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NOTA BENE:

Dear Subscribers,

We are grateful to all of you who submitted pledges to the *High-T_C Update* during our experiment to determine whether we could continue operating on a subscriber-supported basis. A big thank-you also to the organizations who pledged funds ranging from $500 to $5000 for the newsletter project. Unfortunately, the total funds pledged would cover only about a third of our operating costs, well below what was needed to sustain the newsletter. We therefore release you from your pledges. From this point on, we plan to run on reserve funds for as long as feasible. We will let you know when our last issue will be published.

Sincerely,
Sreeparna Mitra
John R. Clem

$RBa_2Cu_3O_{7-\delta}$

The pressure dependence of the in-plane, chain, and out-of-plane resistivity of untwinned crystals of *$YBa_2Cu_3O_{7-\delta}$* under hydrostatic pressure P up to 2 GPa has been investigated by K. Yoshida (SRL-ISTEC) et al. The authors observed a dramatic decrease in all the resistive components and the disappearance of the $\rho_c(T)$ upturn with increasing P, and they report that this can be explained by assuming that applied pressure induces additional carriers in both the *CuO_2* planes and the *CuO* chains, similar to the effect of chemical doping. The authors stress that the conventional model of carrier transfer from the chains to the planes needs to be reexamined.

A study of flux jumps in unirradiated and 7.5×10^{10} *Kr*-ion/cm^2 irradiated *$(Y_xTm_{1-x})Ba_2Cu_3O_{7-\delta}$* single crystals has been carried out by J. Vanacken (Leuven) et al. Using pulsed-field magnetization measurements at field-sweep rates from 0.1 T/s to 1800 T/s, the authors found that flux jumps depend on the magnetic field, the magneto-thermal history of the sample, the magnetic-field sweep rate, the critical current density J_c, the temperature, and the thermal contact between the sample and the bath.

The peak effect in *$YBa_2Cu_3O_{7-\delta}$ (Y-123)* bulk superconductors containing both *Y-123* and *Y_2BaCuO_5 (Y-211)* phases has been studied by H. Suematsu (Tokyo Tech) et al. The authors found that (a) *Y-211* particles have nothing to do with the peak effect while (b) the inter-twin-boundary distance is undoubtedly correlated with the peak effect.

An infiltration process for the fabrication of *Y-123* superconducting materials with the dimensions of a thick film and the microstructure of a melt-textured single-domain bulk has been developed by E. Sudhakar Reddy et al. (ACCESS). The process starts with *Y_2O_3* cloth as a precursor material. The cloth is infiltrated with barium cuprates and copper oxides from a liquid-phase source, then converted into the *Y-211* phase, and finally into the *Y-123* phase.

A preprint by P. Diko (Kosice) and K. C. Goretta (Argonne) reports that *Y-211* macroinhomogeneity is the main source of macrostresses in single-grain melt-grown *Y-123* bulks. The authors also report that macrocracks in multigrain melt-grown *123-211* bulks develop under the influence of stresses between *123* grains during cooling due to the anisotropy of the *123*-phase thermal expansion.

Bi Cuprates

As noted by A.I.M. Rae (Birmingham), recent experimental studies of Josephson tunneling between single crystals of *$Bi_2Sr_2CaCu_2O_{8+\delta}$ (Bi-2212)* and lead *(Pb)* films have revealed small, but finite, critical currents along the c-axis of *Bi-2212,* despite such Josephson tunneling being forbidden by symmetry. The author shows that the known

anisotropy of the *Pb* order parameter would allow quite strong coupling between single crystals of *Bi-2212* and *Pb* if the tunneling direction were along the *Bi-2212* c axis and the [110] direction of the *Pb* crystal. This mechanism could account for the experimental results on granular *Pb* films if there is as little as a few percent preferred orientation in the films, or if time-reversal symmetry is broken at the grain boundaries of the *Pb* film. The author thus stresses that all the experimental evidence is therefore consistent with *Bi-2212* being a pure d-wave superconductor.

