjkim72@postech.ac.kr. Key words: organic superconductor, thermodynamic parameters, vortex fluctuations. 74.25.Bt; 74.25.Ha; 74.60.Ec; 74.70.Kn.

M. R. Koblischka, T. H. Johansen, M. Baziljevich, M. Murakami, and Th. Wolf, "SQUID and Magneto-Optic Investigations of Flux Turbulence." Presented at the 6th Int. Conf. on Mater. and Mech. of Supercond. and High Temp. Supercond. (M^2S-HTSC-VI), Houston, Tex., Feb. 20-25, 2000; to be published in Physica C. Nordic Superconductor Technologies A/S, Priorparken 685, DK-2605 Brøndby, DENMARK; e-mail mk@nst.com or michael.koblischka@risoe.dk.

M. R. Koblischka, T. H. Johansen, B. Larsen, N. H. Andersen, H. Wu, P. Skov-Hansen, M. Bentzon, and P. Vase, "Magneto-Optical Investigations of Multifilamentary *Bi-2223* Tapes." Presented at the 6th Int. Conf. on Mater. and Mech. of Supercond. and High Temp. Supercond. (M^2S-HTSC-VI), Houston, Tex., Feb. 20-25, 2000; to be published in Physica C. Nordic Superconductor Technologies A/S, Priorparken 685, DK-2605 Brøndby, DENMARK; e-mail mk@nst.com or michael.koblischka@risoe.dk.

M. R. Koblischka, M. Muralidhar, and M. Murakami, "Flux Pinning in *123*-Type High-T_c Superconductors." To be published in Studies of High Temp. Supercond., Vol. 31, edited by A. Narlikar (Nova Science Publishers, New York). Nordic Superconductor Technologies A/S, Priorparken 685, DK-2605 Brøndby, DENMARK; e-mail mk@nst.com or michael.koblischka@risoe.dk.

Anke Köhler, Franz M. Sauerzopf, Martin Zehetmayer, Andreas Erb, and Harald W. Weber, "Influence of Neutron Irradiation on the Fishtail Behavior of $YBa_2Cu_3O_{7-\delta}$ Single Crystals." To be published in Physica C. Atomic Institute of the Austrian Universities, A-1020 Wien, AUSTRIA; Harald W. Weber's e-mail weber@ati.ac.at.

J. David Kokales, Patrick Fournier, Lucia V. Mercaldo, Vladimir V. Talanov, Richard L. Greene, and Steven M. Anlage, "Microwave Electrodynamics and Pairing Symmetry of Electron-Doped Cuprate Superconductors." Submitted to Phys. Rev. Lett. Contact Steven M. Anlage, Center for Superconductivity Research, Department of Physics, University of Maryland, College Park, MD 20742-4111; telephone (301) 405-7321; telefax (301) 405-3779; e-mail anlage@squid.umd.edu; preprint also available at http://xxx.lanl.gov/abs/cond-mat/0002300. 74.25.Nf; 74.25.Fy; 74.72.Jt.

Alejandro B. Kolton, Daniel Domínguez, and Niels Grønbech-Jensen, "Dynamical Ordering in the c Axis in 3D Driven Vortex Lattices." Submitted to the Proc. of the 6th Int. Conf. on Mater. and Mech. of Supercond. and High Temp. Supercond. (M^2S-HTSC-VI), Houston, Tex., Feb. 20-25, 2000. Centro Atómico Bariloche, Av. Bustillo 9500, 8400 S. C. de Bariloche, Rio Negro, ARGENTINA; e-mail koltona@cab.cnea.edu.ar; preprint also available at http://xxx.lanl.gov/abs/cond-mat/0002017.

Raphael A. Lehrer and David R. Nelson, "B(H) Constitutive Relations near H_{c1} in Disordered Superconductors." To be

published in Physica C (in press). Contact David R. Nelson, Lyman Laboratory of Physics, Harvard University, Cambridge, MA 02138; telefax (617) 496-2545; e-mail nelson@cmts.harvard.edu; preprint also available at http://xxx.lanl.gov/abs/cond-mat/9908117. Key words: constitutive relations, quenched random disorder, type-II superconductor.