The fabrication of well-defined c-axis *Bi-2212/Au/Nb* junctions on cleaved surfaces of a *Bi-2212* single crystal and the observation of current-voltage characteristics typical for Josephson tunnel junctions are reported by I. Kawayama (Osaka) et al. The magnetic-field dependence of the super-current showed that the zero-bias current is not leakage from pinholes but a Josephson current. The authors argue that the results strongly indicate the presence of an s-wave component in *Bi-2212*. The temperature dependence of the Josephson current suggests that the superconducting gap for the s-wave component in *Bi-2212* is about 10^{-3} of the d-wave component, and that the T_c of the s-wave component is about 10 K.

Measurements of anomalously large dissipative conductivities σ_1 in *Bi-2212* at low temperatures are reported by J. Corson (LBNL and UC-Berkeley) et al. The authors measured the complex conductivity of *Bi-2212* thin films at 100-600 GHz as a function of doping from the underdoped to the over-doped state. At low temperatures there exists a residual σ_1, which scales with the T = 0 superfluid density as the doping is varied. This residual σ_1 is larger than the possible contribution to σ_1 from a thermal population of quasiparticles at the d-wave gap nodes.

The dependence of the irreversibility field H_{irr} on the concentration and distribution of holes in the $Bi_2Sr_2Ca_{1-x}Y_xCu_2O_{8+\delta}$ *(Bi-2212)* system has been investigated by M. Kotiranta (Tokyo Tech) et al. With increasing x, a continuous increase in the oxygen content and decrease in the thickness of the *SrO*-$Bi_2O_{2+\delta}$-*SrO* blocking layer were observed. The extra oxygen taken into the structure only partially counteracts the trivalent-*Y* to divalent-*Ca* substitution, and consequently the hole concentration in both blocks was found to decrease. With increasing x and δ, H_{irr} was not enhanced but rather was suppressed. This suggests that the thickness of the blocking layer is not the primary parameter in determining the irreversibility line.

A theoretical analysis in terms of indirect exchange pairing has been given by L. Jansen (ETH-Zürich) and R. Block (Amsterdam) for the effect of iodine intercalation on the superconducting transition temperature T_c in the high-T_c series $Bi_2Sr_2Ca_{N-1}Cu_NO_{2N+4+\delta}$ (N = 1, 2, and 3) and in the *Y*-doped N = 2 compound. The authors conclude that iodine intercalation leads to removal of oxygen anions from inside $(BiO)_2$ bilayers and migration of these oxygens to the CuO_2 layers as the only effect; i.e., neither a proposed hole transport nor weakening of interlayer coupling takes place. The authors obtain results in quantitative agreement with experimental values of T_c vs x in pristine and intercalated $Bi_2Sr_2Ca_{1-x}Y_xCu_2O_{8+\delta}$.

A comparison experiment has been carried out by W. P. Chen (CREST, Tsukuba) et al. to study the effect of magnetic melt processing on fabrication of *Bi-2212* tapes. Vertical magnetic fields H_a up to 10 T were applied during the melt processing of dip-coated monolayer *Bi-2212/Ag* tapes (over 60 μm in thickness), which were set horizontally or vertically. The authors found that in the horizontally set tapes both the texture development and the transport critical current density J_c were enhanced as the magnetic field H_a increased up to 7.5 T. However, when H_a was further increased from 7.5 to 10 T, J_c was found to decrease sharply. The reason for this is unclear.

Other Cuprates

A preprint by C. W. Chu (TCSUH) et al. reports a systematic investigation of the magnetic, electrical, and structural properties of $RuSr_2GdCu_2O_8$ *(Ru-1212),* in which long-range ferromagnetic order and superconductivity previously have been reported to coexist. From the magnetic measurements, the authors conclude that the bulk Meissner state does not exist in this compound. The authors suggest that the absence of a bulk Meissner state may be attributed either to the appearance of a spontaneous vortex state in the superconducting ferromagnet $RuSr_2GdCu_2O_8$ or to the presence of a minor superconducting phase in an otherwise nonsuperconducting ferromagnet.

Measurements of the out-of-plane resistivity ρ_c of $La_{2-x}Sr_xCuO_4$ under anisotropic pressure are reported by F. Nakamura et al. (Hiroshima). The authors found that c-axis compression, which decreases ρ_c, drastically reduces T_c, whereas c-axis expansion, which increases ρ_c, enhances T_c from 38 K at ambient pressure to 51.6 K at 8 GPa. The authors find that the variation of T_c scales as a function of ρ_c, and that the c-axis pressure coefficient is much stronger than that for the ab axis. The authors suggest that interlayer expansion enhances two-dimensionality, which in turn raises T_c.

Two novel homologous series of superconductive *M-m2(n-1)n* cuprates in the *Ba-Ca-Cu-O* system with the charge-reservoir block consisting of either peroxide-type oxygen [*02(n-1)n* phases] or water [*H-m2(n-1)n* phases] are reported by M. Karppinen (Tokyo Tech and Helsinki University of Technology) et al. The former phases with T_cs higher than 100 K were obtained using high-pressure

synthesis under oxidizing conditions. When exposed to air, the latter phases spontaneously form from the highly unstable *02(n-1)n* phases by incorporation of H_2O molecules.

As reported by H. Yamauchi (Tokyo Tech) and M. Karppinen (Tokyo Tech and Helsinki University of Technology), control of the hole distribution in the layered cuprates is essential to tailoring fundamental superconducting properties such as T_c, the irreversibility line H_{irr}, and the peak effect. Employing the bond-valence-sum (BVS) concept, the authors show that there are three different routes for doping the CuO_2 planes with holes, and that the more confined holes are in the middle of the CuO_2 plane stack, the higher the T_c is. The authors show that in the $Cu(Ba,Sr)_2(Yb,Ca)Cu_2O_{6+z}$ system, the distribution of holes is different depending upon the hole-doping route used, and they find that the more homogeneous the hole distribution along the c axis is, the better the H_{irr} characteristics are.

A preprint by J.-Y. Genoud (NZIIR-Lower Hutt) et al. reports measurements of the Raman spectra of a high-quality $YBa_2Cu_4O_8$ single crystal grown in an inert $BaZrO_3$ crucible, including studies of changes in the electronic background at temperatures from 10 K to 300 K. Although the authors observed no temperature dependence in the XY (B_{2g}) geometry, they found a clear superconductivity-related depletion of the electronic scattering in the X'Y' (B_{1g}) geometry at low frequencies below T_c, from which the authors determined a maximum gap of approximately 650 cm^{-1}. The authors also found a depletion that takes place over a much larger frequency range and appears at higher temperature, which the authors associate with a normal-state gap.

Vortices

The dependence on the magnetic field **B** || c and the temperature T of the interlayer quasiparticle conductivity σ_q in a Josephson-coupled d-wave superconductor has been calculated by I. Vekhter (Guelph) et al. The authors consider a clean superconductor with resonant impurity scattering and a dominant coherent interlayer tunneling. When pancake vortices in adjacent layers are weakly correlated at low T, the conductivity increases sharply with B before reaching an extended region of slow linear growth, while at high T it initially decreases and then reaches the same linear regime. For correlated pancakes, σ_q increases much more strongly with the applied field.

The dynamical vortex response of a two-dimensional array of resistively shunted Josephson junctions in a perpendicular magnetic field has been studied by B. J. Kim and P. Minnhagen (Umeå) using simulations. As a function of magnetic field the response is found to cross over from normal to anomalous, and the authors discuss how this crossover should be reflected in measurements of the complex impedance for Josephson-junction arrays and superconducting films.

Flux Penetration

The magnetic remanence exhibited by Josephson-junction arrays subjected to an ac magnetic field has been studied by W.A.C. Passos et al. (São Carlos). The authors measured the predicted magnetic remanence of Josephson-junction arrays using a 3D disordered Josephson-junction array fabricated from granular *Nb*.

The critical state of a nonuniform type-II superconductor has been analyzed by A. Yu. Galkin (Kiev) et al. using a model superconductor divided into periodic layers with different values of the critical current density. The dependence of the magnetic moment on the external magnetic field B_e differs significantly from the dependence predicted by the Bean model for a homogenous superconductor.