V. V. Luparev, G. M. Kuz'micheva, and E. P. Klybov, "Preparation Methods of Perovskite-Like Complex Oxides *(Hg,Ce,Cu)(Sr,Ln,Ca)$_2$(Ln,Ca,Sr)Cu$_2$O$_{6+\delta}$ (1212)* with Superconducting Properties." To be published in J. Phys. Met. Contact G. M. Kuz'micheva, Department of Solid State Physics and Chemistry, M.V. Lomonosov State Academy of Fine Chemical Technology, Prospekt Vernadsky 86, Moscow 117571, RUSSIA; telephone +7 095 248 0762; telefax +7 095 434 8711; e-mail galkuz@orc.ru. (Paper in Russian.)

Tulika Maitra, "Thermodynamic Properties of $d_{x^2-y^2} + id_{xy}$ Superconductor." To be published in Physica C (in press). Department of Physics and Meteorology, Indian Institute of Technology, Kharagpur 721302, INDIA; telefax +91 3222 55303; e-mail tulika@phy.iitkgp.ernet.in; preprint also available at http://xxx.lanl.gov/abs/cond-mat/0002114. Key words: superconductors, superfluid density, thermodynamic properties. 74.72.-h; 74.20.Fg.

E. Martínez, L. A. Angurel, J. C. Díez, A. Larrea, M. Aguiló, and R. Navarro, "Grain Texture and Bulk Magnetic Anisotropy Correlation in Polycrystalline *Bi$_2$Sr$_2$CaCu$_2$O$_{8+\delta}$* Thin Rods." To be published in Physica C (in press). Contact L. A. Angurel, Instituto de Ciencia de Materiales de Aragón (I.C.M.A.), Centro Politécnico Superior de Ingenieros, CSIC-Universidad de Zaragoza, María de Luna 3, E-50015 Zaragoza, SPAIN; telephone +34 976 761958; telefax +34 976 761957; e-mail angurel@posta.unizar.es. Key words: *BSCCO,* texture, magnetic anisotropy. 74.72.Hs; 74.80.Bj; 74.25.Ha; 74.60.Jg.

E. Martínez, Y. Yang, C. Beduz, and Y. B. Huang, "Experimental Study of Loss Mechanisms of *AgAu/PbBi-2223* Tapes with Twisted Filaments Under Perpendicular ac Magnetic Fields at Power Frequencies." To be published in Physica C (in press). Institute of Cryogenics, School of Engineering, University of Southampton, Highfield, Southampton SO17 1BJ, UNITED KINGDOM; telephone +44 1703 592872; telefax +44 1703 593230; e-mail emf@soton.ac.uk. Key words: ac losses, multifilamentary superconducting tapes, magnetization, twisting. 74.25.Ha; 74.60.Ec; 85.25.Kx.

E. Mendoza, T. Puig, E. Varesi, A. E. Carrillo, J. Plain, and X. Obradors, "Critical Current Enhancement in *YBCO-Ag* Melt Textured Composites: Influence of Microcrack Density." To be published in Physica C. Instituto de Ciència de Materiales de Barcelona, Consejo Superior de Investigaciones Científicas, Campus de la UAB, E-08193 Bellaterra, Barcelona, SPAIN; telephone +34 93 580 18 53; telefax +34 93 580 57 29; e-mail ernest@icmab.es. Key words: melt processing *YBCO, Ag* addition, critical currents, microstructure. 74.60.Jg; 74.62.Dh; 74.72.Bk.

B. H. Moeckly, "Interface-Engineered Josephson Junctions." Presented at the 1999 Int. Workshop on Supercond. (4th Joint ISTEC/MRS Hawaii Workshop), Kauai, Hawaii, June 27-30, 1999. Conductus, Inc., 969 W. Maude Avenue, Sunnyvale, CA 94086; e-mail moeckly@conductus.com.

B. H. Moeckly and Y. M. Zhang, "Tunable Dielectric Thin Films for HTS Microwave Applications." Conductus, Inc., 969 W. Maude Avenue, Sunnyvale, CA 94086; e-mail moeckly@conductus.com.