The magnetic response of superconductors in the presence of low values of a uniform applied magnetic field has been studied by F. M. Araujo-Moreira (São Carlos) et al. Using *Nb* cylinders of different length-to-radius ratios, the authors carried out measurements of the dc magnetization and ac magnetic susceptibility, which showed a dramatic enhancement of the initial magnetization for thin samples due to demagnetizing effects. The authors analyze the experimental results in terms of a model that allows the magnetic response of perfectly diamagnetic cylinders to be calculated with high precision.

Magnetization hysteresis loops and the ac susceptibility $\chi = \chi' + i\chi''$ of a superconducting thin disk have been calculated by D. V. Shantsev (Oslo and St. Petersburg) et al. using a critical-state model allowing for a field-dependent critical current density $J_c(B)$. The results are obtained by numerically solving a set of coupled integral equations for the flux and current distributions in a disk placed in a perpendicular applied magnetic field B_a.

Films

As stressed in a preprint by L. Trappeniers (Leuven) et al., the normal-state resistivity of high-temperature superconductors can be probed in the region below T_c by suppressing the superconducting state in high magnetic fields. In this preprint, the authors present the normal-state properties of $YBa_2Cu_3O_{7-\delta}$ thin films in the underdoped regime and the normal-state resistance of $La_{2-x}Sr_xCuO_4$ thin films under epitaxial strain, measured below T_c by applying pulsed fields up to 60 T. The authors interpret the data in terms of a recently proposed 1D quantum transport model

with the 1D paths corresponding to the charge stripes. A related paper by J. Vanacken (Leuven) et al. compares these results with transport data for the $Sr_{2.5}Ca_{11.5}Cu_{24}O_{41}$ spin-ladder compound.

The growth conditions and microstructure of Y_2O_3 buffer layers on cube-textured *Ni* have been studied by A. Ichinose (Wisconsin-Madison and CRIEPI) et al. as part of a buffer-layer study for $YBa_2Cu_3O_{7-\delta}$ *(YBCO)* coated conductors. The authors found that varying the Y_2O_3 thickness (300 or 600 nm) and deposition-chamber pressure (10^{-4} or 10^{-5} torr) did not affect the development of a {100} texture. However, annealing the *Ni* at 800°C rather than 600°C produced a tendency for {111} rather than {100} growth near grain-boundary grooves. This local imperfection in the texture could lead to significant barriers to supercurrent flow in the *YBCO* overlayer.

The growth of thin films of $Bi_2(Sr,Ca)_2CuO_X$ *(Bi-2201)* on *MgO* has been studied by T. Endo (Mie) et al. Film growth was carried out by ion-beam sputtering at substrate temperatures T_S = 400-700°C with a supply of either oxygen molecules or plasma at around 1 mtorr. Conditions for high-quality film growth are: (a) moderate thermal energy, (b) ultralow growth rate, (c) collision-induced moderate energy of the sputtered particles, (d) suitably excited oxygen, (e) plasma-induced multiple nucleation, and (f) ordering of *Sr* and *Ca* and reduction of the surface energy of the growing film by the plasma.

Applications

As emphasized in a preprint by P. Kummeth (Siemens-Erlangen) et al., the main advantages of high-temperature-superconducting (HTS) transformers are reduced size and weight and better efficiency in comparison with conventional transformers. These advantages are due to the high critical current densities and low ac losses of HTS tape conductors. Moreover, nonflammable liquid nitrogen can be used as a coolant in HTS transformers, thereby dramatically reducing the potential fire and environmental hazards that are present in conventional transformers. The authors have designed, manufactured, and tested a 100 kVA HTS power transformer as a functional model operated at 77 K. The iron core and HTS windings were mounted inside a glass-fiber-reinforced-plastic cryostat and cooled by liquid nitrogen. The nominal primary current of the transformer was 18 A (5.6 kV), and the secondary nominal current was 92 A (1.1 kV). Untwisted silver-sheathed *(Bi,Pb)-2223* tapes with 55 filaments were used. While the high-voltage primary winding was made of a stack of 30 pancake coils connected in series, the two low-voltage secondary windings were solenoid coils with five tape conductors wound in parallel and transposed *in-situ.* The primary and secondary windings were arranged concentrically, and the secondary windings were connected in series. The authors performed no-load tests, short-circuit tests, and load tests, which proved the rated capacity of the transformer. The loss measurements yielded HTS winding losses of 20.6 W and iron losses of 403 W.