M. Mora, E. Martínez, L. A. Angurel, and R. Navarro, "Annealing Evolution of the Flux Pinning in Well-Textured *Bi-2212* Thin Rods." To be published in Physica C (in press). Contact L. A. Angurel, Departamento de Ciencia y Tecnología de Materiales y Fluidos, Centro Politécnico Superior, Instituto de Ciencia de Materiales de Aragón (I.C.M.A.), Universidad de Zaragoza, María de Luna 3, E-50015 Zaragoza, SPAIN; telephone +34 976 761958; telefax +34 976 761957; e-mail angurel@posta.unizar.es. Key words: *Bi-2212,* textured bulk HTS materials, flux pinning, V-I characteristics. 74.72.Hs; 74.60.Jg; 74.60.Ge.

Dirk K. Morr, Jörg Schmalian, and David Pines, "Spin and Charge Inhomogeneities in High-T_c Cuprates: Evidence from NMR and Neutron Scattering Experiments." Theoretical Division, T-11, Mail Stop B-262, Los Alamos National Laboratory, Los Alamos, NM 87545; telephone (505) 665-1166; telefax (505) 665-4063; e-mail morr@viking.lanl.gov. 74.25.Ha; 74.25.Nf.

P. Müller, S. Rother, O. Waldmann, S. Heim, M. Mössle, and R. Kleiner, "Gap-to-Pseudogap Evolution of *Bi$_2$Sr$_2$CaCu$_2$O$_{8+\delta}$* Near Optimal Doping." Physikalisches Institut III, Universität Erlangen-Nürnberg, D-91058 Erlangen, GERMANY. 74.25.-q; 74.50.+r; 74.72.Hs; 74.80.Dm.

M. Muralidhar, M. R. Koblischka, and M. Murakami, "*(Nd,Eu,Gd)-Ba-Cu-O* Superconductors with Combined Additions of *CeO$_2$* and *Pt*." To be published in Supercond. Sci. & Technol.: Proc. of the 2nd Int. Workshop on the Proc. and Appl. of Supercond. *(RE)BCO* Large Grain Materials, Morioka, Japan, Oct. 19-22, 1999. Superconductivity Research Laboratory, Division 3, International Superconductivity Technology Center (ISTEC), 3-35-2 Iioka-Shinden, Morioka, Iwate 020-0852, JAPAN; telephone +81 19 635-9015 or -9016; telefax +81 19 635-9017; e-mail miryala1@istec.or.jp. Key words: melt processing, *NEG-123,* TEM, sub-micron particles, high critical current density.

M. Muralidhar, T. Miyamoto, and M. Murakami, "Field Dependence of Trapped Fields in *(Nd,Eu,Ge)-Ba-Cu-O* Bulk Superconductors." To be published in Supercond. Sci. & Technol.: Proc. of the 2nd Int. Workshop on the Proc. and Appl. of Supercond. *(RE)BCO* Large Grain Materials, Morioka, Japan, Oct. 19-22, 1999. Superconductivity Research Laboratory, Division 3, International Superconductivity Technology Center (ISTEC), 3-35-2 Iioka-Shinden, Morioka, Iwate 020-0852, JAPAN; telephone +81 19 635-9015 or -9016; telefax +81 19 635-9017; e-mail miryala1@istec.or.jp. Key words: *NEG-123* bulk, *Nd-123* seed, trapped field, critical current density (J_C).

T. Nakane, Y. Morooka, E. S. Otabe, T. Matsushita, M. Karppinen, and H. Yamauchi, "Effects of *Sr* Substitution on the Magnetic-Field Irreversibility in Superconductive $Cu(Ba_{1-y}Sr_y)_2YbCu_2O_{6+z}$." To be published in Physica C. Contact H. Yamauchi, Materials & Structures Laboratory, Tokyo Institute of Technology, 4259 Nagatsuta, Midori-ku, Yokohama 227, JAPAN; telephone +81 45 924-5315; telefax +81 45 924-5365 or -5360; e-mail yamauchi@materia.titech.ac.jp.

S. A. Nemov, R. V. Parfeniev, D. V. Shamshur, P. P. Konstantinov, M. O. Safonchik, D. I. Popov, J. Stepien-Damm, and D. Kaczorowski, "Observation of Superconducting and Structural Phase Transitions in $Sn_{1-z}Ge_zTe:In$ Solid Solutions." To be published in Physica C (in press). State Technical University, Politechnicheskaya str. 29, St. Petersburg 195251, RUSSIA; telephone +7 812 552 9671; e-mail nemov@tvonet.stu.neva.ru. Key words: superconductivity, structural phase transition, semiconductors, solid solutions. 71.28.+d; 74.70.Ad.