The effects of the surface resistance R_S and surface reactance X_S on superconducting microstrip antenna properties have been investigated by M. I. Ali et al. (Yamagata). The antennas were fabricated from *YBCO* thin films on a (100) *MgO* single-crystal substrate at 11.7 GHz. Experiments revealed that the X_S of the superconducting thin film mainly influences the antenna resonant frequency and has a small influence on the antenna input impedance, while R_S mainly affects the input impedance of the antenna.

Bolometric effects of a simple, large-area, unpatterned *YBCO* thin film on a 1 μm thick *Pt* membrane are reported by J. Yoon et al. (KAIST). The *YBCO* film was found to be composed of c-axis-normal and a-axis-normal textures. Measurements of bolometric effects at the resistive transition edge indicated a responsivity similar to the theoretically predicted value.

A new, simple, low-cost experimental technique designed for investigating the electrical properties of disk-shaped superconducting samples is described in a preprint by Ph. Vanderbemden (Liège) et al. In response to two neighboring, 90° out-of-phase ac magnetic fields applied perpendicular to the disk, the material experiences an electromagnetic torque, which depends on its electrical properties.

Theory

As noted in a preprint by M. B. Walker and M. F. Smith (Toronto), the quasiparticle lifetime and the related relaxation times are the fundamental quantities that must be known in order to obtain a description of the transport properties of the high-T_C superconductors. Studies of these quantities have been undertaken previously for d-wave high-T_C superconductors for the case of temperature-independent elastic impurity scattering. However, much less is known about temperature-dependent inelastic scattering. The preprint gives a detailed description of the characteristics of temperature-dependent quasiparticle-quasiparticle scattering in d-wave superconductors. The authors find that this process gives a natural explanation of the rapid variation with temperature of the electrical transport relaxation rate.

As noted in a preprint by T. Dahm (Dresden) and D. J. Scalapino (UC-Santa Barbara), despite several efforts, the nonlinear Meissner effect in d-wave superconductors, discussed by Yip and Sauls in 1992, has not yet been verified experimentally in high-T_C superconductors. In

this preprint, the authors reinvestigate the nonlinear response expected in a d-wave superconductor, taking into account the influence of nonmagnetic impurity scattering. They find that while the linear |**H**| field dependence of the penetration depth predicted by Yip and Sauls is restricted by the lower critical field and can be masked by nonlocal effects, the upturn of the nonlinear coefficient of the quadratic field dependence is more stable and remains observable over a broader range of parameters. The authors suggest that this coefficient can be measured by harmonic generation and intermodulation.

The physical properties of low-energy superconducting quasiparticles in high-T_c superconductors have been examined by T. Xiang (Beijing) and C. Panagopoulos (IRC-Cambridge) using experimental magnetic penetration depth and specific-heat data. The authors find that the low-energy density of states of quasiparticles in $La_{2-x}Sr_xCuO_4$ scales with $(x - x_c)/T_c$ to leading order, where x_c is the critical doping concentration below which $T_c = 0$.

A preprint by T. Okabe (Gunma) reports an evaluation of vertex corrections to T_c in the context of the antiferromagnetic spin-fluctuation model of high-T_c superconductivity. The author finds that the corrections are attractive in the $d_{x^2-y^2}$ channel and that they become appreciable upon passing through an intermediate-coupling regime of $T_c \approx 100$ K, the maximum T_c attainable in the one-loop Eliashberg calculation.

Progress in understanding the fermionic Ising spin glass with arbitrary filling is discussed in a preprint by R. Oppermann and H. Feldmann (Würzburg). Using an extended model, the authors discuss the competition between local pairing superconductivity and spin-glass order.

In a preprint by M. P. Das (Australian National University), the author suggests that it should be possible to describe a superconducting or superfluid ground state using density-functional theory. A correct understanding of the ground state, however, would require a good knowledge of the energy functional, which is currently lacking.

Other Activities

Through neutron and x-ray diffraction and resistivity measurements on crystals of the superconducting material $La_{1.6-x}Nd_{0.4}Sr_xCuO_4$, N. Ichikawa (Tokyo) et al. present evidence that charge stripes that order at low temperatures are intrinsically metallic. Despite a slight difference in the charge-ordering temperatures determined by diffraction and recent nuclear quadrupole resonance (NQR) studies, the latter results are found to correlate with a specific signature in the resistivity. The authors conclude that the smooth evolution of the resistivity with temperature indicates that charge ordering involves a gradual pinning of preformed stripes.

Measurements bearing on the question of whether stripes in cuprates and nickelates are insulating or metallic have been carried out by Yu. G. Pashkevich (Donetsk) et al. The authors carried out Raman light-scattering and optical conductivity measurements on a single crystal of $La_{1.775}Sr_{0.225}NiO_4$, which exhibits incommensurate charge-stripe order. The extra phonon peaks induced by stripe order can be understood in terms of the energies of phonons that occur at the charge-order wave vector $\mathbf{Q}_c$. A strong Fano antiresonance for a *Ni-O* bond-stretching mode provides clear evidence for finite dynamical conductivity within the charge stripe.

The 23 K superconducting phase in the *Y-Pd-B-C* system has been identified by L. M. Dezaneti et al. (TCSUH) using a microanalysis technique on micrograin samples. Through physical and structural characterization of such micrograins, the authors found that the tetragonal $YPd_2B_2C_x$ phase with space group I4/mmm and lattice parameters a = 0.371 nm and c = 1.08 nm is responsible for the 23 K superconducting transition in this system.

Overviews

A review by M. Karppinen (Tokyo Tech and Helsinki University of Technology) and H. Yamauchi (Tokyo Tech) stresses that in the known multilayered superconductive copper-oxide structures, the charge distribution is inhomogeneous over several different length scales in the crystal. The authors discuss: (a) general crystallographic categorization and naming scheme of multilayered copper oxides based on the concept of homologous series, (b) crystallographic and chemical factors to control the oxygen nonstoichiometry and charge distribution, (c) techniques for probing the charge and charge-carrier distributions in the layered copper-oxide crystal, and (d) empirical relationships between the carrier distribution and superconducting properties including the superconducting transition temperature T_c, the magnetic irreversibility field H_{irr}, and the peak-effect (fishtail) phenomenon (221 refs.).

As noted in a brief review by S. Sachdev and M. Vojta (Yale), it was argued many years ago that translational symmetry breaking due to the appearance of spin-Peierls ordering (or bond-charge stripe order) is a fundamental property of the quantum paramagnetic states of a large class of two-dimensional square-lattice antiferromagnets. Recently, such states were shown to be a convenient point of departure for studying translational symmetry breaking in doped antiferromagnets. The authors briefly review these results with an emphasis on experimental implications (29 refs.).

Contributed by John R. Clem

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TECHNOLOGY NEWS

(Also see Applications section of Nota Bene.)

This section describes progress in manufacturing, product development, and technology transfer in the high-T_C superconductivity field. Please send your contributions (product development information, news regarding technology transfer efforts, or any information you would like to share about your corporation or laboratory) to the editor.

In a recent notification, Intermagnetics General Corporation (IGC) announced that it is centralizing its High-Temperature Superconductors (HTS) Development and Manufacturing Unit in a newly renovated facility near its corporate headquarters. HTS technology is viewed as being especially valuable to the deregulating electric utility industry. Officials stated that the success to date of projects the company is currently undertaking with industry partners, aimed at the commercialization of products such as transformers, fault-current controllers, and transmission cables, convinces them that the technology is capable of being competitive on a global scale. Intermagnetics is working with partners such as General Atomics, Waukesha Electric Systems, Southwire Company, several DOE National Laboratories, Rensselaer Polytechnic Institute, and the University of Albany, to commercialize the technology beyond existing sales of materials and prototype devices.