X. Oudet, "The Quantum State and the Doublets." To be published in Annales de la Fondation Louis de Broglie. 26 rue des Ecoles, F-78400 Chatou, FRANCE; telefax +33 1 3952 8481; e-mail oudet@physique.uvsq.fr.

C. Panagopoulos, B. D. Rainford, J. R. Cooper, and C. A. Scott, "Antiferromagnetic Correlations versus Superfluid Density in $La_{2-x}Sr_xCuO_4$." Presented at the 6th Int. Conf. on Mater. and Mech. of Supercond. and High Temp. Supercond. (M^2S-HTSC-VI), Houston, Tex., Feb. 20-25, 2000. Interdisciplinary Research Centre in Superconductivity, University of Cambridge, Madingley Road, Cambridge CB3 0HE, UNITED KINGDOM; telephone +44 1223 337 072; telefax +44 1223 337 074; e-mail cp200@hermes.cam.ac.uk; preprint also available at http://xxx.lanl.gov/abs/cond-mat/0002239.

E. L. Papadopoulou, P. Nordblad, and P. Svedlindh, "Dynamic Scaling of Granular $Bi_2Sr_2CaCu_2O_8$: Evidence of a Chiral-Glass Transition?" Department of Materials Science, Uppsala University, SE-751 21 Uppsala, SWEDEN.

V. Ta Phuoc, A. Ruyter, R. de Sousa, L. Ammor, E. Olive, and J. C. Soret, "Effect of Field Tilting on the Vortices in Irradiated *Bi-2212*." Submitted to the Proc. of the 6th Int. Conf. on Mater. and Mech. of Supercond. and High Temp. Supercond. (M^2S-HTSC-VI), Houston, Tex., Feb. 20-25, 2000; to be published in Physica C. Laboratoire d'Electrodynamique des Matériaux Avancés, Université de Tours, UFR Sciences et Techniques, Parc de Grandmont, F-37200 Tours, FRANCE; e-mail taphuoc@delphi.phys.univ-tours.fr; preprint also available at http://xxx.lanl.gov/abs/cond-mat/0002271.

David Pines, "Quantum Protectorates in the Cuprate Superconductors." To be published in Physica C: Proc. of the 6th Int. Conf. on Mater. and Mech. of Supercond. and High Temp. Supercond. (M^2S-HTSC-VI), Houston, Tex., Feb. 20-25, 2000. LANSCE Division, Los Alamos National Laboratory, Los Alamos, NM 87545; preprint also available at http://xxx.lanl.gov/abs/cond-mat/0002281.

R. Prozorov, R. W. Giannetta, P. Fournier, and R. L. Greene, "Evidence for d-Wave Pairing in Electron-Doped Superconductors." Submitted to Phys. Rev. Lett. Loomis Laboratory of Physics, University of Illinois at Urbana-Champaign, 1110 West Green Street, Urbana, IL 61801-3080; e-mail prozorov@uiuc.edu; preprint also available at http://xxx.lanl.gov/abs/cond-mat/0002301.

G. C. Rout, B. N. Panda, and S. N. Behera, "Mutual Influence of Superconductivity and Magnetism in Strongly Correlated Cuprates." To be published in Physica C (in press). Department of Physics, G. M. College, Sambalpur, Orissa 768004, INDIA. Key words: magnetic superconductor, antiferromagnetic order, *Cu-O* planes, BCS model. 75.50.Ee.

M. Ruther, H. Forster, M. Eisterer, and H. W. Weber, "Trapped Field Measurements on Melt Textured Bulk Superconductors in Liquid Nitrogen." To be published in Physica C. Atominstitut der Österreichischen Universitäten, A-1020 Wien, AUSTRIA; H. W. Weber's e-mail weber@ati.ac.at.

S. Saito, H. Yoshimoto, Y. Y. Suzuki, and S. Kurihara, "Quantum Phase Transition in Extended Attractive Hubbard Model." Submitted to Phys. Rev. Lett. Department of Physics, Waseda University, 3-Okubo, Tokyo 169-8555, JAPAN; telephone +81 3 5286 3447; telefax +81 3 5286 3487; e-mail saito@kh.phys.waseda.ac.jp; preprint also available at http://xxx.lanl.gov/abs/cond-mat/0002288. 74.20.Fg; 71.30.+h; 71.45.Lr; 74.25.Dw; 74.20.-z; 74.25.-q.

Edson Sardella, "Magnetic Field of an In-Plane Vortex Inside and Outside a Layered Superconducting Film." Departamento de Física, Faculdade de Ciências, Universidade Estadual Paulista, Caixa Postal 473,

17033-360 Bauru-SP, BRAZIL; e-mail sardella@email.fc. unesp.br; preprint also available at http://xxx.lanl.gov/abs/cond-mat/0002152. 74.60.Ec; 74.60.Ge.

Franz M. Sauerzopf, M. Zehetmayer, A. Köhler, and H. W. Weber, "Can the Collective Pinning Approach be Applied to $YBa_2Cu_3O_{7-\delta}$ Superconductors?" To be published in Physica C. Atominstitut, TU Wien, A-1020 Wien, AUSTRIA; H. W. Weber's e-mail weber@ati.ac.at.

V. V. Srinivasu, V. Sreedevi, K.-I. Itoh, A. Hashizume, M. Tada, J. Yamada, S. Moehlecke, Y. Kopelevich, and T. Endo, "Microwave Absorption in *BSCCO* Single Crystals." To be published in the Proc. of the Int. School on Crystal Growth Methods and Processes, Chennai, India, Jan. 24 - Feb. 4, 2000. Faculty of Engineering, Mie University, 1515 Kamihama, Tsu, Mie 514-8507, JAPAN; T. Endo's telephone +81 592 32 1211; telefax +81 592 31 9471; e-mail endo@cm.elec.mie-u.ac.jp.

Xiao-dong Su, Jai-moo Yoo, Jae-wong Ko, Hai-doo Kim, Hyung-sik Chung, Z. Q. Yang, and Gui-wen Qiao, "The Influence of Precursor Powders on the Phase Evolution, Grain Size and Transport Current Properties of *BSCCO 2223 Ag*-Sheathed Tapes." To be published in Physica C (in press). Institute of Metal Research, Chinese Academy of Sciences, 72 Wenthav Road, Shenyang 110015, PEOPLE'S REPUBLIC OF CHINA; telephone +86 242 384 3531; telefax +86 242 3891 320; e-mail xdsu@hotmail.com. Key words: *Bi-2223/Ag*-sheathed tapes, precursor powder, critical current density, grain size. 74.25.Fy; 74.60.Ge; 74.60.Jg; 74.72.Hs.

S. V. Sudareva, E. I. Kuznetsova, T. P. Krinitsina, I. B. Bobylev, and E. P. Romanov, "Modulated Structures in Non-Stoichiometric $YBa_2Cu_3O_{7-\delta}$ Compounds." To be published in Physica C (in press). Institute of Metal Physics, Ural Division of Russian Academy of Sciences, S. Kovalevskaya Str. 18, GSP-170, Ekaterinburg 620219, RUSSIA; telephone +7 3432 499 179; telefax +7 3432 745 244; e-mail krinitsina@imp.uran.ru. Key words: non-stoichiometric $YBa_2Cu_3O_{7-\delta}$ compound, low-temperature annealing, oxygen separation, atomic displacement waves, modulated structure.

H. Suematsu, H. Okamura, S. Lee, S. Nagaya, and H. Yamauchi, "A Possible Cause of Peak Effect in the *Y-Ba-Cu-O* Melt-Grown Bulks: Modulation in Oxygen Distribution." To be published in Physica C. Contact H. Yamauchi, Materials & Structures Laboratory, Tokyo Institute of Technology, 4259 Nagatsuta, Midori-ku, Yokohama 227, JAPAN; telephone +81 45 924-5315; telefax +81 45 924-5365 or -5360; e-mail yamauchi@materia.titech.ac.jp.