Intermagnetics' Advanced Devices & Systems Department, responsible for commercializing high-temperature superconductivity technology, is expected to complete its move by the end of November 1999. Centralizing all operations will increase the efficiency and economy of operations, enabling manufacturing of HTS materials and devices to ramp up to commercially viable levels, and the new facility will enable the expansion of next generation HTS wire manufacturing utilizing high-technology manufacturing techniques similar to those employed by the semiconductor industry. The new techniques are expected to reduce materials costs to levels necessary for broad commercial applications of HTS technology over the next three to five years. For further information, contact Intermagnetics General Corporation, 450 Old Niskayuna Road, P.O. Box 461, Latham, NY 12110-0461; telephone (518) 782-1122.

Contributed by Sreeparna Mitra

PREPRINTS

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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.)*

Feb. 1 - 11, 2000: Magnetic Properties Of Condensed Matter Investigated by Neutron Scattering and Synchrotron Radiation Techniques, Miramare, Trieste, Italy. School organized jointly by INFM and the Abdus Salam ICTP. Purpose of the School is to increase the number of users of neutrons and photons at central facilities and to expose people already carrying out research in magnetism (or those acquiring an interest in magnetic materials) to the basic principles and usefulness of the two techniques for investigation of the magnetic properties of condensed matter. Leading authorities in magnetism/neutron/synchrotron radiation research will lecture at the School on basic principles and recent developments in both fields. The lectures are intended for young researchers and graduate students. An important aspect of the School will be the problem classes, where students will be tested on their knowledge of concepts introduced in the lectures. The School will ultimately give researchers who have not used the two techniques a motivation to use neutron and/or photon scattering in their relevant field of interest. Open to scientists and students from all countries that are members of the UN, UNESCO or IAEA. Activity to be conducted in English. Limited funds available for some scientists from developing countries. No registration fee. **Deadline for requesting participation, November 15, 1999.** For information, contact the Abdus Salam ICTP, SMR 1216 (c/o Ms. D. M. Sauleek), Strada Costiera 11, I-34014 Trieste, Italy; telephone +39 040 2240111; telefax +39 040 2240585; e-mail smr1216@ictp.trieste.it; Web site http//www.ictp.trieste.it/.

**Feb. 10 - 11, 2000:* The 2000 Wire Development Workshop of the DOE Superconductivity Program, in St. Petersburg, Fla. Recent progress in first- and second-generation wire technology will be presented by national laboratories, wire manufacturers, and other program partners. Registration information will be available by the end of November. To be added to the program's mailing list, please contact Audrey Lamanna, Energetics, telephone (202) 479-2748, e-mail alamanna@energeticsinc.com.

*Feb. 13 - 18, 2000: Gordon Research Conference on Superconductivity – Harbortown Resort, Ventura, Calif. Session titles include new materials; pseudo-gap and normal-state properties; stripe phases; vortex physics; applications; novel heavy electron, organic, and magnetic superconductors; condensation energy; pairing symmetry, and mechanisms; theory; and c-axis transport. For further information, contact M. Brian Maple, Conference Chair, Department of Physics – 0319, University of California at San Diego, 9500 Gilman Drive, La Jolla, CA 92093; e-mail mbmaple@ucsd.edu. Applications should be sent to Conference Application, Gordon Research Conferences, University of Rhode Island, P.O. Box 984, West Kingston, RI 02892-0984; e-mail app@grcmail.grc.uri.edu (send/request e-mail application form from this address).

*June 18 - 23, 2000: European Conference on Energy Dispersive X-Ray Spectrometry (EDXRS 2000), Kraków, Poland. Aim of the conference is to bring together scientists working either in basic research in x-ray spectrometry, detectors and sources, or involved in applications of x-ray spectrometry or some of the related experimental techniques. Main topics: interaction of photons and particles with matter and modeling; new developments in instrumentation (instruments utilizing polarized radiation, synchrotron radiation and other x-ray sources, grazing angle spectrometers, portable instruments); energy dispersive x-ray detectors (cryo-detectors, low-Z detectors, Peltier-cooled detectors, dedicated pulse processing); quantitation and data handling (sample preparation, quality control and quality assurance, simulation, modeling, software); x-ray optics (capillaries, mirrors, multilayers, TXRF, imaging); microanalysis and elemental mapping (micro-XRF, micro-PIXE, EPMA); and x-ray spectrometry applications in life and environmental sciences, earth sciences, art and cultural heritage, material sciences, and industry. **Pre-registration deadline, November 15, 1999; abstract deadline, March 1, 2000.** The official language of the Conference is English. For information, contact EDXRS-2000 Secretariat, Faculty of Physics and Nuclear Techniques, University of Mining and Metallurgy, Al. Mickiewicza 30, 30-059 Kraków, Poland; telefax +48 12 6340010; Web site http://www.ftj.agh.edu.pl/wfitj/conf/edxrs/.

June 20 - 22, 2000: 11th International Cryocooler Conference (ICC11), Keystone Resort and Conference Center, Keystone, Colo. Technical program will consist of oral and poster sessions. Invited technical topics include Stirling and Pulse-Tube cryocoolers, J-T and G-M cryocoolers, new cryocooler concepts, cryocooler component developments, modeling and test techniques, performance and life test data, applications and integration issues, space flight cryocoolers, and low cost cryocoolers. Oral and poster sessions. For information, contact Rodney L. Oonk, ICC11, Ball Aerospace Systems Division, P.O. Box 1062, Boulder, CO 80306-1062; telephone (303) 939-4449; telefax (303) 939-6307; e-mail iccchair@cryocooler.org.

Sept. 13 - 16, 2000: The Second International Conference on Inorganic Materials, University of California, Santa Barbara. Meeting will provide an opportunity to highlight recent developments and to identify emerging and future areas of growth in this field. Topics include electronic materials, structural materials and ceramics, biomaterials, intermetallics, catalytic and porous materials. Emphasis on oral presentations by invited speakers combined with extended poster sessions. **Abstract deadline, February 25, 2000.** Official language is English. A tabletop exhibition will run for the duration of the conference. For information, contact Sarah Wilkinson, Second International Conference on Inorganic Materials, Elsevier Science Ltd., The Boulevard, Langford Lane, Kidlington, Oxford, OX5 1GB, United Kingdom; telephone +44 1865 843691; telefax +44 1865 843958; e-mail sm.wilkinson@elsevier.co.uk.

RESOURCES

Information

Proceedings: *Nano-Crystalline and Thin Film Magnetic Oxides* – Proceedings of the NATO Advanced Research Workshop on Ferrimagnetic Nano-crystalline and Thin Film Magneto-optical and Microwave Materials, Sozopol, Bulgaria, Sept. 27 - Oct. 3, 1998, edited by Ivan Nedkov and Marcel Ausloos. The development of planar devices for high-density magnetic and magneto-optical recording, and microwave integral technologies has led to a substantial growth of scientific interest in nano-crystalline and thin film magnetic oxides, such as ferrites, manganates, and cuprates. Book deals with three main areas in the study of magnetic oxides for microwave and magneto-optical applications: thin films and nano-crystalline ferroxides, magnetic behavior and applications of oxides with perovskite structures, and nano-sized materials and modeling. Readership: teachers, researchers, and academic and industrial-level workers concerned with magnetic oxides. Publ. 1999; 396 pp.; $189 (HB), $75 (PB); ISBN ISBN 0-7923-5872-4 (HB), ISBN 0-7923-5873-2 (PB). For ordering information (in the Americas), contact Kluwer Academic Publishers, Order Department, P.O. Box 358, Accord Station, Hingham, MA 02018-0358; telephone (781) 871-6600; telefax (781) 871-6528; e-mail kluwer@wkap.com. For all other countries, contact Kluwer Academic Publishers, Book Department, P.O. Box 322, 3300 AH Dordrecht, The Netherlands; telephone +31 78 639 23 92; telefax +31 78 654 64 74; e-mail services@wkap.nl; Web site http://www.wkap.nl/kaphtml.htm/HOMEPAGE.

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