Y. Takahama, H. Suematsu, T. Matsushita, and H. Yamauchi, "Dependence of Peak Effect on the Particle Size in Superconducting $SmBa_2Cu_3O_{7-\delta}$ Powder Samples." To be published in Physica C. Contact H. Yamauchi, Materials & Structures Laboratory, Tokyo Institute of Technology, 4259 Nagatsuta, Midori-ku, Yokohama 227, JAPAN; telephone +81 45 924-5315; telefax +81 45 924-5365 or -5360; e-mail yamauchi@materia.titech.ac.jp.

K. Tanaka and F. Marsiglio, "Anderson's 'Theorem' and Bogoliubov-de Gennes Equations for Surfaces and Impurities." Submitted to Physica C: Proc. of the 6th Int. Conf. on Mater. and Mech. of Supercond. and High Temp. Supercond. (M^2S-HTSC-VI), Houston, Tex., Feb. 20-25, 2000. Department of Physics, University of Alberta, Edmonton, Alberta, CANADA T6G 2J1; e-mail ktanaka@phys.ualberta.ca; preprint also available at http://xxx.lanl.gov/abs/cond-mat/0002260.

Takami Tohyama and Sadamichi Maekawa, "Angle-Resolved Photoemission in High-T_c Cuprates from Theoretical Viewpoints." To be published in Supercond. Sci. & Technol. Institute for Materials Research, Tohoku University, Sendai 980-8577, JAPAN; e-mail tohyama@imr.tohoku.ac.jp; preprint also available at http://xxx.lanl.gov/abs/cond-mat/0002225. 79.60.-i; 74.20.-z; 74.25.Jb.

S. Tönies, H. W. Weber, D. Milliken, Y. C. Guo, S. X. Dou, A. Gandini, R. Sawh, Y. Ren, and R. Weinstein, "Influence of Neutron Irradiation on the Superconducting Properties of *BiSCCO* Tapes Containing Different Amounts of Uranium." To be published in Physica C. Atomic Institute of the Austrian Universities, Technical University of Vienna, Stadionallee 2, A-1020 Wien, AUSTRIA; H. W. Weber's e-mail weber@ati.ac.at.

C. C. Tsuei and J. R. Kirtley, "Phase-Sensitive Evidence for d-Wave Pairing Symmetry in Electron-Doped Cuprate Superconductors." IBM T. J. Watson Research Center, P.O. Box 218, Yorktown Heights, NY 10598; e-mail kirtley@watson.ibm.com; preprint also available at http://xxx.lanl.gov/abs/cond-mat/0002341.

A. Vostner, H. W. Weber, A. Mathen, C. Jooss, J. Hoffmann, and H. C. Freyhardt, "Characterization of *YBCO* Coated Conductors Deposited by LPE on *MgO* Substrates." To be published in Physica C. Atominstitut der Österreichischen Universitäten, A-1020 Wien, AUSTRIA; H. W. Weber's e-mail weber@ati.ac.at.

H. Yamauchi, M. Karppinen, T. Hosomi, and H. Fjellvåg, "Water-Containing Phases Derived from '02(n-1)n' Superconductors: I. Novel 02(n-1)n Homologous Series in the *Ba-Ca-Cu-O* System and the Derivative Series." To be published in Physica C. Materials & Structures Laboratory, Tokyo Institute of Technology, 4259 Nagatsuta, Midori-ku,

Yokohama 227, JAPAN; telephone +81 45 924-5315; telefax +81 45 924-5365 or -5360; e-mail yamauchi@materia.titech.ac.jp.

H. Yamauchi, M. Karppinen, T. Hosomi, and H. Suematsu, "Water-Containing Phases Derived from '02(n-1)n' Superconductors: II. Derivative of the $Sr_2Ca_2Cu_3O_{8\pm\delta}$ ($0^{(Sr)}223$) Phase." To be published in Physica C. Materials & Structures Laboratory, Tokyo Institute of Technology, 4259 Nagatsuta, Midori-ku, Yokohama 227, JAPAN; telephone +81 45 924-5315; telefax +81 45 924-5365 or -5360; e-mail yamauchi@materia.titech.ac.jp.

Youichi Yanase and Kosaku Yamada, "Effect of Magnetic Field on the Pseudogap Phenomena in High-T_c Cuprates." Department of Physics, Kyoto University, Kyoto 606-8502, JAPAN; e-mail yanase@ton.scphys.kyoto-u.ac.jp; preprint also available at http://xxx.lanl.gov/abs/cond-mat/0002274. Key words: high-T_c cuprates, pseudogap phenomena, strong-coupling superconductivity, superconducting fluctuation, $1/T_1T$, magnetic field dependence, transport coefficient.

Masateru Yoshizumi, Makoto Kambara, Yuh Shiohara, and Takateru Umeda, "Effect of Oxygen Partial Pressure on Quasi-Ternary Phase Diagram of $NdO_{1.5}$-BaO-CuO System." To be published in Physica C (in press). Superconductivity Research Laboratory, International Superconductivity Technology Center (ISTEC), 1-10-13 Koto-ku, Tokyo 135-0062, JAPAN; telephone +81 3 3536 5711; telefax +81 3 3536 5705; e-mail yoshizumi@istec.or.jp. Key words: phase diagram, oxygen partial pressure, *Nd123,* solid solution.

Oron Zachar, "Stripes: Why Hole Rich Lines are Antiphase Domain Walls?" International Centre for Theoretical Physics, 11 Strada Costiera, I-34100 Trieste, ITALY; e-mail zachar@lps.u-psud.fr; preprint also available at http://xxx.lanl.gov/abs/cond-mat/0001217.

COMING EVENTS

*(An * indicates a previously listed event. Also see complete listing of upcoming conferences and workshops at our Web site http://www.iitap.iastate.edu/htcu/comevents.html.)*

July 1 - 9, 2000: 6th Advanced Studies on Superconducting Engineering (ASSE2000), Eger, Hungary. Detailed studies on the newest results and their engineering aspects both in fundamental research and applications of high-temperature superconductors. The main frame is a series of lectures held by well-known scientists, researchers, engineers, and experts. After lectures, the unique "Club of Scientists" will be organized to provide time for free discussions. The last three days of the Studies will be devoted to a workshop for each participant willing to present the results of her/his work. The purpose of ASSE2000 is: to introduce a wide range of aspects of superconducting engineering to interested people; to get together researchers, engineers, students, lecturers, and scientists to discuss new results and ideas in the HTS field; and to make new friendships and create a partnership among participants. After ASSE2000, a special two-day (July 10-11, 2000) satellite workshop will be held on Superconducting Flywheels – all participants are invited to attend. Contact Dr. István Vajda, Department of Electrical Machines and Drives, Technical University of Budapest, H-1111 Budapest, Egry József u. 18., Hungary; telephone +36 1 463-2961; telefax +36 1 463-3600, e-mail vajda@supertech.vgt.bme.hu.

Aug. 1 - 4, 2000:* Minisymposium on Correlation in Mesoscopic Systems, Miramare, Trieste, Italy. Objective is to bring together leading researchers actively working in the field of normal-metal mesoscopic systems and 2D metal-insulator transitions, in order to discuss the most recent developments and research directions. Topics are interaction in mesoscopic systems, 2D delocalization transition, and non-equilibrium mesoscopics. Scientists and physicists from all countries that are members of the UN, UNESCO, or IAEA can attend the Minisymposium. Some funds are available for subsistence allowance to a limited number of participants from developing countries. No registration fee. **Deadline for participation request, March 31, 2000. Request for participation obtainable via e-mail from smr1234@ictp.trieste.it. Contact Ms. E. Brancaccio, Minisymposium on Correlation in Mesoscopic Systems, International Centre for Theoretical Physics, Strada Costiera 11, I-34014 Trieste, Italy; telephone +39 040 2240284; telefax +39 040 2245163; e-mail SMR1234@ictp.trieste.it; Web site http://www.ictp.trieste.it/cgi-bin/ICTPsmr/mkhtml/smr2html.pl?smr1234/Bulletin.

**Sept. 17 - 22, 2000:* The Applied Superconductivity Conference (ASC 2000), Pavilion Convention Center, Virginia Beach, Virginia. Premier conference on applied superconductivity held every two years. The meeting will highlight the latest developments and will feature invited presentations that offer an exciting look into the future. Papers will be presented in three general areas of superconductivity: large scale, materials, and electronics. Further information available at the Web site http://www.ascinc.org.

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